

BMJ Open Quality Facilitators and barriers to conducting an efficient, competent and high-quality oncological multidisciplinary team meeting

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ABSTRACT

Background Optimal oncological care nowadays requires discussing every patient in a multidisciplinary team meeting (MDTM). The number of patients to be discussed is rising rapidly due to the increasing incidence and prevalence of cancer and the emergence of new multidisciplinary treatment options. This puts MDTMs under considerable time pressure. The aim of this study is therefore to identify the facilitators and barriers with regard to performing an efficient, competent and high-quality MDTM.

Methods Semistructured interviews were conducted with Dutch medical specialists and residents participating in oncological MDTMs. Purposive sampling was used to maximise variation in participants' professional and demographic characteristics (eg, sex, medical specialist or resident, specialty, type and location of affiliated hospital). Interview data were systematically analysed according to the principles of thematic content analysis.

Results Sixteen medical specialists and 19 residents were interviewed. All interviewees agreed that attending and preparing MDTMs is time-consuming and indicated the need for optimal execution in order to ensure that MDTMs remain feasible in the near future. Four themes emerged that are relevant to achieving an optimal MDTM: (1) organisational aspects; (2) participants' responsibilities and requirements; (3) competences, behaviour and team dynamics and (4) meeting content. Good organisation, a sound structure and functioning information and communication technology facilitate high-quality MDTMs. Multidisciplinary collaboration and adequate communication are essential competences for participants; a lack thereof and the existence of a hierarchy are hindering factors.

Conclusion Conducting an efficient, competent and high-quality oncological MDTM is facilitated and hindered by many factors. Being aware of these factors provides opportunities for optimising MDTMs, which are under pressure due to the increase in the number of patients to discuss.

INTRODUCTION

In recent decades, the organisation of care for patients with cancer has changed significantly worldwide. There has been a shift

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Multidisciplinary collaboration takes place throughout healthcare by discussing patient cases in multidisciplinary team meetings (MDTMs). Oncological MDTMs in particular suffer from time pressure and optimal execution is not evident.

WHAT THIS STUDY ADDS

⇒ This study identified facilitating and hindering factors for the performance of an efficient, competent and high-quality MDTM.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ These findings form the starting point for determining the improvements needed to make MDTMs future-proof.

from different specialties all working within their own silo, to integrated multidisciplinary care,¹ which is particularly reflected in the emergence of oncological multidisciplinary team meetings (MDTMs).² In these—often weekly—meetings, the outcome of diagnostic procedures is discussed with the intention of arriving at a final diagnosis and treatment plan. Medical specialists from all the involved specialties, including a surgical, medical and radiation oncologist, radiologist, nuclear radiologist and pathologist are present at MDTMs.³ In addition, in teaching hospitals, residents (defined as qualified doctors in training to become medical specialists) from all these specialties are also present.³ In many countries, there are also administrative support and clinical nurse practitioner (CNS) present.^{3 4}

Discussing a patient in the MDTM is a central point in the treatment trajectory, as it contributes to adequate tumour staging, improves decision making about the most appropriate treatment plan, enhances communication

between involved departments and contributes to efficient planning.⁴⁻⁶ Limited evidence even suggests an improvement in patients' overall survival after being discussed in an MDTM.⁵ Most national guidelines worldwide, therefore, recommend that all patients with cancer should be discussed at least once in an MDTM.⁷⁻⁹ In some cases, a patient is discussed several times: preoperatively to discuss diagnostics and treatment plan, postoperatively to determine the pathological tumour-node-metastasis stage and follow-up plan, in the event of recurrent disease and in the palliative phase.⁷ Sometimes a patient is the subject of discussion in different MDTMs (eg, in a local and a regional MDTM).¹⁰ Although patients can be discussed in general MDTMs dealing with different tumour types, it is increasingly common to discuss cases in tumour-type specific MDTMs.³ The duration of the meetings varies, usually between 1 and 2 hours, with an average of 2 min discussion time per patient.¹¹ Furthermore, the number of different patients to be discussed is growing rapidly due to the ever-increasing incidence and prevalence of cancer and the increasing number of multidisciplinary treatment options.^{12 13}

Discussing a large number of patients in an MDTM requires a substantial investment in terms of effort and time on the part of the medical specialists and residents involved and accentuates the need to perform MDTMs efficiently. However, this is not self-evident: MDTMs have simply been introduced in cancer care without the development of formal training programmes.^{14 15} Participants are expected to possess competences such as multidisciplinary collaboration and communication, while Fahim *et al*¹⁶ found that the lack of such competences impairs the decision-making process in MDTMs.¹⁶ Residents are expected to learn to participate in MDTMs according to the master-apprentice principle, in other words they learn on the job.¹⁷ This seems insufficient given that their 'masters' might not have the necessary skills, nor will it necessarily make them into excellent models for future residents.¹⁸

In summary, MDTMs are under pressure and optimal execution is not evident. Existing templates on how to perform an MDTM are based on the Calman-Hine report (1995), which described principles about how to organise and structure high-quality multidisciplinary care.¹ Following this, in 2010 the British National Cancer Action Team (NCAT) came with a report with 86 recommendations, divided into 5 domains (ie, the team, infrastructure for meetings, meeting organisation and logistics, patient-centred clinical decision-making and team governance) on how to effectively set up and implement an MDTM.¹⁹ However, these recommendations are based on a survey with 2000 multidisciplinary team members in the UK, and not based on an interventional study on MDTM-effectiveness.

Therefore, there is no clear definition for the execution of an optimal MDTM. However, the experiences of MDTM participants can provide us the necessary insights into factors that contribute to the MDTM quality. The

aim of this study is therefore to identify what, according to medical specialists and residents, the facilitating and hindering factors are for the performance of an efficient, competent and high-quality MDTM. This should be the starting point for determining the improvements needed to make MDTMs future-proof. This study focuses on oncological MDTMs. However, MDTMs are executed throughout healthcare and therefore this study serves as an example for conducting optimal multidisciplinary collaboration in general.

METHODS

See online supplemental file 1 for a more detailed description on the methods that were used to execute this study.

Study design

Between May 2018 and May 2019, a qualitative semistructured telephone interview study was conducted following the Standards for Reporting Qualitative Research (online supplemental file 2).

Participants

Participants were required to participate in oncological MDTMs on a regular (eg, weekly) basis. In order to maximise variation in participants' professional and demographic characteristics, we purposively sampled²⁰ interviewees based on five criteria: (1) sex; (2) medical specialist vs residents; (3) specialty (surgical, medical and radiation oncology, radiology, nuclear radiology and pathology); (4) type of hospital (peripheral or academic) and (5) region of hospital (coded to A-B-C-D, based on the provinces in the Netherlands). Of note: since the CNS and administrator are not standard (actively involved) MDTM members, they were not included in this study. Interviewees were approached by email by two researchers (JEW and IMED) to participate in our study.

Data collection

The primary researcher (JEW) conducted semistructured interviews. JEW is a medical oncologist who has been attending two MDTMs per week for 5 years and received interview training prior to the study from an experienced researcher in the field of qualitative research (GH). Interviews were conducted using a topic guide, which was evaluated and adjusted if necessary after each interview. The main topics that guided question development were: MDTM quality, atmosphere and competences, and MDTM improvements and the future (online supplemental file 3). These topics emerged from an extensive systematic literature search into quality factors for MDTMs prior to the interview study.^{19 21}

All interviews were audiotaped and transcribed verbatim. Interviews had a median duration of 38.7 min and lasted between 27 and 72 min. The transcripts were loaded and stored on the secure servers at the hospital where the researchers work, using ATLAS.ti software V.8.0, a software program for detailed coding in qualitative data analysis.

Data analysis

The data were analysed through thematic analysis, where the unit of analysis was the recorded interview. In thematic analysis, researchers become familiar with the data by reading and rereading the data, generating initial codes, finding overarching themes and revising those themes.²² Three researchers (JEW, RvdM and AO-B) were involved in reviewing and analysing the interview transcripts. RvdM and AO-B had different backgrounds than JEW to ensure different reflexive positions (RvdM is a student of biomedicine, AO-B a health scientist). Relevant data were identified and structured using open, axial and selective coding. Coding is the interpretive process in which conceptual labels are given to the data.²³ Data sufficiency was reached after 35 interviews, that is, new data no longer provided additional insights relative to the research question.²⁴ During the iterative analysis process, researchers regularly shared and discussed the meaning and uniqueness of generated open codes. Throughout the analysis JEW grouped codes belonging to the same concept into categories and finally identified themes from the data in consultation with other research members involved (IMED, GH, RHAV). Data analysis was supported using a qualitative analysis software program (ATLAS.ti V.8.0).

Patient and public involvement

Patients were not involved in this study. We thank the interviewees for participating in this study and will send them a copy of this publication to inform them of the results.

RESULTS

Thirty-five individual semistructured telephone interviews with 16 medical specialists and 19 residents were analysed. Interviewees were evenly divided between medical specialties and sex. The distribution of the interviewees across the regions was slightly skewed. More residents were located in academic hospitals (n=16) than in peripheral hospitals (n=3), reflecting the teaching role of academic hospitals. However, the distribution of medical specialists was equal: academic hospital (n=7) vs peripheral hospital (n=9) (table 1).

All interviewees agreed that attending and preparing MDTMs is very time-consuming and indicated that they should be performed as efficiently as possible in order for them to remain feasible in the near future.

The analysis resulted in the emergence of four themes: (1) organisational aspects; (2) participants' responsibilities and requirements; (3) competences, behaviour and team dynamics and (4) meeting content (online supplemental table 2). Furthermore, online supplemental table 2 also lists the associated eleven categories, 55 facilitators and 45 barriers that were identified. Figure 1 includes associated quotes.

Theme 1: organisational aspects

Five categories were identified within this theme: (1) conditions for information and communication

Table 1 Characteristics of participants

	Medical specialists (n=16)	Residents (n=19)
Sex		
Male	9	8
Female	7	11
Medical specialism		
Surgical oncology	4	4
Medical oncology	3	3
Radiation oncology	3	3
Pathology	3	4
Radiology	2	3
Nuclear radiology	1	2
Hospital		
Academic	7	16
Peripheral	9	3
Region*		
A	3	1
B	7	7
C	2	2
D	4	9

*Regions are coded based on the provinces in the Netherlands

technology (ICT), logistics and administrative support; (2) planning and preparation conditions; (3) conditions for structure; (4) prerequisites for minutes and (5) evaluation needs.

Conditions for ICT, logistics and administrative support

According to the interviewees, the basic conditions for performing a high-quality MDTM are having a U-shaped arrangement in which participants can see each other, where radiological images are projected on large screens and where administrative support is present. Residents, in contrast to specialists, describe that they regularly have to take a seat in the back row, which makes it very difficult for them to make an active contribution to the discussion. Although video conferencing with other hospitals is seen as a benefit when it comes to easy participation, due to less travel time, connectivity issues have been raised.

Planning and preparation conditions

A clear preference was expressed for scheduling MDTMs during working hours. Some interviewees reported feeling less energetic or easily distracted during MDTMs that take place at lunchtime or outside, both before and after regular working hours.

Interviewees indicated that a good discussion is only possible if the participants have prepared the patient case. This assumes a number of preconditions: the preparation time is planned, all necessary information (eg, results of radiological and pathological procedures, patient



Figure 1 Quotes related to themes impacting the quality of oncologic multidisciplinary team meetings.

medical history and preferences) is available on time and there is a deadline for adding a patient case to the application form. In addition, this application form must state which diagnostic specialists (eg, radiologist, nuclear radiologist and pathologist) are required to present diagnostic results, so that they do not prepare cases unnecessarily. Furthermore, radiologists (in training) in particular endorse the importance of a clear question on the application form that must be answered in the MDTM, so that they can specifically show those parts of the radiology results that contribute to the discussion, instead of naming all abnormalities.

Conditions for structure

All interviewees mentioned that structure is an important condition for an efficient MDT: this includes maintaining a fixed order in which participants speak so that everyone's opinion is heard, a fixed order in which patients are discussed and presenting a patient case in a structured manner.

Barriers to a structured MDTM are disturbances during the meeting (eg, participants making calls or walking in and out of the room), or long meetings (defined by most interviewees as longer than 2 hours), causing attention to decline. Interviewees indicate that, in particular, patients at the bottom of the patient list may receive less attention due to time constraints caused by an excessively long list, or a disproportionate distribution of time between patient cases.

Prerequisites for minutes

Interviewees indicated that good minutes are an important aspect of a high-quality MDTM. Prerequisites for the minutes are that they are taken by experienced administrative support during the meeting, that they are visible on the screens and can be corrected immediately when necessary, that they answer the question and in any event contain a conclusion and treatment plan and alternative treatment options if available. In addition, the minutes should be comprehensible to healthcare providers outside the core team.

Evaluation needs

There was disagreement among the interviewees about the added value of evaluating the functioning of the MDTM; some indicated that a critical assessment offers scope for applying improvements, while others described such an evaluation as time-consuming and predicted that it was unlikely to lead to structural improvements. After comparing the different categories of participants (ie, gender, medical specialist vs resident, medical specialty, type of hospital), we could not identify a category that was specifically in favour or against the evaluation of MDTMs. It was striking that some interviewees were unable to formulate their opinion on this point.

Theme 2: participants' responsibilities and requirements

Two categories were identified within this theme: (1) the chairperson's responsibilities and requirements and (2) team member requirements.

Chairperson's responsibilities and requirements

All interviewees agreed that the presence of a designated chairperson is indispensable to efficient MDTM discussion. The chairperson is responsible for deciding not to discuss a case if preparation is insufficient, structuring the discussions, ensuring that all participants get speaking turns, checking the minutes, summarising each case and drawing the final conclusion. Furthermore, interviewees indicated that intervening in conflicts is also the task of the chair. Young chairpersons (defined as less than 5 years of experience as a medical specialist) in particular indicated that they find it difficult to actually do this, citing a lack of authority.

Team member requirements

According to the interviewees, a high-quality MDTM can only be guaranteed if all core team members (ie, surgical, medical, and radiation oncologist, radiologist, nuclear radiologist, and pathologist) have sufficient up-to-date tumour-specific knowledge and if at least one member from each core specialty is present. A fixed composition of the team is preferred, so that team members become familiar with each other. In the absence of a participant, it is their own responsibility to provide a suitable replacement. Insufficient preparation and absence of a participant who knows the patient personally (to implement patient's preferences in discussions) are considered as the main obstacles to a smooth discussion.

Theme 3: competences, behaviour and team dynamics

Two categories were identified within this theme: (1) required competences and behaviour of participants and (2) team dynamics and hierarchy.

Required competences and behaviour of participants

Interviewees endorse the importance of the presence of competent MDTM participants. By this they mean: participants are confident, are aware of any gaps in their knowledge and are not afraid to name them, listen to other participants and allow them to finish without interruption and are open to feedback on their performance. In particular, residents who describe themselves as shy indicated that they did not feel free to speak during discussions due to their shyness or introversion. Others (ie, residents or specialists who reported feeling free to talk themselves) noticed that dominant behaviour hinders other participants from providing input in discussions. Engaging in other activities (eg, checking mobile phones or answering emails) is considered to be inappropriate behaviour on the part of participants.

Team dynamics and behaviour

The importance of good team dynamics was emphasised by the interviewees. This means that there is an open and

friendly atmosphere and a professional and non-personal attitude towards each other. In addition, participants are able to reach democratic consensus, vulnerability among participants is allowed and participants are loyal and willing to help and trust each other, but are also able to address undesirable behaviour.

However, good team dynamics can be hindered by hierarchy: young, less experienced participants in particular indicate that they feel weighed down by this. Relationships of authority (eg, experienced physician from peripheral hospital vs young consultant from academic centre) might also play a negative role.

Interviewees stated that collaboration is more difficult if there are conflicts between participants, if participants are irritated or unfriendly, if mutual respect is lacking or if subgroups are formed that work together, counteracting the team dynamics. An atmosphere that is too informal is however also seen as a barrier, as it can lead to inefficiency.

Theme 4: meeting requirements

Two categories were identified within this theme: (1) discussion needs; (2) acknowledge educational aspects of MDTMs.

Discussion needs

For an efficient discussion, the interviewees emphasised that taking into account patient preferences and disease-specific characteristics is crucial to formulating a treatment plan, leaving room to deviate from guidelines and devise an alternative treatment plan. In addition, it has been agreed by the interviewees of the clinical specialties that MDTMs can also serve as a forum for discussing the possibility of participating in clinical trials.

The discussion appears to be less efficient if a participant elaborates too much or shares irrelevant information, if arguments are repeated multiple times, if participants (predominantly pathologists were named) only read their report aloud instead of adding value to it, or if only one tumour-specific expert is present, leading to one-sided input. In addition, some interviewees mentioned that their attention decreases if no active input is asked from them.

Acknowledge educational aspects of MDTMs

Interviewees mentioned the importance of acknowledging MDTMs as a learning instrument for both medical and non-medical competences (eg, collaboration, communication). For learning purposes, a case should be reintroduced if the treatment received deviates from the MDTM advice. Furthermore, attention should be paid to non-medical competence training between participants. Residents indicate that they can learn from active participation in MDTMs, although time pressure prevents them from asking questions. Some medical specialists said that participation by too many residents slows the progress of the meeting and felt that too much focus on education is a waste of time.

DISCUSSION

With this interview study, we identified four themes that are important to performance of an efficient, competent and high-quality oncological MDTM: (1) organisational aspects; (2) participants' responsibilities and requirements; (3) competences, behaviour and team dynamics and (4) meeting requirements. These findings are in line with the themes from the NCAT report, which makes our results more valid and sustainable. All interviewees agreed that MDTMs require a considerable time investment and that the workload has increased substantially in recent years and will continue to increase due to the large number of patients that need to be discussed. They; therefore, indicated that current MDTM execution needs to be improved in order to ensure that the implementation of MDTMs remains feasible in the near future.

Some of these suggested improvements seem quite easily achievable at first glance, however can still be challenging within the background of a demanding healthcare system with high workload and staff shortages.^{25 26} This concerns improvements such as structuring the meeting, having all core members including a designated chairperson present, scheduling sufficient preparation time, and ensuring that all necessary information is available.

MDTMs often take place in consultation with experts from a nearby hospital or through partnerships where several hospitals participate in one regional MDTM. To enable this kind of consultation and collaboration, a well-functioning video connection with display of radiological imaging, visibility of members on the other side of the connection and medical record display is essential.^{27 28} However, making optimal use of ICT seems to be a challenge since different hospitals use different systems and sharing information is not therefore self-evident.²⁹ Furthermore, Janssen *et al*²⁹ found that ICT is underused for providing feedback and real-time data collection.²⁹ However, it should be noted that the COVID-pandemic has accelerated improvements in ICT-capabilities.³⁰ Further future improvements should focus on expanding opportunities of the use of artificial intelligence and computerised decision support systems.^{31 32}

Another challenge in improving MDTMs lies in optimising communication and collaboration between medical specialists and residents of different specialties and recognising their educational value in this respect. It starts with recognising the importance of these core competences, as team dynamics are negatively affected if they are absent.^{16 33} Residents and young medical specialists in particular reported being hindered by existing hierarchical cultures, making it even more difficult to speak freely. This phenomenon has been identified in several other studies.^{33 34} To improve multidisciplinary collaboration, MDTM simulation training was suggested by some interviewees. However, the need for this was not supported by all interviewees. Further research is needed to determine the added value of simulation or competence training in general. In addition, this research should include analysing the role of the CNS. The CNS

plays an invisible role, but is considered important for the presentation of patient-centred information.^{35–37}

A striking finding from the interviews was that patients at the bottom of the patient list sometimes receive less attention. This phenomenon was explained by the large number of patients on the list, as well as by disproportionate distribution of time between patient cases. However, it may also be related to cognitive fatigue: a literature review of 2019 described behavioural pitfalls that are associated with prolonged periods of cognitive activity within oncological MDTMs. Decreased rational thinking, reduced attention and more impulsive and riskier decisions were mentioned.²⁵ A lack of attention due to the long duration of MDTMs was also recognised in our interview study. Named solutions to improve cognitive fatigue were taking a short break with stretching in between, take food or drinks (ie, glucose and caffeine) or perform cognitive exercises.²⁵

Interviewees disagreed whether structural evaluation of MDTMs would be of added value for improving quality compared with the time investment such evaluation would require. Several evaluation tools can be identified in literature.^{4 21} Most of them require an observer that scores predefined quality items such as attendance of core members and availability of all required patient data.²¹ These evaluation tools were thought to be useful in guiding the evaluation process. Whether they actually optimise MDTM functioning is not yet proven and needs to be further investigated.

We are convinced that optimising MDTM organisation, ICT and team dynamics improves the quality of MDTMs. However, it is questionable whether such interventions actually relieve the perceived time pressure sufficiently and additional measures should be investigated. Time pressure is predominantly caused by the number of patients to be discussed in an MDTM. Streamlining is a possible solution to reduce the number of patients to discuss.^{10 21} With streamlining patient cases are classified as standard or complex. Standard cases can be selected for discussion in a smaller group of medical specialists and do not need to be discussed in a large regional MDTM.^{10 38} Streamlining support was investigated by Hoinville *et al*.³⁸; they conducted a national survey of 1220 MDT members in the UK and found that 60% of respondents were in favour of streamlining, while 25% expressed concern about ensuring optimal care for patients that are not discussed.³⁸ Applying streamlining in order to reduce the time pressure on MDTMs needs further research.

Limitations

Our findings should be interpreted in light of several limitations. First, our interview study was conducted exclusively in the Netherlands. In other countries MDTM organisation and ICT capabilities may differ, while other cultural aspects (eg, hierarchy) can have a different impact on the quality of MDTMs. Nevertheless, since MDTMs are common practice, we believe that our general findings are relevant worldwide.

Second, we indicated that MDTMs are performed throughout healthcare. However, it is assumed that the quality factors found in this study also apply to MDTMs other than oncological MDTMs.

Third, we conducted telephone interviews rather than face-to-face interviews. This may have given the interviews a different depth or dynamic. However, the primary researcher was aware of this potential disadvantage and maintained a non-directive and open attitude at all times. By using telephone interviews, we increased the chances of making an appointment and possibly even interviewees' willingness to participate, as they have busy schedules.

Fourth, we only interviewed medical specialists and residents, as they actively contribute to the MDTM discussion. However, it would be valuable to also include insights from the CNS or administrative supporter with regard to quality improvements for MDTMs. Further research is needed.

Fifth, after an extensive literature search we found that there is a lack of a clear definition for a 'high-quality MDTM', since 'quality' is a subjective concept.²¹ Therefore, we focused in our exploratory interview study on factors that reasonably contribute to the execution of an optimal MDTM. This makes our findings less specific and measurable. However, the long list of facilitators and barriers that we found offers an important insight into how MDTMs can be improved to strive for the highest possible quality.

Lastly, interview findings may be biased by the medical background of the interviewer: this entailed a risk of steering the direction of the interview or interpretation of the data. However, this was mitigated by extensive interview training and having the data analysed by multiple researchers from different backgrounds who reached consensus on the final themes and categories.

CONCLUSION

Conducting an efficient, competent and high-quality oncological MDTM is facilitated and hindered by many factors. Good organisation, a sound structure and functioning ICT are preconditions. Attention should be paid to (training in) multidisciplinary collaboration and communication competences to optimise team dynamics. Future research should focus on additional options to further reduce time pressure on MDTMs, for example, by streamlining cases.

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Contributors JEWV identified the research question, the topic guide and the research design which was corrected and checked by IMED, RvdM, GH, JJMvdH, RHAV and VEPPL. JEWV received extensive interview training from GH; JEWV and IMED invited interviewees to participate. JEWV performed semistructured telephone interviews. JEWV, RvdM and AO-B analysed interview transcripts. The codebook was developed and refined and categories and themes emerged in consultation with IMED, GH and RHAV. JEWV wrote the manuscript. All authors reviewed the manuscript. Guarantor, IMED.

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Supplementary file 1

This supplementary file contains a more detailed description on the methods that were used to execute this study.

Methods

Study design

Between May 2018 and May 2019 a qualitative semi-structured telephone interview study was conducted following the Standards for Reporting Qualitative Research (SRQR) (Appendix A). The study was approved by the local ethics committee (CMO Arnhem – Nijmegen: registration number ECSW-LT-2022-3-11-40903). All participants agreed to participate after reading written information about the project and its aims and their consent was formally recorded.

Participants

Participants were required to participate in oncological MDTMs on a regular (e.g. weekly) basis. In order to maximise variation in participants' professional and demographic characteristics, we purposively sampled(1) interviewees based on five criteria: 1) sex; 2) medical specialist versus residents; 3) specialty (surgical, medical, and radiation oncology, radiology, nuclear radiology, and pathology); 4) type of hospital (peripheral or academic) and 5) region of hospital (coded to A-B-C-D, based on the provinces in the Netherlands). Of note: since the CNS and administrator usually do not make an active contribution to the MDTM, they were not included in this study. Interviewees were approached by email by two researchers (JW and ID) to participate in our study. After permission was obtained, an appointment was made.

Data collection

The primary researcher (JW) conducted semi-structured interviews. JW is a medical oncologist who has been attending two MDTMs per week for five years and received interview training prior to the study from an experienced researcher in the field of qualitative research (GH). Interviews were conducted using a topic guide, which was evaluated and adjusted if necessary after each interview. The main topics that guided question development were: MDTM quality, atmosphere and competences, and MDTM improvements and the future (*Appendix B*). These topics emerged from an extensive systematic literature search into quality factors for MDTMs prior to the interview study.(2, 3)

During the interviews JW used probes, took notes and summarised statements to fully comprehend and validate interviewees' perspectives. All interviewees gave their consent prior to each interview and were given the opportunity to reflect and comment on the accuracy and validity of the information obtained. All interviews were audiotaped and transcribed verbatim. Interviews had a median duration

of 38.7 minutes and lasted between 27 and 72 minutes. The transcripts were loaded and stored on the secure servers at the hospital where the researchers work, using ATLAS.ti software version 8.0, a software program for detailed coding in qualitative data analysis.

Data analysis

The data was analysed through thematic analysis, where the unit of analysis was the recorded interview. In thematic analysis researchers become familiar with the data by reading and re-reading the data, generating initial codes, finding overarching themes and revising those themes.⁽⁴⁾ Three researchers (JW, RM, AO) were involved in reviewing and analysing the interview transcripts. RM and AO had different backgrounds than JW to ensure different reflexive positions (RM is a student of biomedicine, AO a health scientist). Relevant data was identified and structured using open, axial and selective coding. Coding is the interpretive process in which conceptual labels are given to the data.⁽⁵⁾ Initially, all three researchers independently read the transcripts and coded relevant fragments (related to perceived facilitators and barriers to performing an efficient, competent and high-quality oncological MDTM) to minimise the subjectivity of findings (open coding). After each interview, the transcript was coded before the next interview took place. During the iterative analysis process, researchers frequently shared and discussed the uniqueness and meaning of generated open codes. After discussion, codes were reformulated and those with the same meaning were grouped into one unique code (axial coding). After the open and axial coding of the first 15 interviews, all three researchers reached consensus on a list of codes (codebook) that guided the further coding of the rest of the interviews performed by one researcher (RM). New codes and related text fragments were then discussed with at least one of the other researchers. Finally, in the last transcripts only data that provided additional insights were coded (selective coding). Data sufficiency was reached after 35 interviews: i.e. new data no longer provided additional insights relative to the research question.⁽⁶⁾ During the iterative analysis process, researchers regularly shared and discussed the meaning and uniqueness of generated open codes. Throughout the analysis JW grouped codes belonging to the same concept into categories and finally identified themes from the data in consultation with other research members involved (ID, GH, RV). Data analysis was supported using a qualitative analysis software program (ATLAS.ti version 8.0).

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Standards for Reporting Qualitative Research (SRQR)*

<http://www.equator-network.org/reporting-guidelines/srqr/>

	Page/line no(s).
Title and abstract	
Title - Concise description of the nature and topic of the study Identifying the study as qualitative or indicating the approach (e.g., ethnography, grounded theory) or data collection methods (e.g., interview, focus group) is recommended	Lines 5-6
Abstract - Summary of key elements of the study using the abstract format of the intended publication; typically includes background, purpose, methods, results, and conclusions	Lines 48-73
Introduction	
Problem formulation - Description and significance of the problem/phenomenon studied; review of relevant theory and empirical work; problem statement	Lines 119-130
Purpose or research question - Purpose of the study and specific objectives or questions	Lines 130-135
Methods	
Qualitative approach and research paradigm - Qualitative approach (e.g., ethnography, grounded theory, case study, phenomenology, narrative research) and guiding theory if appropriate; identifying the research paradigm (e.g., postpositivist, constructivist/ interpretivist) is also recommended; rationale**	Lines 139-140 Lines 171-173
Researcher characteristics and reflexivity - Researchers' characteristics that may influence the research, including personal attributes, qualifications/experience, relationship with participants, assumptions, and/or presuppositions; potential or actual interaction between researchers' characteristics and the research questions, approach, methods, results, and/or transferability	Lines 155-157 Lines 173-176 Lines 414-417
Context - Setting/site and salient contextual factors; rationale**	Line 139
Sampling strategy - How and why research participants, documents, or events were selected; criteria for deciding when no further sampling was necessary (e.g., sampling saturation); rationale**	Lines 146-151 Lines 187-189
Ethical issues pertaining to human subjects - Documentation of approval by an appropriate ethics review board and participant consent, or explanation for lack thereof; other confidentiality and data security issues	Lines 140-142
Data collection methods - Types of data collected; details of data collection procedures including (as appropriate) start and stop dates of data collection and analysis, iterative process, triangulation of sources/methods, and modification of procedures in response to evolving study findings; rationale**	Lines 154-166

Data collection instruments and technologies - Description of instruments (e.g., interview guides, questionnaires) and devices (e.g., audio recorders) used for data collection; if/how the instrument(s) changed over the course of the study	Appendix B Lines 166-168
Units of study - Number and relevant characteristics of participants, documents, or events included in the study; level of participation (could be reported in results)	Lines 197-202 Table 1
Data processing - Methods for processing data prior to and during analysis, including transcription, data entry, data management and security, verification of data integrity, data coding, and anonymization/de-identification of excerpts	Lines 170-194
Data analysis - Process by which inferences, themes, etc., were identified and developed, including the researchers involved in data analysis; usually references a specific paradigm or approach; rationale**	Lines 170-194
Techniques to enhance trustworthiness - Techniques to enhance trustworthiness and credibility of data analysis (e.g., member checking, audit trail, triangulation); rationale**	Lines 173-176 Lines 190-191

Results/findings

Synthesis and interpretation - Main findings (e.g., interpretations, inferences, and themes); might include development of a theory or model, or integration with prior research or theory	Lines 204-211
Links to empirical data - Evidence (e.g., quotes, field notes, text excerpts, photographs) to substantiate analytic findings	Table 2 Figure 1

Discussion

Integration with prior work, implications, transferability, and contribution(s) to the field - Short summary of main findings; explanation of how findings and conclusions connect to, support, elaborate on, or challenge conclusions of earlier scholarship; discussion of scope of application/generalizability; identification of unique contribution(s) to scholarship in a discipline or field	Lines 351-396
Limitations - Trustworthiness and limitations of findings	Lines 398-417

Other

Conflicts of interest - Potential sources of influence or perceived influence on study conduct and conclusions; how these were managed	Line 428
Funding - Sources of funding and other support; role of funders in data collection, interpretation, and reporting	Line 430

*The authors created the SRQR by searching the literature to identify guidelines, reporting standards, and critical appraisal criteria for qualitative research; reviewing the reference lists of retrieved sources; and contacting experts to gain feedback. The SRQR aims to improve the transparency of all aspects of qualitative research by providing clear standards for reporting qualitative research.

**The rationale should briefly discuss the justification for choosing that theory, approach, method, or technique rather than other options available, the assumptions and limitations implicit in those choices, and how those choices influence study conclusions and transferability. As appropriate, the rationale for several items might be discussed together.

Reference:

O'Brien BC, Harris IB, Beckman TJ, Reed DA, Cook DA. **Standards for reporting qualitative research: a synthesis of recommendations.** *Academic Medicine*, Vol. 89, No. 9 / Sept 2014
DOI: [10.1097/ACM.0000000000000388](https://doi.org/10.1097/ACM.0000000000000388)

Supplementary file 3: Topic guide for semi-structured interviews to identify facilitators and barriers to performing an efficient, competent and high-quality oncological multidisciplinary team meeting

1. Introduction
 - Introducing, asking for consent to recording, explaining goals.
 - Verifying specialty, resident or medical specialist, number and type of tumour-specific MDTMs* interviewee is participating in, and affiliated hospital.
2. MDTM quality
 - What is the quality of the MDTM(s) you participate in, in your experience? Reasons for answer.
 - What do you think is counterproductive to a good quality MDTM? Why/how does that influence your actions? How does it influence the outcomes of the MDTM? Can you give examples?
 - What do you like about the MDTM? Why/How does it affect your actions? Can you give examples?
 - Topics: chairperson, participants, tumour-specific expertise, minutes, question to be answered, presenting case, last-minute cases, postponing cases, presence treating physician, video conferencing.
3. Atmosphere and competences
 - What is the atmosphere in MDTMs, in your experience? Is there a hierarchy? If yes, what effect has this on the interviewee? What is your experience of the learning climate?
 - What is your experience of the educational function of MDTMs? What competences need to be acquired?
 - For residents: do you feel that the current form of MDTM participation prepares you for a role in the MDTM? If not, what is missing and why?
 - For medical specialists: how would you evaluate your current MDTM performance? How do you see your current teaching role during MDTMs?
4. MDTM improvements and future
 - Do you feel that changes / improvements in the MDTM are necessary? Why yes/no?
 - What is needed to improve the MDTM in the future? What is your role in this? What do you need for a future-proof MDTM? Can you give suggestions?

*MDTM = Multidisciplinary team meeting

Supplementary Table 2: Facilitators and barriers impacting the quality of oncological multidisciplinary team meetings**Theme: organisational aspects****Category: conditions for ICT*, logistics and administrative support***Facilitators*

- There is an U-shaped set-up where all participants can see each other
- All participants can view all the screens
- Possibility of videoconferencing increases willingness to participate in the MDTM** of another hospital
- Availability of adequate equipment for video conferencing
- Ability to zoom in on the face of the speaker during video conferencing
- Availability of administrative support

Barriers

- Participants sitting in the back row cannot see the faces of participants in the front row
- Travelling to be physically present in another hospital is too time consuming
- Imaging / electronic health record not visible during the meeting
- Poor connection and prolonged transmission time with video conferencing
- Talking over each other due to the inability to see who is speaking on the other end of the video conference
- Scheduling multiple video conferencing connections to different hospitals sequentially slows down the meeting due to transmission time
- Information exchange between different participating hospitals is hampered by different ICT systems

Category: planning and preparation conditions*Facilitators*

- Meeting is scheduled within working hours
- Preparation time is reserved in the schedule of participants
- All necessary information (e.g. radiology and pathology results, patient medical history and preferences) is available in time
- Application with clear question to be answered in the MDTM and summary of medical history
- Having a deadline for adding patients to the list to ensure proper preparation
- Case-specific preparation only by required participants to reduce the workload of other participants
- Preparing difficult cases with colleagues of the same specialty

Barriers

- Lack of attention or energy due to meetings scheduled at lunchtime, at the end of the day or outside regular working hours
- Participants are not prepared due to lack of time
- Absence of radiology or pathology results during MDTM
- Application form is incomplete
- Participants of diagnostic specialties prepare all cases, because it is not indicated in which case their input is desired
- If the MDTM is cancelled and not rescheduled (e.g. due to a national holiday), the patient list will be far too long the following week

Category: conditions for structure*Facilitators*

- A fixed order in which participants speak to ensure that everyone's view is acknowledged
- There is a fixed order for patients to be discussed
- Patient case is presented in an efficient and structured manner
- MDTM starts on time and does not run over the scheduled time
- Last patients on the list also receive all the necessary attention, even if the MDTM runs out of time as a result

Barriers

- Meeting is held up due to disturbances during the meeting (e.g. participants calling or walking in and out of the room)
- Long meeting duration or running out of time diminishes attentiveness
- Last patients on the list receive less attention due to time pressure because of there are too many patients on the list
- Last patients on the list receive less attention due to time pressure caused by disproportionate time distribution among the patients

Category: prerequisites for minutes*Facilitators*

- The minutes are typed by an administrative assistant during the case discussions
- The structured minutes contain at minimum a conclusion and treatment proposal and, if present, alternative options
- The minutes are visible on the screens and if necessary immediately corrected

Barriers

- The administrative assistant taking the minutes is inexperienced

- Highly profession-specific minutes are not comprehensible to health care providers other than the core team members
- The treatment advice stated in the minutes does not answer the question on the application form

Category: evaluation needs

Facilitators

- Structurally evaluate MDTM functioning by discussing with all participants what is going well, what can be improved and what improvements can be made

Barriers

- Evaluation of the MDTM takes time and it is not worth it, because it does not result in sufficient improvements / the MDTM is already functioning well

Theme: participants responsibilities and requirements

Category: chairperson's responsibilities and requirements

Facilitators

- Designated chairperson dedicates themself to this task
- Chairperson decides not to discuss a case when the preparation is insufficient
- Chairperson structures the meeting by giving speaking turns to participants, summarising and drawing up the final conclusion
- Chairperson checks and corrects the minutes
- Chairperson intervenes in conflicts

Barriers

- Chairperson struggles to intervene (e.g. when unnecessary information is presented, when participants are insufficiently prepared, when there are conflicts)
- (Young) chairperson lacks authority

Category: team member requirements

Facilitators

- There is a fixed team composition to promote familiarity between team members
- At least one participant of each core specialty is present
- All core members have adequate tumour-specific experience and up-to-date knowledge
- If a participant is unable to attend, he will provide a replacement from the same subspecialty with expertise

Barriers

- Absence of participants knowing the patient in person
- Insufficient preparations by core team members

Theme: competences, behaviour and team dynamics

Category: required competences and behaviour of participants

Facilitators

- Participants are confident about their own knowledge
- Participants are aware of and open about a lack of knowledge
- Participants pay full attention to the MDTM during the entire meeting
- Participants do not interrupt each other / allow each other to speak
- Participants listen carefully to each other
- Participants are open to feedback

Barriers

- Participants are too dominant, exploit their authority or express very strong opinions, which hinders the input in discussions of other participants
- Participants are too introvert, hindering participation in the discussion
- Participants' insecurity prevents them from speaking
- Participants are not objective because they are emotionally involved with the patient
- Participants are distracted by other activities (e.g. checking their mobile phones or answering emails)

Category: team dynamics and hierarchy

Facilitators

- There is an open and friendly atmosphere
- Discussions remain professional and not personal
- Consensus is reached democratically
- The communication between participants offers space for a participant to show vulnerability
- There is loyalty and helpfulness between participants
- Participants hold each other accountable for undesirable behaviour
- Participants trust each other

Barriers

- The hierarchical position of less experienced / younger participants hinders their MDTM participation
- Consensus is negatively influenced by power relations (e.g. experienced physician from peripheral hospital versus less experienced expert from academic centre).
- Collaboration is jeopardised by conflicts between participants
- Irritation on the part of participants leads to unfriendly excesses, negatively affecting the atmosphere

- Formation of subgroups of participants who collude hinders an open atmosphere
- There is a lack of respect among participants
- The atmosphere is too informal, which hinders efficiency

Theme: meeting content

Category: discussion needs*Facilitators*

- Taking disease-specific characteristics into account
- Taking patient preferences into account
- Presence of a patient advocate who represents patient preferences and views
- Formulating an alternative treatment option when there is a considerable chance that the proposed option is not suitable
- Discussing the arguments when deviation from current guidelines is proposed
- Discussing all equivalent treatment options
- Discussing the options for clinical trial participation
- Active contribution of all participants promotes good discussion

Barriers

- Attention wanes when no active contribution is needed
- In-depth discussion is hindered if participants only read their report aloud instead of adding value to it
- Only one tumour-specific expert (e.g. consultant) is present, which inhibits discussion due to one-sided input
- Discussions go beyond the subject or contain irrelevant input, making it more difficult to reach consensus
- Repeating discussion arguments wastes time

Category: acknowledge educational aspects of MDTMs*Facilitators*

- Acknowledging education for residents as MDTM learning moment for both medical and non-medical competences***
- Attention should be paid to non-medical competence training (e.g. collaboration, communication) between participants
- For learning purposes a case should be reintroduced if the treatment received differs from the MDTM advice

Barriers

- Active contribution by too many residents slows down the progress of the meeting
 - There is no time or space for asking questions
 - Spending time on medical education is useful for the residents, but does not provide the medical specialists with any new information, making it a waste of time for them
-

* ICT: Information communication technology

** MDTM: multidisciplinary team meeting

*** Given that the MDTM takes place in a teaching hospital.