Virtually the same? Examining the impact of the COVID-19 related shift to virtual lung cancer multidisciplinary team meetings in the UK National Health Service: a mixed methods study

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ABSTRACT

Objectives To evaluate the impact of the shift to virtual lung cancer multidisciplinary team meetings (MDTMs) in response to the COVID-19 pandemic, specifically in relation to the magnitude of information technology (IT) issues and distractions and MDT members/managers’ perceptions and experiences of this shift.

Design A mixed methods study comprising real-time observations of IT issues/distractions within virtual MDTM case discussions held between April and July 2021 and qualitative data from interviews/surveys.

Setting Eight hospital organisations in Southern England.

Participants Team members (respiratory physicians, surgeons, oncologists, radiologists, pathologists, palliative care professionals, nurses and MDT coordinators) and managers (n=190) across 8 local MDTs.

Results MDTM observations (n=1664) highlighted significant variation between teams regarding IT functionality. IT issues and other distractions relating to the virtual MDTM format were observed 465 times affecting 20.6% of case discussions, most of which were audio issues (18.1%). Case discussions that had audio issues were, on average, 26 s longer (t(1652)=−2.77, p<0.01). A total of 73 MDT members and managers participated in the survey and 41 participated in interviews, with all 8 teams being represented. Increased flexibility, reduced travel time and easier real-time access to patient information were seen as the main advantages of virtual MDTMs. Views regarding the impact on relational aspects and communication differed. In line with observational findings, concerns were raised in relation to IT, including having inappropriate equipment, insufficient bandwidth (impairing image sharing and video communication) and an overarching theme that virtual meeting platforms provided were not fit for purpose.

Conclusions Despite the potential benefits of virtual MDTMs, IT issues can waste valuable MDTM time. If IT issues and other distractions and MDT members'/managers’ perceptions are taken into account, investment in appropriate IT infrastructures is essential.
case of rare tumours or geographical areas characterised by workforce shortages or little specialist coverage. In the UK, however, MDTMs for common cancers such as lung cancer tended to be held at a local, single organisation level and commonly took place face-to-face pre-pandemic. The need for social distancing associated with the arrival of COVID-19 necessitated rapid change to this format, with virtual meetings replacing classic MDTMs.

The putative benefits reported in a recent report and literature review include that virtual MDTMs could be a ‘game changer’ for UK MDT working, by reducing travel time and offering the possibility of improved attendance/quotacy and freeing up clinical capacity, and by enabling easier sharing of high-quality radiological imaging and advancing the adoption of digital pathology. These benefits are similar to those suggested in the literature regarding cross-centre tumour boards. It is highlighted, however, that appropriate information technology (IT) infrastructure is necessary for these benefits to be realised.

To date, little research has been conducted regarding the shift from face-to-face to virtual MDTMs. UK research published in the last 2 years, consisting of small-scale surveys of team members’ experiences of virtual MDTMs, concurs with the benefits and limitations suggested above, reporting that virtual MDTMs are felt to be a safe alternative to face-to-face meetings, with decision-making unchanged, and quality of imaging and histology being equal to or better than in face-to-face MDTMs. In these studies, participants reported high satisfaction in relation to general MDTM performance, length and depth of patient discussions and organisation and efficiency in the MDTMs. Limitations included negative impacts on engagement and teamworking, particularly in relation to quality of interactions. Findings were inconsistent in relation to impact on chairing and recording of outcomes (some reporting improvement and others that these aspects were complicated by working virtually); and in relation to technology, which was reported to be satisfactory in one study but limited in a second. Technological issues are a common concern for MDTs, even in face-to-face meetings.

Building on this emerging evidence base, we aimed to uniquely use both survey/interview and live ‘in-meeting’ observational data to describe the impact of the change to virtual MDTMs on lung cancer MDTs. Specifically, we aimed to determine (a) What is the magnitude of IT issues and distractions in relation to virtual MDTMs and does this impact on the length of case discussions? and (b) What are MDT members’ and managers’ perceptions and experiences regarding the shift to virtual MDTMs?

METHODS
Design, setting and participants
A mixed methods study comprising (a) non-participant observation in 12 consecutive MDTMs in lung MDTs from 8 National Health Service (NHS) hospital organisations in Southern England (n=96 MDTMs) and (b) MDT member/cancer services manager views on virtual MDTMs through interviews and survey. Participants invited included all core members from each MDT (respiratory physicians, surgeons, oncologists, radiologists, pathologists, palliative care professionals, nurses and MDT coordinators) and cancer services managers.

Informed consent
Participants were sent an information sheet and consent form to opt into the study, and a separate information sheet and consent form on invitation to interview (if applicable).

Patient and public involvement
Patient and public involvement (PPI) was obtained for the wider study (see below) that formed the context for this research. This consisted of discussion of the project within a patient representative group focused on the improvement of cancer care and inclusion of PPI members in the project steering group.

Data collection
Non-participant observation in MDTMs
Three researchers observed all virtual MDTMs held by the participating lung teams, in 12 consecutive weeks between April and July 2021 (n=96 MDTMs, each researcher observing 24–36 MDTMs). A proforma for recording observed IT issues and distractions for individual case discussions was developed and piloted (online supplemental file 1). Observed IT issues and distractions were then classified into five categories: audio, video, connectivity (eg, unable to connect/losing connection during MDTMs), other technical issues (eg, difficulties loading imaging, other software/hardware problems) and distractions. Distractions (eg, a team member holding simultaneous conversations with people outside the MDT and/or asking for a question to be repeated due to being otherwise engaged during the meeting) were only included if the researchers observed these to be specifically related to the virtual MDTM format. Researchers could only record IT issues when they were obvious (eg, connection being lost while contributing to a patient discussion), with the true number of IT issues likely to be greater. The presence/absence of issues within these categories was recorded in binary format (issues/no issues) for each case discussion observed.

MDT member/manager perceptions of virtual MDTMs
Semistructured interviews
Semistructured online interviews (May–August 2021) were conducted with MDT members that were purposively sampled to ensure representation from all MDTs and professional groups. All interviews took place via Microsoft Teams and were audio-recorded on an external recording device. They lasted between 16 and 51 min. Interviews used a topic guide that included questions (see online supplemental file 2) on their experience and
views about the impact of COVID-19 on the lung cancer MDTM. Recordings were transcribed.

**Survey**
All core MDT members (N=190) from the 8 lung MDTs were invited to participate in a wider study, aiming at developing a streamlining protocol for lung MDTMs in line with NHS England guidance. One of the surveys completed as part of this study included six open questions (see online supplemental file 2) about the impact of the pandemic on the MDT/MDTMs.

**Analysis**
Quantitative observational data were analysed descriptively, then independent samples t-tests (\(\alpha=0.05\), two tailed) were performed to assess the effect on case discussion time for any IT issues/distractions (composite variable) and separately for each of the five issues categories listed above. As analysis was exploratory, no adjustments were made for multiple comparisons. SPSS V.27 was used for quantitative analysis.

Qualitative data (from free text survey questions and interviews) were analysed thematically, according to Braun and Clarke’s six-step method. Data from the interviews and survey were initially coded separately by JEG, using an inductive (data-driven) method and constant comparison, going back and forth between transcripts and datasets. This allowed the researcher to stay as close to the data as possible. At the next stage, codes from the interviews and survey were integrated to form comprehensive themes. To avoid bias and add rigour, EA read and re-read part of the data and reviewed themes prior to final coding and synthesis.

**Ensuring trustworthiness of data collection and analysis**
Lincoln and Guba describe four criteria for trustworthiness in research, namely credibility, confirmability, dependability and transferability.

We used several means of triangulation to enhance the credibility of findings. The inclusion of eight different hospital organisations contributed to environmental triangulation. Data triangulation took place through integrating quantitative observational data with qualitative findings. Regarding the latter, data from open/free-text survey questions enabled representation of a wide range of overall participant views, whereas interviews provided more in-depth data based on a smaller sample of participants. The integration of these two types of qualitative data ensured that concordance and discordance could be taken into consideration when generating themes, and that thematic saturation was met. In order to achieve investigator triangulation, the researchers involved in data collection (JEG, MZ, EA) read each other’s field notes and met at least two times per week (including a whole team meeting in which all authors were involved) to discuss and compare emergent findings as well as agree on any areas of key focus for subsequent interviews. These meetings simultaneously added to the dependability of the research, as it allowed for continuous sense-checking and peer feedback. At the analysis stage, the aforementioned involvement of EA regarding the review and synthesis of themes was designed to further satisfy the dependability criterion.

Non-involvement of researchers—to avoid contaminating natural environments—is recommended in relation to the confirmability criterion. Previous research with cancer MDTs has shown that the impact of observers dissipates quickly over time and is therefore unlikely to alter the natural environment of the MDTMs. While conducting their observations, researchers refrained from participating in any MDTM discussions and ensured that (after initially introducing themselves) they joined the virtual meetings muted and with cameras off at all times.

The MDTs participating in this research were representative of UK lung cancer teams in terms of core member consistency. This added to the transferability of the study findings. Information regarding the numbers of participants from each professional group taking part in the interviews and survey (see table 1 above) and, where necessary, contextual information about teams and meeting formats were included with the purpose of enabling further assessment of transferability to other contexts by third parties and/or future researchers.

### RESULTS
A total of 96 MDTMs were observed across the 8 MDTs, providing a total of 1671 MDTM patient discussions. Researchers were able to record the presence or absence of issues and distractions for 1664 discussions. Interviews were conducted with 41 participants, 15 of whom were interviewed two times (in line with the objectives of the wider streamlining project), with 56 interviews conducted in total. Out of 108 MDT members who agreed to participate in the wider study, 73 participants (2–17 members per MDT) completed the survey (67.7% response rate) (table 1).

<table>
<thead>
<tr>
<th>Professional group</th>
<th>n (interviews)</th>
<th>n (survey)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Respiratory physicians</td>
<td>9</td>
<td>19</td>
</tr>
<tr>
<td>Thoracic surgeons</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Oncologists</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td>Radiologists</td>
<td>7</td>
<td>12</td>
</tr>
<tr>
<td>Pathologists</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Clinical Nurse Specialists</td>
<td>4</td>
<td>12</td>
</tr>
<tr>
<td>Multidisciplinary team coordinators</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>Other clinical professionals</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Other non-clinical (eg, managers)</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>Total</td>
<td>41</td>
<td>73</td>
</tr>
</tbody>
</table>
Non-participant observational data
All eight MDTs had implemented virtual MDTMs: at the time of data collection six teams had fully virtual MDTMs and two had hybrid MDTMs (some members meeting face to face, others joining virtually). Seven MDTs were using a generic (non-healthcare-specific) meeting platform to meet virtually and one was using an alternative meeting platform designed specifically for healthcare teams.

In total, 465 instances of IT issues and other distractions were recorded in 342 individual patient discussions (20.6%, Table 2). Most were audio problems, present in 18.1% of observed cases. MDT 3 used a hybrid model and was the only MDT using the alternative platform (though others had trialled and stopped using it prior to the data collection period). Audio problems—varying from different levels of distortion to complete loss of sound—were observed in all (100%) case discussions within this MDT, with video problems present for 34.5% cases (either poor quality or having to stop video transmission to prioritise sound and image sharing). The low rates of video issues in other MDTs (only five occurrences in one other MDT) were mostly accounted for by the fact that video was not universally used by MDT members, because having cameras on would impair image sharing, audio and connectivity due to insufficient bandwidth.

Although observed connection and distraction issues were rare (2% and 1.6% of cases, respectively) they were highly disruptive to meetings. They varied by MDT with slightly more than half of all distractions recorded in MDT 2—one of the teams that held hybrid MDTMs. Other technical issues were rare in all MDTs (observed for 1.3% of the total cases).

Impact of IT issues/distractions
We tested the hypothesis that IT issues/distractions would impact on the length of patient discussions. There was no statistically significant difference in the time spent discussing cases with or without IT issues/distractions when treated as a composite variable (4 min 5 s vs 4 min 8 s; t(1652)=0.32, p=0.75) and for four of the five subcategories (video, connection, other technical issues, distractions). However, individual case discussions with audio problems were, on average, 26 s longer (4 min 29 s vs 4 min 3 s, t(1652)=−2.77, p<0.01). As most audio issues occurred in MDT 3, we repeated the analysis excluding MDT 3, but found the difference in length of discussion between those with or without issues remained significant and increased to 57 s (5 min vs 4 min 3 s; t(1438)=−3.37, p<0.001).

MDT members and managers’ perceptions of virtual MDTMs
Analysis of the interview and survey data provided by MDT members and managers resulted in the construction of five themes: attendance, flexibility and travel time; information sharing; relational and social aspects; communication and participation; and IT issues. Each of these themes is outlined below, with corresponding exemplar quotations listed in Table 3. Benefits and limitations of virtual MDTMs were reported within each theme, with IT and infrastructure being seen as central to the putative benefits of virtual MDTMs and simultaneously as the cause of their limitations.

Participants also spoke about their ‘post COVID-19’ preferences for MDTM format. Most participants wished to retain the virtual MDTM in some form post pandemic, but some stated a preference to return to face-to-face meetings as soon as possible. Participants from two of the MDTs stated they were unlikely to ever return to face-to-face format due to the MDT rooms being repurposed. There were no clear patterns found between team member views working in hybrid versus totally virtual formats. Some participants preferred keeping the flexibility to dial in for those finding it difficult to attend physically—whereas others believed this would be an inefficient way of working (due to, for instance, challenges with chairing and MDT rooms not being appropriately set up for this). At the time of interviewing, one team had already returned to face-to-face meetings, partly due to poor IT. Another team also had concrete plans to do so.

Attendance, flexibility and travel time
Pre-existing attendance (and quoracy) issues were not necessarily resolved by the introduction of virtual MDTMs, but participants from all MDTs stated that the elimination of travel time made MDTMs more accessible and facilitated attendance. Despite the single organisation setting, most MDTs relied on attendance from at least one team member that was primarily based within and/or employed by a different organisation and outsourced/contracted to the team for a certain number of hours a week. The virtual format was thereby particularly time-efficient for these members.

Table 2 Frequency of information technology issues and distractions presented by team and overall

<table>
<thead>
<tr>
<th>Multidisciplinary team</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>All</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of total cases in sample</td>
<td>192</td>
<td>238</td>
<td>220</td>
<td>230</td>
<td>128</td>
<td>299</td>
<td>180</td>
<td>177</td>
<td>1664</td>
</tr>
<tr>
<td>Audio issues n (%)</td>
<td>17 (8.9)</td>
<td>2 (0.8)</td>
<td>220 (100)</td>
<td>24 (10.4)</td>
<td>1 (0.8)</td>
<td>25 (8.4)</td>
<td>10 (5.6)</td>
<td>3 (1.7)</td>
<td>302 (18.1)</td>
</tr>
<tr>
<td>Video issues n (%)</td>
<td>0</td>
<td>5 (2.1)</td>
<td>76 (34.5)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>81 (4.9)</td>
<td></td>
</tr>
<tr>
<td>Connection issues n (%)</td>
<td>0</td>
<td>6 (2.5)</td>
<td>10 (4.5)</td>
<td>13 (5.7)</td>
<td>0</td>
<td>4 (1.3)</td>
<td>0</td>
<td>33 (2.0)</td>
<td></td>
</tr>
<tr>
<td>Distractions n (%)</td>
<td>2 (1.0)</td>
<td>14 (5.9)</td>
<td>3 (1.4)</td>
<td>3 (1.3)</td>
<td>2 (1.6)</td>
<td>0</td>
<td>1 (0.6)</td>
<td>2 (1.1)</td>
<td>27 (1.6)</td>
</tr>
<tr>
<td>Other technical issues n (%)</td>
<td>0</td>
<td>3 (1.3)</td>
<td>11 (5.0)</td>
<td>1 (0.4)</td>
<td>2 (1.6)</td>
<td>4 (1.3)</td>
<td>0</td>
<td>1 (0.6)</td>
<td>22 (1.3)</td>
</tr>
</tbody>
</table>
Information sharing

Many participants reported increased ease of access to information during MDTMs due to attending the meetings from their own computers. This meant that they could access clinical IT systems while in the MDTM, for instance to find missing information during patient discussions. Some also stated that it was easier to share visual information, though in practice, this did not always work optimally (see section IT issues below).

Participants from four MDTs stated that a key limitation was that MDT coordinators could no longer share their screens while recording the MDT recommendations (as per the method used when they met face to face), thereby preventing live corrections of any omissions or errors. The afore-mentioned generic platform only allows one person to share their screen at a time, with radiological imaging having to take priority.

Relational and social aspects

Participants across all MDTs argued that virtual MDTMs affected the social and relational aspects of teamworking. Perceptions varied in strength, but the negative impact on informal communication and team cohesion was cited, as well as the increased risk of team members feeling isolated. Some ‘new’ team members had never met their colleagues in person, and, due to cameras being switched off during MDTMs (mostly due to bandwidth limitations), did not even know what their colleagues looked like. Participants who still saw their fellow MDT members in person on-site within other contexts reported fewer concerns regarding social and relational effects.

Communication and participation

Many participants reported negative impacts on communication—and thereby quality of discussion—due to loss of ability to take nuances and non-verbal elements into account. Furthermore, it was suggested that virtual attendance reduces active participation and opportunities to ‘chip in’ with comments. Participants from two teams argued that meeting etiquette had improved with virtual working (better general meeting behaviours and not talking over each other as much). There were opposing views about the impact of virtual MDTMs on ability to focus on the discussion: some said that this had improved but others that it had worsened. Some team members stated that a benefit of the virtual format was that they did not have to focus for the whole meeting and instead could opt in or out of contributing, allowing time for ‘multitasking’ or ‘switching off’ for case discussions that did not require their immediate input.

Table 3 Exemplar quotations from MDT members and managers

<table>
<thead>
<tr>
<th>Theme</th>
<th>Exemplar quotations</th>
</tr>
</thead>
</table>
| Attendance, flexibility and travel time | I think it can be efficient in some ways because you’re getting a lot of clinicians in the same place very quickly. – P2, Radiologist  
And also, if you’ve got a pathologist travelling up from [other hospital organisation], you’re saving him two hours of driving. – P18, Cancer services manager |
| Information sharing                 | Previously, yes, you might have only had one person with a laptop... Who was having to(…)...look things up. Whereas now(…)most of us have double screens and can look things up whilst we’re... whilst talking – P24, Oncologist  
We can show pictures of bronchoscopies and things like that, things that we’ve not previously done. – P13, Respiratory physician/MDT lead  
When we were in the hospital and we were all in one room,(…)there was a screen where it projected as they were typing. But now that they’re working remotely, we don’t get to see what’s being written. And frankly we don’t always trust what’s recorded. – P37, Radiologist |
| Relational and social aspects       | I don’t have necessarily the relationship with the members of the MDT yet. For example, I’ve never met them in person. – P2, Radiologist  
[The virtual MDTM] works really well for me, but then it also is a bit sad, because then I don’t know how everyone looks like. They don’t know how I look like too. So if they turn up, I wouldn’t even know that they’re there. – P28, Pathologist  
We could use [healthcare team-specific platform] to have more than one screen shared so that everybody could look at both the radiology images and the outcome being typed, but it doesn’t work on our bandwidth at [hospital organisation], unfortunately. It just kept crashing, and the radiology images wouldn’t project(...), which is why we’ve gone over to [generic meeting platform]. – P8, Respiratory physician/MDT lead |
| Communication and participation     | I would say technological issues aside, what it has done is kind of focused people’s attention more. There was a tendency during the meeting when everybody was in the one room for people to [start] having their own little conversations, which is impossible now. – P22, MDT coordinator  
They can switch on, turn the camera off, go out, make a cup of coffee, watch a movie. You’ve got no idea. I mean, one time, a guy was quite clearly driving(...and he’s supposed to be in an MDT meeting...)We could hear windscreen wipers going, you know? It’s... how can you hold a functioning meeting like that? – P37, Radiologist  
It’s abysmal. It really was and that was a very disappointing thing from my perspective. Because it almost felt like the [hospital organisations] weren’t making enough of an effort to make sure that approach worked(...There’s no point in just buying, like, [healthcare team-specific platform]...It’s paying lip service to the remote MDT. You’re not actually making a success. – P35, Radiologist  
But our oncologist, it’s been very difficult to engage in the meeting(...)For [them] to(...)participate in a meeting appropriately because the IT has been so bad. – P30, Respiratory physician/MDT lead  
We can show pictures of bronchoscopies and things like that, things that we’ve not previously done. – P13, Respiratory physician/MDT lead  
But now that they’re working remotely, we don’t get to see what’s being written. And frankly we don’t always trust what’s recorded. – P37, Radiologist |
| IT issues                           | But our oncologist, it’s been very difficult to engage in the meeting(...)For [them] to(...)participate in a meeting appropriately because the IT has been so bad. – P30, Respiratory physician/MDT lead  
IT was abysmal. It really was and that was a very disappointing thing from my perspective. Because it almost felt like the [hospital organisations] weren’t making enough of an effort to make sure that approach worked(...There’s no point in just buying, like, [healthcare team-specific platform]...It’s paying lip service to the remote MDT. You’re not actually making a success. – P35, Radiologist  
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IT, information technology; MDT, multidisciplinary team; MDTM, multidisciplinary team meeting.
IT issues
In line with the observational findings (table 2), participants reported experiencing a range of technological issues when holding MDTMs virtually, caused by having inappropriate equipment and/or insufficient bandwidth. Although there was agreement that video communication could be beneficial in terms of engagement and decision-making, this was often not realised due to these technical limitations.

The MDT that experienced the most IT issues used the previously mentioned alternative platform designed specifically for healthcare teams (enabling multiple screens to be shared simultaneously). This function was, however, incompatible with the available bandwidth. One participant from this team suggested that, early on in the pandemic, incident reports had been filed, as poor IT functionality compromised MDT discussions. Two other teams had initially worked with this platform, but experienced similar problems and therefore discontinued its use. IT issues were perceived to be one of the key factors impacting on the sustainability of virtual meetings.

DISCUSSION
This is the first study to collect real-time observational data on technological challenges in online or hybrid cancer MDT meetings. We have found that such issues—particularly audio difficulties—are common and may be associated with longer patient discussions. This is important given the pressures on cancer MDTs due to increasing caseloads in the context of staffing and resource limitations. We did not specifically focus on clinical outcomes here. However, as MDTMs are scheduled for a set amount of time, with often little scope for overrunning due to busy clinician rotas, the extra time spent on case discussions with audio issues may take time away from other case discussions and/or leave less room for the in-depth discussion of patient details and treatment options. Concerningly, a participant suggested that incident reports had been filed due to safety concerns surrounding MDTM discussions being compromised by poor IT. Furthermore, some instances of IT issues causing cases to be rolled over to the next meeting were observed and although such situations are rare, when they occur, they have the potential to cause treatment delays.

The pandemic resulted in technological innovation being implemented at speed and perceptions of MDT members and cancer managers we report here to confirm that virtual MDTs can have many benefits in relation to flexibility and attendance, and the improved ability to share information and imaging.7 8 It is noteworthy, however, that although this study took place more than a year into the pandemic, IT functionality and infrastructure remained suboptimal. If, as seems likely, the virtual or hybrid MDTMs are sustained in future, more consideration from hospital management and leadership is needed to optimise their implementation. As previously highlighted, the benefits of virtual MDTMs can only be realised in the context of a sufficient technological infrastructure.7 8 The literature on virtual tumour boards describes novel IT innovations such as the development of a cloud-based platform allowing for videoconferencing, anonymous voting on treatment decisions and secure patient data storage all in one.9 21 Such software may also be beneficial for UK MDTMs, but is unlikely to work with current hospital internet connectivity.

This study also highlighted the potential negative impacts of the virtual meeting format on communication and relational aspects of teamwork, in line with the previous research findings.10 11 Our research showed that such issues with communication can be linked in with the afore-mentioned IT issues: most of the MDTs in this study had to compromise on platform functionality due to inadequate connectivity to support simultaneous image sharing and video communication. Making improvements in relation to this should therefore be the first priority. However, our findings also suggest that, once IT problems have been addressed, it would be beneficial to instate a virtual MDTM etiquette, for example, including guidelines regarding when cameras can be on or off, announcing when one is joining or leaving the meeting, and clear expectations in relation to attention and meeting focus. Over a decade ago, recommendations based on clinical consensus from over 2000 cancer MDT members in England22 included the need to agree a behavioural etiquette for MDTMs, and the findings described herein support the importance of an agreed standard of behaviour to deliver effective virtual MDTMs.

One limitation of this study, mentioned earlier, is that researchers were only able to record IT issues and distractions when these were obvious to them. Team members losing connection during the meeting while they were not directly contributing to a patient discussion (or being unable to connect to the meeting in the first place) may have gone unnoticed. Study findings are likely to be an underestimation of the IT issues therefore (which, arguably, strengthens the argument for focusing on making improvements to hospital IT infrastructures). The fact that IT issues and distractions were recorded at the case discussion level rather than the meeting level made data collection more precise, but may mean that some nuances at the meeting level (eg, variations between different meetings) were missed. Other limitations were the absence of comparison data from before the adoption of virtual working and the fact that the researchers collecting the data were not lung cancer experts (therefore unable to judge the impact on clinical decision-making, which would be an important consideration for future research). Although this research was limited to lung MDTs within one region of England, our findings are unlikely to be unique to lung MDTs, nor the UK.

Virtual MDMTs have many putative benefits, including patient care and economic impacts, that warrant further exploration. Such benefits are likely to require training and guidelines regarding the effective chairing and
participation for virtual meetings and will only be realised with sufficient investment in the required infrastructure.

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**Acknowledgements** We thank the three reviewers for their helpful, constructive feedback.

**Contributors** JEG was involved in the development of data collection tools, investigation and project administration, formal analysis and writing of the original article draft. EA was involved in the development of data collection tools, investigation and project administration, formal analysis and reviewing and approving the article draft. MJZ was involved in the development of data collection tools, investigation and project administration and reviewing and approving the article draft. HJ was involved in the development of data collection tools, formal analysis and reviewing and approving the article draft. MH was involved in the conceptualisation, methodology and funding acquisition for the research, as well as the development of data collection tools and reviewing and approving the article draft. CT was involved in the conceptualisation, methodology and funding acquisition for the research, as well as project supervision, the development of data collection tools and reviewing and approving the article draft, and is overall responsible for the content as guarantor.

**Funding** This research was funded by NHS England, through a regional cancer alliance not named to protect anonymity of teams and participants within the study. Grant/award number: N/A.

**Competing interests** MH is co-chair for lung cancer within the regional cancer alliance through which this research was funded. No competing interests declared for any of the other authors.

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

**Patient consent for publication** Not applicable.

**Ethics approval** This study was reviewed and approved by the Health Research Authority (IRAS 270697) following approval from the NHS London Fulham Research Ethics Committee (ref. 19/L/0199) and Confidentiality Advisory Group (ref. 19/ CAG0211). Study researchers held: (1) fully completed and signed Research passport document; (2) letter of Access from each participating organisation; (3) additional confidentiality agreements as required by individual organisations depending on their own requirements for CAG supported studies. Participants consented to the study by returning informed consent forms.

**Provenance and peer review** Not commissioned; externally peer reviewed.

**Data availability statement** Dataset with IT issues for each case discussion available from corresponding author upon reasonable request.

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