Improving the effectiveness of multidisciplinary team meetings in skin cancer – analysis of national Cancer Research UK survey responses

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Abstract

Introduction

Skin cancer is the most common form of cancer in the UK, comprising at least 25% of all new cancer diagnoses. Many patients will require referral to the local or specialist skin cancer multidisciplinary team (MDT) for ongoing management. However, national data has shown that Specialist Skin Cancer MDT's are costly and do not currently meet NICE standards for composition and quoracy. Innovative solutions to these problems are therefore warranted.

Methods

Secondary comparative analysis of 3563 quantitative responses to two Cancer Research UK commissioned surveys with sub-analysis of 282 skin cancer MDT respondents.

Results

There was more uniformity amongst skin respondents in the belief that stratification on risk and prioritising more complex cases were the most important factors compared to other cancer MDT members. The most important priorities for areas requiring change to MDT working deemed by the skin MDT were 1) imaging and pathology results ready for the meeting 2) time to discuss patients in detail 3) clear meeting owner in charge and 4) clear agenda, in advance of the meeting. There was agreement (median Likert score 4) amongst skin MDT respondents that patients should be placed on protocolised treatment pathways.

Conclusion

The views of skin MDT respondents in the current study support changes to meeting attendance, preparation and protocolised streaming. In line with other studies we support tumour-specific guidance for streamlining MDT discussions. We also encourage stakeholders to adopt an evidence-based approach to test, develop and re-assess changes in this herculean task.

Keywords

Basal cell carcinoma; squamous cell carcinoma; melanoma; skin cancer; MDT; service provision; group processes; interdisciplinary health team.

Introduction

Multidisciplinary team meetings (MDT's) are an integral component of contemporary cancer care. Since their introduction to the United Kingdom (UK) in the 2000's by the National Health Service (NHS) Cancer Plan, evidence has shown that MDT's improve outcomes for patients with cancer.[1-9] However, variations in treatment still exist and as such, MDT's have not been entirely successful in their aim of reducing variation in access to the best, evidenced-based care.[10] Additionally, there are significant direct and indirect costs of MDT working and evidence demonstrates that some MDT's function more effectively than others.[11-12] Regular meetings to discuss patients also present an opportunity cost to MDT members who have other critical roles in the NHS, negatively impacting on workflows in their respective departments e.g. pathology and radiology.[13]

Skin cancer is a significant and growing societal health problem, with the UK having one of the highest rates of melanoma in the UK and an incidence rate that has risen by almost 60% between 2003 and 2015.[14, 15] Among Caucasian populations, the incidence of skin cancer is rising faster than that of any other malignancy, with this trend expected to continue.[14, 15] With an ageing population, longer life expectancy, higher patient expectations and the long-term impact of a cultural shift to increased sun exposure now being realised, it is unlikely that the health service will be able to cope unless care services are designed and planned more effectively. Innovative solutions to new ways of MDT working are therefore warranted.

The National Institute for Health and Clinical Excellence (NICE) improving outcomes guidance describes six levels of care for skin cancer which differ in their member composition and case-mix.[16] These have subsequently been incorporated into the Manual for Cancer Services: Skin Measures v 2.0 National Cancer Peer Review (NCPR), National Cancer Action Team 2011.[17] MDT structure and characteristics exist to standardise care. Level 1 care can be provided by any general practitioner (GP) in the community and manage benign lesions, actinic keratoses or squamous cell carcinoma (SCC) in situ. Level 2 care is provided by a listed community skin cancer clinician associated with a named MDT and manage low risk basal cell carcinoma (BCC). Level 3 and 4 care is provided by local skin cancer multidisciplinary teams (LSMDT's) whilst specialist skin cancer multidisciplinary teams (SSMDT's) provide level 5 care (Table 1) whilst level 6 care is provided by supra-network MDT's who manage cutaneous T-cell lymphoma for the whole of their host network and also other named networks to offer total surface electron beam therapy and photopheresis. Recommendations for the case-mix of each skin MDT from the British Association of Dermatologists (BAD) National Reform of Cancer MDT Meetings report are shown in Table 1.[18]

Despite MDT's being central to the management of patients with skin cancer, previous work investigating the functionality and financial impact of specialist skin cancer MDT (SSMDT) meetings in the UK has deemed that they are costly and do not currently meeting NICE quoracy standards.[19] The mean unit cost per discussion at an SSMDT has been quoted as £132.68 vs £91.84 for breast cancer, the most common cancer in the UK.[19, 20] Whilst only 26% of SSMDT's are quorate by membership with a lack of clinical oncology presence as the most common reason for failure.[19] It is evident that there is a need to standardise

operationalisation to reduce variations in cost. By identifying other ways of improving the effectiveness of MDT meetings in skin cancer care services we will be in a position to make recommendations for re-designing a service that is safer, more effective, more convenient and more cost efficient for patients and the NHS.

The 2017 Cancer Research UK (CRUK) commission investigated the effectiveness of MDT meetings in cancer services with the aim of improving MDT effectiveness.[21] The crucial findings from this report included the lack of sufficient time to discuss complex patients, suboptimal meeting attendance, not utilising the right information to inform discussions, and MDT's not being able to fulfil their secondary roles, such as in audit and education. A number of approaches to streamlining MDT working have been identified, including the development of tumour-specific guidance.[20, 21] However, no attempts have been made by the skin cancer community to undertake an evidence-based approach to identifying areas for future development.

The aim of this study is to identify skin cancer specific variation in views of current MDT practices and suggestions for refocusing MDT meetings. The culmination of this will provide a better understanding of existing skin cancer care in the UK, which will serve as a basis for developing new and more effective ways of SSMDT working.

Methods

Cancer Research UK (CRUK) distributed two surveys to all MDT members in the UK in 2017.[21] The first of these surveys asked respondents to provide their opinion on the importance of 13 different areas to MDT working (Table 2) and current compliance of their MDT with each of these on a 6-point Likert scale (1 = not very important or never done to 6 = extremely important or always done). The second survey asked respondents to rank on a 5-point Likert scale the degree to which they agree or disagree with several recommendations for changes to MDT working (1 = strongly disagree to 5 = strongly agree). We included responses to both surveys from all skin MDT members (LSMDT) and (SSMDT) for analysis. Results were reported with median values and range. We included responses from members belonging to other MDT's across the UK (brain, haematological, gynaecology, upper gastrointestinal, head and neck, colorectal, lung, urology and breast) for comparison. Statistical data analyses were performed using RStudio (R Core Team, R Foundation for Statistical Computing, Vienna, Austria) and Mathematica Version 12.3 (Wolfram Research, Inc., Champaign, Illinois, USA).

Results

Characteristics of respondents

The first CRUK survey had 2,294 responses, of which 181 were from skin MDT members from a range of professional groups (Table 3). The second CRUK survey had 1,269 responses, of which 101 were from skin MDT members (Table 3). Respondents covered all areas in the UK. Overall there was a response rate of 50% to both surveys from skin MDT sites.

Current practise

Of the 13 questions in the first survey, there was more uniformity (Likert score 5 [range 4-6]) amongst skin respondents in the belief that stratification on risk and prioritising more complex cases were the most important factors compared to other MDTs (Figure 1). For factors considered potential targets for future improvement, there was considerable variation in the extent that they are implemented (Figure 2). There was a mismatch between the majority of importance and implementation Likert scores (Figure 3).

Recommendation for changes to skin MDT working

The most important priorities in the changes necessary to MDT working deemed by the skin MDT were 1) imaging and pathology results ready for the meeting 2) time to discuss patients in detail 3) clear meeting owner in charge and 4) clear agenda, in advance of the meeting. These results closely mirror those of other MDT respondents except that other MDT's ranked 'clear meeting owner in charge' higher (Table 4).

Clinician attendance levels

Skin MDT respondents agreed that core-MDT members should attend more than 50% of the total meetings annually (Figure 4a) as defined by cancer indicators derived from the Manual for Cancer Services: Skin Measures v 2.0 National Cancer Peer Review (NCPR), National Cancer Action Team 2011 which is based on the NICE standard 'Improving outcomes for people with skin tumours including melanoma and Cancer Services Guidelines 2006'.[16, 17] However, skin MDT respondents agreed (median Likert score 4) that attendance levels could be lower than peer review guidance if correct clinical governance (e.g. auditing process) was in place (Figure 4b).

Protocolised streamlining

There was agreement (median Likert score 4) amongst skin MDT respondents that some patients should be placed on protocolised treatment pathways and do not need to be discussed at the meeting at all, whilst the other main specialties were uncertain (median Likert score 3) about this (Supplementary Figure 1a). Most specialities including skin agreed (median Likert score 4) that if protocolised streamlining were to take place that it should take place in advance of the main MDT meeting in order to decide which patients should be discussed (Supplementary Figure 1b). Skin respondents felt that this could allow more straightforward cases to be progressed more quickly, rather than waiting for a weekly meeting (Supplementary Figure 1c) and deemed that 30% of cases could potentially be resolved outside of the meeting (Supplementary Figure 1d) which was higher compared to other specialities. Skin respondents agreed with the majority of other specialties (median Likert score 4) that if patients followed treatment protocols or had recommendations made by a smaller team, the full MDT reviewing a selection of these patients would provide sufficient governance of this process (Supplementary Figure 1e).

Meeting preparation

Most MDT's use a form of checklist or proforma to inform referrals to the MDT (Supplementary Figure 2). All respondents felt that use of a checklist would help improve MDT meetings (median Likert score 4), however skin respondents had the widest range in this response (1-5).

Identifying case complexity

Participants were asked to identify the importance of a number of potential issues that could increase case complexity and require discussion in a full MDT. There were a range of medical, surgical, psychological and treatment factors considered important (Likert score ≥4) to skin MDT members (Table 5) which closely mirrored that of other specialities.

Discussion

Fieldwork and observations that underpinned the CRUK report into 'Improving the Effectiveness of Multidisciplinary Team Meetings in Cancer Services' demonstrate that there is not enough time to discuss complex patients, attendance is not optimal, the right information is often not used to inform discussions and that MDT's are unable to fulfil their secondary roles in data validation, audit and education.[21] The evidence base for cancer treatment is accumulating constantly, with NICE regularly updating their advice. Innovative solutions to these problems identified by CRUK would have health economic benefit, free up specialist time and improve the reproducibility of evidence-based decision making.

Whilst it is incumbent that we refresh the format of MDT meetings to reflect the changing nature of cancer care and increased demand for services, solutions will not be the same for every MDT or every specialty. Previous national data investigating composition, quoracy and cost of Specialist Skin Cancer Multidisciplinary Team (SSMDT) meetings has shown that SSMDT's in the UK are not currently meeting NICE quoracy standards.[19] In addition to this there is large variation in mean cost per patient, time (preparation, running and dissemination), total cases discussed and case re-discussion across SSMDT's.[19] Whilst it is clear SSMDT's are costly and there is a need to improve MDT meeting efficiency without losing the considerable benefits associated with regular meetings, there are no previous studies that provide an evidence-based approach to identifying areas for future development, specific to the skin MDT. It is important to understand whether tumour site affects the areas of MDT practise. If MDT's are relatively homogeneous in terms of practices and priorities then recommendations can address the issues and priorities of a broad range of MDT's, and therefore be broadly applicable.

In the present study we identify that members of skin LDMDT's and SSMDT's considered the ability to stratify patients based on risk and prioritise more complex cases more important than other MDT members. This likely represents either the fact that NMSC is the most common group of cancers in the UK and therefore result in a high volume of patients processed by skin MDT's, or that there is a feeling that many of these NMSCs are less serious and therefore those that are more so should be prioritised. Clearly a one-size fits all approach for all tumour types is not appropriate for protocolised streaming. Previous studies support the development of tumour-specific guidance for streamlining MDT discussions considering a range of approaches.[21, 23]

Historically, UK guidelines have recommended that all cases of high-risk squamous cell carcinoma and malignant melanoma are discussed at the skin MDT and omit any recommendations on referral for basal cell carcinoma (BCC).[24-26] The BAD UK BCC guidelines highlight the pivotal role of the MDT in the management of high-risk BCC.[27] Given these new recommendations, caseloads of LSMDT's and SSMDT's are only set to rise making solution to these factors time critical if we are to cope with the increased demand for peer review.

Meeting attendance

MDT respondents felt that there should be no change to clinician attendance levels. They did however agree that that attendance levels could be lower than peer review guidance if correct clinical governance was in place. This would potentially have the ability to make better use of some of the specialties time commitments e.g. radiologists, oncologists and histopathologists who may only need to attend part of the meeting to discuss specific cases. Previous work has demonstrated reduced core membership quoracy at the SSMDT in these specialities who have critical roles in the NHS for imaging, endoscopy and pathology capacity. MDT's should bring together staff with the necessary knowledge, skills and experience to ensure high quality diagnosis, treatment and care. Each patient will require a different set of core team members to discuss their case. Treatment options may be lost if some specialties are not in attendance at the MDT.[21] However, pre-MDT structured listing of patients and grouping could allow specific MDT members to stay only for the required period as recognised by the BAD multi-stakeholder workshop that discussed and proposed recommendations for changes to the structure and function of the skin MDT.[18] National guidance on quoracy standards therefore need to be reviewed in respect to this.

Meeting preparation and protocolised streaming

In the current study skin respondents considered 'imaging and pathology results ready for the meeting' as the top priority for changes necessary to MDT working. Fieldwork and observation of 624 MDT discussions by CRUK has revealed that 7% are deferred.[21] A main contributor to this is missing diagnostic information. Delays may occur at different stages of the cancer diagnostic journey and secondary care delay (delay in from being first seen in secondary care to diagnosis) due to missing diagnostic information is both distressing for the patient but also wastes valuable MDT discussion time. Fifty four percent of MDTs currently use a proforma however usage is inconsistent and there is no national guidance on proforma use.[21] All respondents in the study felt that use of a checklist would help improve MDT meetings and CRUK in fact now recommend that MDTs should mandate a completed proforma for incoming MDT referrals prior to discussion.[21] This would go some way to mitigate deferral and secondary care delay due to incomplete or missing diagnostic information.

As evidenced here there is a general acceptance of the benefits of protocolised treatment by skin respondents. This would reduce some of the work associated with the more straightforward cases and ensure that quoracy could be met and allow MDT's to undertake important secondary roles in data validation, audit and education. CRUK recommend that the UK's health services should work with NICE and Scottish Intercollegiate Guidelines

Network (SIGN) to identify where a protocolised treatment pathway could be applied and develop a set of treatment recommendations for each of these to be implemented across the four nations.[21] The response by the BAD to the suggestions of protocolised treatment is that individual MDT's should consider formalised management protocols for routine cases that can be managed on a treatment pathway without the need for formal discussion by the full MDT.[18]

The Association of Breast Surgery, British Society of Breast Radiology, Association of Breast Pathology and the UK Breast Cancer Group have jointly produced the Breast MDT meeting Toolkit.[28] This toolkit is a comprehensive resource and includes guidance on ways to conduct a pre-MDT triage meeting as one component of the toolkit. The pre-MDT triage meeting can be an effective way of reducing the number of cases requiring formal discussion. A defined smaller group of MDT members meet with the MDT coordinator in advance of the meeting to determine cases that should 1) be listed for formal discussion, 2) managed without formal discussion and 3) be suitable for management by protocolisation to a standard of care (SoC).[28] The SoC can be defined as a point in the pathway of patient management where there is a recognised international, national, regional or local guideline on the intervention(s) which should be made available to a patient.[28]

With the guidance on streamlining according to clinical complexity and guidelines now published by NHS England and NHS Improvement in 2020 – discussing all cancer cases in unessessary.[29]There is an urgent need for evidence-based approaches that can be used by the skin MDT to streamline services, while maintaining the safety and quality of patient care. Existing validated tools can be applied at different points along the MDT pathway to build a protocolised streaming programme to ensure the delivery of excellent cancer care whilst safety is maintained. These tools can facilitate pre-meeting case selection, intra-multidisciplinary team meeting streamlining and team reflection, assessment and team building.[30]

Other novel solution to support protocolised streaming includes a machine-learning approach to clinical decision support. Andrew et al developed a supervised machine-learning algorithm to predicting MDT decisions for Mohs micrographic surgery (MMS) vs conventional surgery or radiotherapy.[31] By using their model, 37.5% of patients were able to be triaged to MMS and reduce the overall MDT workload by 45.1%. Whilst the authors determine that this approach would provide more time for MDT members to consider more complex patients the predictive accuracy precludes their use as a fully autonomous system and a 'human in the loop' would still be required to review treatment decisions and account for the shortcomings in system performance.

Complex patients

In surgical oncology we have traditionally relied on tumour factors to predict patient outcome, and treatment pathways, with patient factors being used secondarily to decide which treatment pathway is appropriate, particularly if the treatment is toxic or morbid. There are many non-invasive measures of patient status such as the American Society of Anesthesiologists (ASA) physical status classification grade, Rockwood clinical frailty scale, World Health Organization (WHO) performance and Karnofsky performance status which

predict clinical frailty, and Charlson comorbidity index, Portsmouth-Physiological and Operative Severity Score for the enUmeration of Mortality and Morbidity (P-POSSUM), the Acute Physiology and Chronic Health Evaluation (APACHE II) which predict 30-day perioperative mortality.[32] Routine use of these patient-based risk stratification tools at the outset of an MDT could allow patient screening and prioritisation of complex cases and to facilitate pre-meeting case selection. There are authors who have commented on how the adoption of the Rockwood clinical frailty scale can potentially improve the quality and focus of MDT discussions for complex patients at their skin MDT.[33]

Limitations

The primary data did not record whether skin respondents belonged to either LSMDT or the SSMDT. LSMDT and SSMDT have similar but different roles. The NHS Cancer Plan recommends that 'the care of all patients with cancer should be formally reviewed by a specialist team'. The BAD recognises that LSMDTs currently keep clinicians 'honest' and act as a 'safety net' allowing for increased scrutiny and allow for personalised care of individuals with increased local knowledge.[18] Accordingly, it would be valuable to identify variation between LSMDTs and SSMDT practice and if there are any specific suggestions that could be tailored to these members and ergo patients which we were not able to investigate in the current study.

Conclusion

The views of skin MDT members in the current study support changes to meeting attendance, preparation and protocolised streaming. There is now a mandate for protocolised streaming at a national level. Clearly a one-size fits all approach for all tumour types is not appropriate for protocolised treatment and tumour-specific guidance for streamlining the skin MDT is needed. We would encourage those seeking to implement change in skin MDT practise to consider the views held by respondents identified in this study and make use of the wide range of evidence-based tool available to test, develop and re-assess changes in MDT practise.

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Appendices

Appendix A: Tables.

Table 1: Core membership and case-mix of each type of skin MDT.

Care level	Person or team	Core membership	Case mix/procedure
3	LSMDT, hospital staff core team member (may be core member of SSMDT acting as 'local' LSMDT). Without mandatory individual case review by MDT	• Two dermatologists • Histopathologist • Skin nurse specialist • MDT co-ordinator/secretary • An NHS-employed member of the core or extended team should be nominated as having specific responsibility for users' issues and information for patients and carers; • A member of the core team nominated as the person responsible for ensuring that recruitment into clinical trials and other well designed studies is integrated into the function of the MDT	• Low risk BCC — incompletely or narrowly (<1mm) excised, perineural invasion • Low risk BCC's excised by non-accredited GP's in the community • High risk BCC — incompletely or narrowly (<1mm) excised, perineural invasion* • High risk BCC's excised by GP's in the community* • SCC's excised by GP's in the community
4	LSMDT, hospital staff core team member(s), with mandatory individual case review by LSMDT (may be the SSMDT and its core members acting as 'local' LSMDT)		• BCC's - recurrent after previous excision and BCC's persistent (i.e. having histologically positive resection margins) after excision • BCC's - which are sited such that excision poses a potential risk to important underlying structures, areas where difficult excision may lead to a poor cosmetic result and areas where primary closure may be difficult (lips, nose, nasofacial sulci, nasofacial folds, periorbital areas and ears). • SCC — incompletely or narrowly excised (<1mm), perineural or lymphovascular invasion, thickness 6mm or more,

			pT2 or above, poorly differentiated tumours, specific histological subtypes (clear cell, desmoplastic, verrucous, carcinosarcoma, adenosquamous) • SCC's from special or high-risk sites (ear, lip, eyelid/canthus) • MM — new, single primary, adult, non-metastatic, not for approved trial entry, up to and including stage IIa • MM excised or biopsied in primary care • Radiotherapy if attendance by clinical oncologist at LSMDT • Lesion where diagnosis is uncertain but may be malignant • Incompatible clinical and histological findings
5	SSMDT hospital staff core team member(s) with mandatory individual case review by SSMDT. May have been previously reviewed by LSMDT or rapidly referred without prior review). For some cases — only one agreed SSMDT, if more than one in the network	• Two dermatologists • Two surgeons, at least one of whom should be a consultant surgeon trained in plastic and reconstructive surgery • Skin nurse specialist • Two histopathologists • Imaging specialist • Clinical oncologist • Medical oncologist • MDT co-ordinator/secretary • An NHS-employed member of the core or extended team should be nominated as having specific responsibility for users' issues and information for patients and carers	• Selected BCC's and SCC's needing plastic/reconstructive surgery by SSMDT core member (as per network clinical guidelines) • Radiotherapy (as per network clinical guidelines). If not discussed and treated by LSMDT clinical oncology core team member • Metastatic SCC on presentation or newly metastatic • MM — stage IIb or more, or <19 years or metastatic on presentation or newly metastatic or recurrent or for approved trial

		• A member of the core team nominated as the person responsible for ensuring that recruitment into clinical trials and other well designed studies is integrated into the function of the MDT	entry or positive excision margins • Patients for sentinel lymph node biopsy • Positive sentinel lymph node biopsies • Patients with positive lymph nodes following lymph node clearance • Any cases for adjuvant therapy (as per network clinical guidelines) • Histology opinion from SSMDT core pathology team member • Mohs surgery — designated SSMDT regionally • Skin cancer in immunocompromised patients including organ transplant recipients • Skin cancer in genetically predisposed patients including Gorlin's Syndrome including BCC's. • Tumours associated with burns, albinism, xeroderma, post-irradiation • Rare skin tumours — sebaceous carcinoma, malignant pilomatrixoma, neuroendocrine carcinoma — designated regional SSMDT • Cutaneous sarcoma superficial to the deep fascia

Table 2: Suggested key areas for cancer MDT working.

Areas
Stratify patients based on risk
Prioritise more complex cases
Incorporate discussion on patient preferences

Have results present for patient discussions
Audit decisions made by team
Discuss patients on 14-day pathway if investigations do not show cancer
Discuss patients at all stages in pathway
Enter patient details into database in real time
Ensure all required members are present
Ensure sufficient time to discuss patients
Circulate agenda in advance of meetings
Meeting owner takes charge of discussions
Time allocated for preparation in job plans

Table 3: Number of survey respondents for major cancer types.

	Number of respondents (% of total)	
Tumour type	**Survey 1**	**Survey 2**
Brain	81 (3.5%)	43 (3.4%)
Haematology	161 (7.0%)	77 (6.1%)
Gynaecology	160 (7.0%)	89 (7.0%)
Upper GI	185 (8.1%)	90 (7.1%)
Head and Neck	178 (7.8%)	124 (9.8%)
Colorectal	293 (12.8%)	132 (10.4%)
Lung	260 (11.3%)	141 (11.1%)
Urology	263 (11.5%)	160 (12.6%)
Breast	322 (14.0%)	177 (13.9%)
Skin	**181 (7.9%)**	**101 (8.0%)**

Table 4: Summary of priorities of importance for across different MDT's.

Tumour group	**Priority 1**	**Priority 2**	**Priority 3**	**Priority 4**
Brain	Imaging, pathology results ready	Clear meeting owner in charge	All required members present	Time to discuss patients in detail
Breast	Imaging, pathology results ready	Time to discuss patients in detail	All required members present	Clear meeting owner in charge

Children and Young People	Time to discuss patients in detail	Clear meeting owner in charge	Clear agenda, in advance	All required members present
Colorectal	Imaging, pathology results ready	Time to discuss patients in detail	All required members present	Clear agenda, in advance
Gynaecology	Imaging, pathology results ready	Time to discuss patients in detail	Prep time in job plan	Clear meeting owner in charge
Haematology	Imaging, pathology results ready	Time to discuss patients in detail	Clear agenda, in advance	Clear meeting owner in charge
Head and Neck	Imaging, pathology results ready	Time to discuss patients in detail	Clear agenda, in advance	Clear meeting owner in charge
Lung	Imaging, pathology results ready	Time to discuss patients in detail	Clear meeting owner in charge	All required members present
Sarcoma	Imaging, pathology results ready	All required members present	Time to discuss patients in detail	Clear meeting owner in charge
Skin	Imaging, pathology results ready	Time to discuss patients in detail	Clear meeting owner in charge	Clear agenda, in advance
Upper GI	Imaging, pathology results ready	Time to discuss patients in detail	Clear agenda, in advance	All required members present

Urology	Imaging, pathology results ready	Time to discuss patients in detail	Clear meeting owner in charge	All required members present
Summary of most important priorities	**Imaging, pathology results ready**	**Time to discuss patients**	**Clear agenda, in advance**	**Clear meeting owner in charge**

Table 5: Factors suggested by skin respondent which would increase case complexity and require escalation to full MDT discussion.

Category	Factor
Medical	Patient discussed in the meeting has unusual or rare tumour type
	Patient has a poor performance status (i.e., they are frail and/or need assistance with care/mobility)
	Patient has significant physical co-morbidity (e.g. diabetes, congestive heart failure, kidney or vascular disease, immunocompromised or suppressed).
Surgical	Patient has a significant past surgical history (e.g. relevant previous surgeries that may affect surgical options)
Psychological	Patient has a significant mental health or cognitive co-morbidity (e.g. they are sanctioned under the Mental Health Act, have schizophrenia, dementia from stroke or Alzheimer's disease)
Treatment	Patient has treatment failure (i.e., there is cancer progression despite current treatment)
	Patient experienced treatment toxicity and/or contraindications to standard treatment
	There is a conflict of opinion regarding the best treatment option for a patient
	Guidelines/pathway do not account for patients' specific situation, (i.e. exceptional case)

Appendix B: Figure legends.

Figure 1: Extent of importance of key areas of multidisciplinary teams (MDTs). MDT members ranked on a Likert scale their current level of implementation of the following factors (1 = low to 6 = high. Bold bar represents median; boxes represent interquartile range; whiskers represent overall range. Outliers are represented by dots.

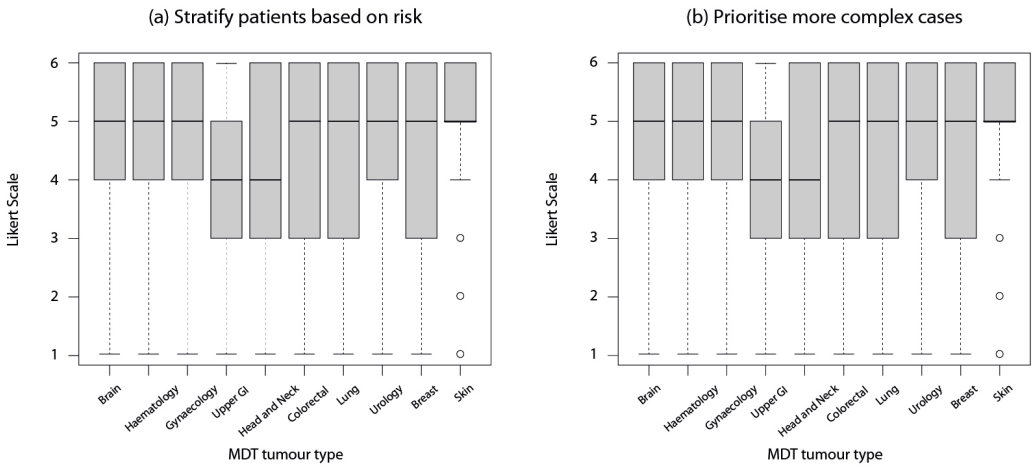


Figure 2: Extent of implementation of key areas of multidisciplinary teams. MDT members ranked on a Likert scale their current level of implementation of the following factors (1 = low to 6 = high. Bold bar represents median; boxes represent interquartile range; whiskers represent overall range. Outliers are represented by dots.

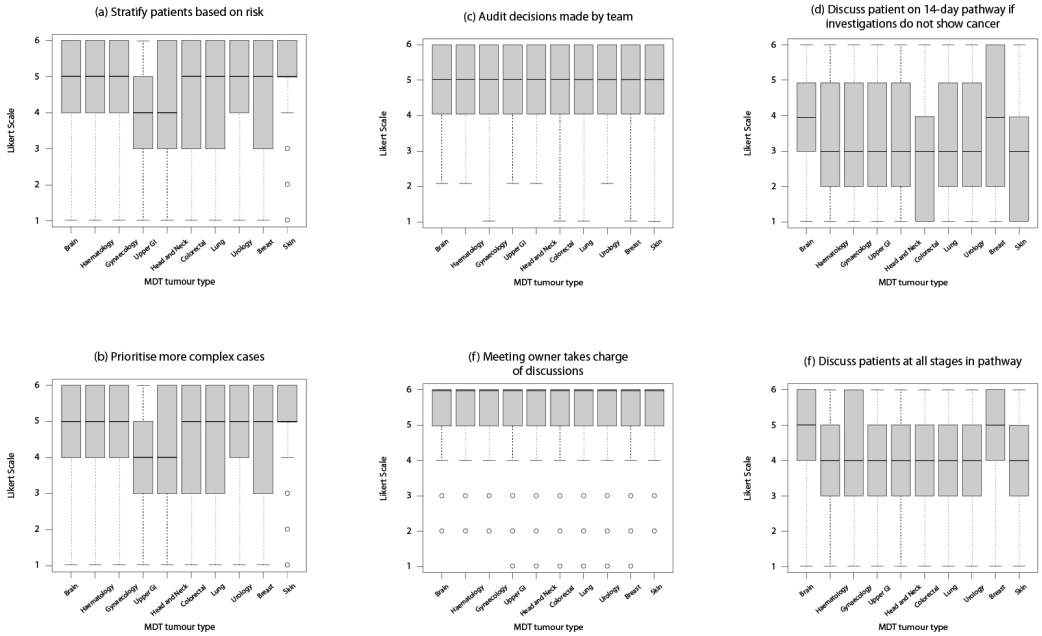


Figure 3: Plot of compliance vs importance Likert scores from skin respondents.

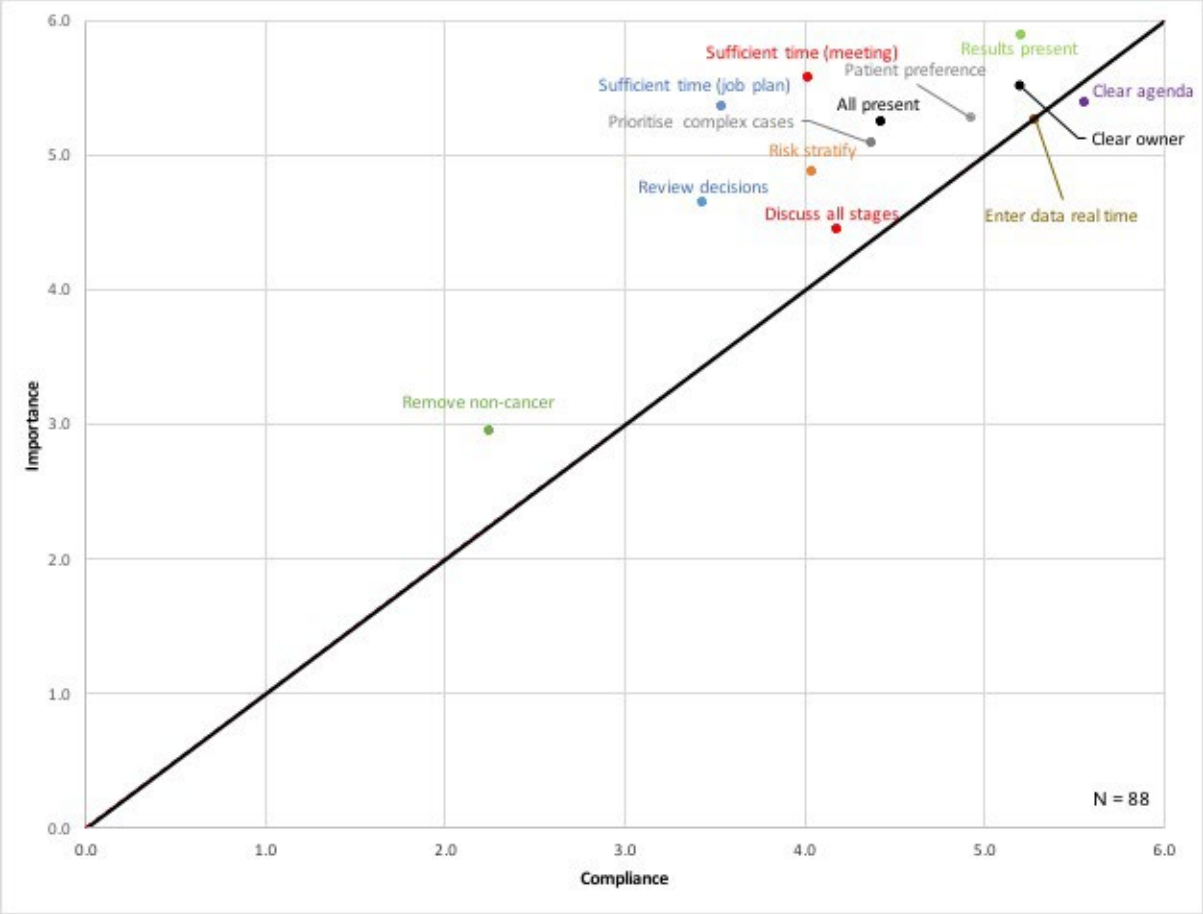
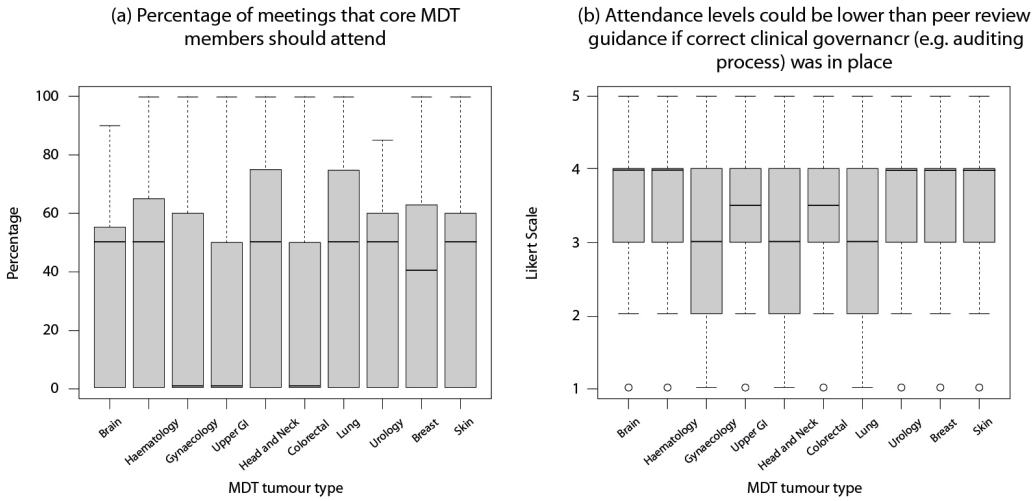


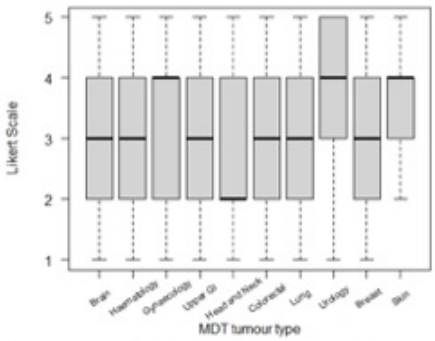
Figure 4: Differences in view of skin MDT respondents on clinician attendance levels.



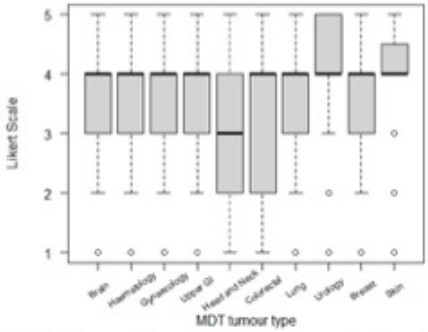
Appendix C: Supplementary data.

Supplementary Figure 1: Differences in view of skin MDT respondents on protocolised streaming.

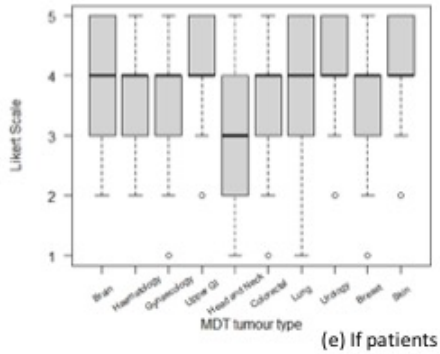
(a) Patients should be placed on protocolised treatment pathways and are not needed to be discussed at the meeting at all.



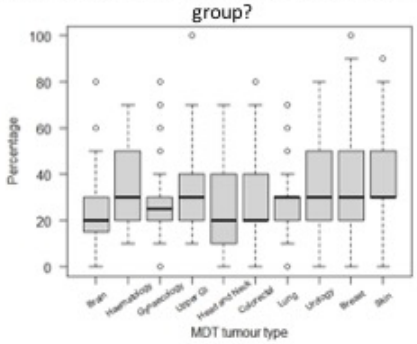
(b) The streamlining of patient discussions should be performed in advance of the main MDT meeting in order to decide which patients should be discussed at the meeting, and which should receive a protocolised treatment plan.



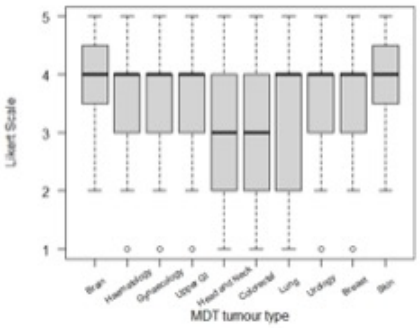
(c) This approach of streamlining patient discussions could allow more straightforward cases to be progressed more quickly, rather than waiting for the weekly meeting.



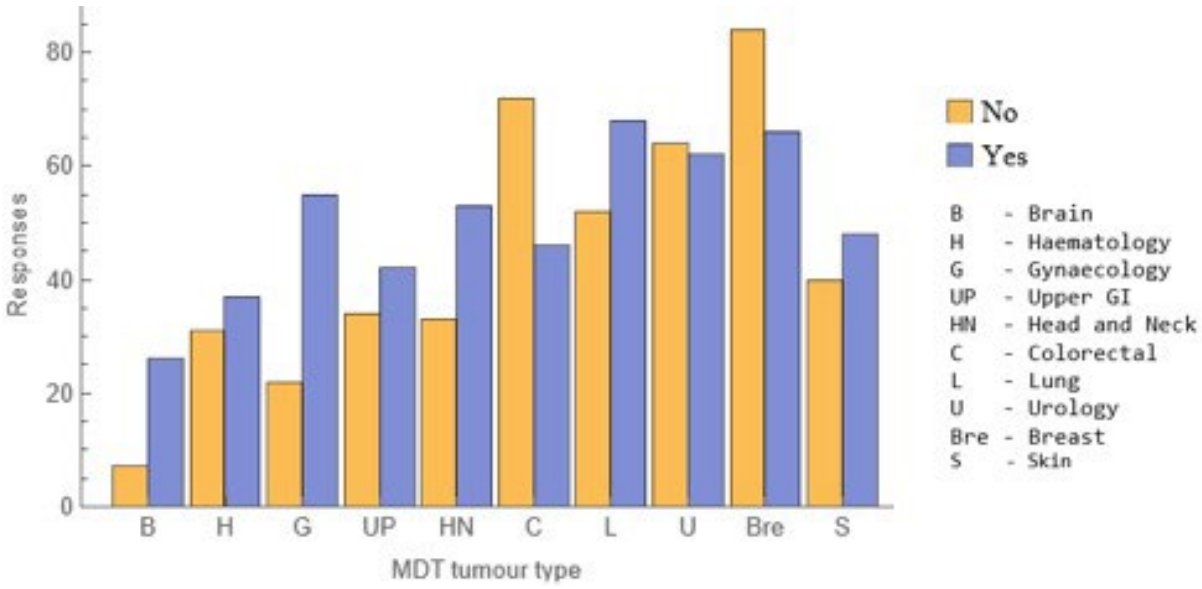
(d) What percentage of patients do you feel could be resolved outside of the meeting, for example, through clearly defined treatment protocols and review by a smaller group?



(e) If patients followed treatment protocols or had recommendations made by a smaller team, the full MDT reviewing a selection of these patients would provide sufficient governance of this process



Supplementary Figure 2: Do you currently use any form of checklist or proforma to inform referrals to your MDT?


Responses
0
20
40
60
80
B
H
G
UP
HN
C
L
U
Bre
S
MDT tumour type
No
Yes
B - Brain
H - Haematology
G - Gynaecology
UP - Upper GI
HN - Head and Neck
C - Colorectal
L - Lung
U - Urology
Bre - Breast
S - Skin