



# Educational Value of Surgical Multidisciplinary Team Meetings for Learning Non-Technical Skills – A Pilot Survey of Trainees From Two UK Deaneries

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**OBJECTIVE:** This prospective survey study aimed to identify trainee surgeons' views on the educational potential of multi-disciplinary team (MDT) meetings for learning non-technical skills and relevant issues around using MDT meetings as an educational instrument.

**DESIGN:** An online survey questionnaire containing eight closed and three open-ended questions; was developed based on established educational theories. Responses were anonymous.

**SETTING:** This survey study was designed as professional project for masters in medical education degree at Warwick University. The study received ethical approval from the Biomedical Science Research and Ethics Committee of Warwick University.

**PARTICIPANTS:** Trainee surgeons and non-trainee junior surgical doctors within two regions (Health Education Kent Surrey and Sussex, Health Education Wessex) in the UK were invited through an email to take the survey with the help of regional heads of surgery and coordinators.

**RESULTS:** Twenty eight (28) out of 420 invitees completed the survey. High internal consistency was observed for questionnaire (Cronbach's  $\alpha = 0.924$ ). 71.42% (20/28) respondents attended MDT at least once a week. 75.9% of participants indicated the importance of attendance to MDT meetings with any level of involvement; passive attendance considered the least important (5/28, 17.9%,  $p=0.005$ ). Trainees felt included in the team by attendance to MDT meetings (Median score 5,

$p=0.027$ ). MDT meetings were considered important for learning all domains of non-technical skills for surgeons taxonomy (cumulative mean score 2.4,  $p=001$ ). Respondents considered MDT as a valuable tool for learning non-technical skills for surgeons on Miller's pyramid for learning (Cumulative mean 5.6,  $p=0.025$ ). Free text answers indicated agreement to the learning opportunity provided by MDT meetings. Consistent suggestions of increasing trainee participation were obtained.

**CONCLUSION:** Results indicate consistently positive views from trainees about the educational value of MDT meeting in general and for non-technical skills. Trainee participation, in the form of case-preparation, presentation, and discussion are recommended by respondents. (J Surg Ed 76:1034–1047. © 2019 Association of Program Directors in Surgery. Published by Elsevier Inc. All rights reserved.)

**KEY WORDS:** Developing individual competence, Inter-professional education, Learning, Team learning, Mentoring

**COMPETENCIES:** Professionalism, Interpersonal and Communication Skills, Practice-Based Learning and Improvement

**ABBREVIATIONS:** ACGME, Accreditation Council for Graduate Medical Education BSREC, Biomedical Sciences Research and Ethics Committee CBD, case based discussion CCT, Certificate of Completion of Training CESR, Certificate of Eligibility for Specialist Registration CT1, Core Trainee year 1 EWTD, European Working Time Directive FRCR, Fellowship of the Royal College of Radiologists ISCP, Intercollegiate Surgical Curriculum Programme KSS, Kent Surrey and Sussex MDT,

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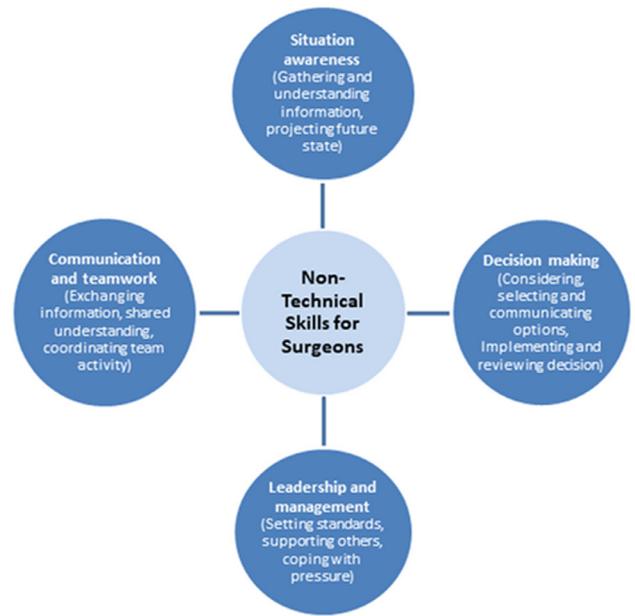
multi-disciplinary team NCAT, National Cancer Action Team NOTSS, Non-Technical Skills for Surgeons ST1 to 8, Speciality Trainee –year 1 to year 8 WPBA, work place based assessment WHO World Health Organization

## INTRODUCTION

### Background

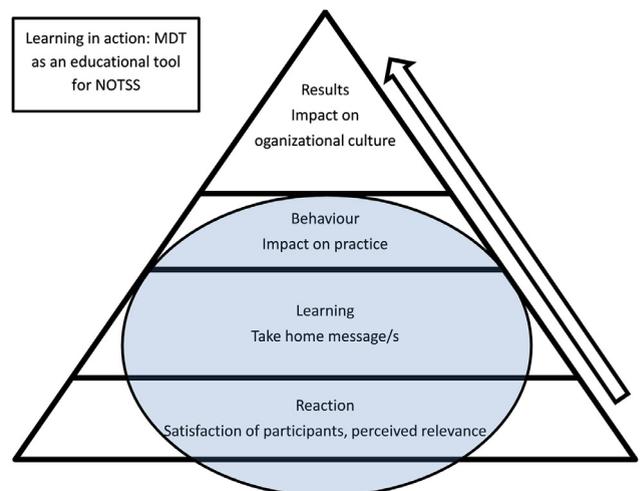
Surgical multi-disciplinary team (MDT) meetings have been at the core of cancer care within National Health Service (NHS) in the United Kingdom since the Calman Hine Report in 1995.<sup>1</sup> An MDT meeting is defined as “a meeting of the group of professionals from one or more clinical disciplines who together make decisions regarding recommended treatment of individual patients’ and MDT team may specialise in certain conditions, such as Cancer. Clinical decisions are made based on reviews of clinical documentation such as case notes, test results, diagnostic imaging etc. The patient may or may not be present.”<sup>2</sup> Department of Health in the United Kingdom recommends multi-specialty management to get better patient outcomes.<sup>3</sup> Consequently, the care of cancer patients has become more consistent, collaborative and evidence based with the evolution of multidisciplinary teams consisting of clinicians as well as non-clinicians.<sup>4</sup> It is suggested that the patients undergoing discussion in respective surgical MDT meetings, have improved staging, superior review of images, and better access to neoadjuvant or adjuvant treatment modalities as compared to their historic counterparts, who did not have access to surgical MDT meetings.<sup>5</sup> On an average, these meetings are attended by clinicians and other staff members at least once a week.<sup>6</sup>

The National Cancer Action Team (UK) has identified teamwork, communication between different specialists, collaborative decision-making, and leadership qualities, as some of the core characteristics of an effective MDT meeting.<sup>4</sup> Interestingly, these characteristics are not too dissimilar from the non-technical skills for surgeons (NOTSS) identified by Yule et al.<sup>7</sup> The perceived resemblance between aviation crew resource management and operating theatre staff including surgeons has steered substantive research towards identifying and exploring the significance of non-technical skills within the operating room environment.<sup>8</sup> More recently, a favourable effect of non-technical skills on technical performance of surgeons has been identified, which in turn leads to better patient outcomes.<sup>9,10</sup> Assessment of these non-technical skills in the workplace is waiting to be integrated in postgraduate surgical curriculum in the UK under NOTSS taxonomy (Fig. 1).<sup>11,12</sup>



**FIGURE 1.** Non-technical skills for surgeons framework (Adapted from Flin et al., 2012).

Various educational instruments have been studied for assessment of non-technical skills in surgical trainees. These vary from didactic courses with pre and post intervention questionnaires, to survey questionnaires, to simulation based training sessions and apprenticeship model.<sup>13,14</sup> Many of the described interventions are simulation based; however, others have explored learning in real life scenario and its impact on performances of participants.<sup>15,16</sup> These tools aim to achieve a higher level of educational effect of learning on Kirkpatrick’s hierarchy<sup>17</sup> (Fig. 2). Despite growing literature, there is



**FIGURE 2.** Learning non-technical skills in practice (adapted from Kirkpatrick and Kirkpatrick, 2016).

no agreement regarding best teaching and assessment tool for non-technical skills in light of low quality evidence.<sup>13</sup> How exactly the trainees learn non-technical skills, and which educational intervention is effective to assess these skills, remain unclear from the evidence so far. Moreover, learning non-technical skills beyond the operating room environment has been scarcely examined. This paucity of evidence has encouraged the author to identify opportunities for surgical trainees to learn non-technical skills within the core working hours, and service commitments. This survey study describes an initial attempt to explore the educational potential of surgical MDT meetings as perceived by the trainees. It highlights not only the trainee involvement in MDT meetings, but also their perspective on the learning offered by them.

### **Aims and Objectives**

‘The aim of this pilot survey study was to explore the educational value of surgical MDT meetings as perceived by the surgical trainees. The study intended to take into account the trainee surgeons’ views on non-technical skills learned during real life situations where service provision can be integrated with training in the context of MDT meetings. The study also aims to identify the issues related to learning from surgical MDT meetings, and attend them in future research.

## **MATERIAL AND METHODS**

### **Survey Questionnaire Design**

A simple questionnaire containing eleven questions consisting of open and closed-ended questions was designed focusing on trainee surgeons’ participation in surgical MDT meetings. Specific questions exploring the educational value of surgical MDT meetings in general and focused on non-technical skills were designed on a foundation of well-established educational theories of andragogy and “adult learning model in action” as described by Taylor and Hamdy<sup>18,19</sup> (Appendix 1). Free text boxes were included to obtain valuable information outside closed-ended questions. Questions were amended and re-worded as appropriate after an initial trial of the survey questionnaire among three surgical trainees and one senior consultant with special interest in the surgical MDT meetings.

Recent systematic review of 84 studies identified 23 educational tools for teaching and assessing non-technical skills.<sup>14</sup> The authors concluded in favour of NOTSS taxonomy and assessment tool to evaluate non-technical skills among surgeons with high internal and external validity.<sup>11</sup> The survey questionnaire was aligned with

NOTSS tool and hence with surgical curriculum in the UK to keep the inherent validity.<sup>12</sup>

### **Mix Method Design**

The survey questionnaire was designed in a “concurrent mix-method” approach by amalgamating closed / multiple choice questions with the open-ended questions. The mix-method approach has been shown to combine strengths of both qualitative and quantitative methods while avoiding potential drawbacks of individual approaches. At the same time, mix method study design also poses challenges of time constraints and risk of obtaining conflicting results from quantitative and qualitative datasets within the same study.<sup>20</sup> Following extensive discussion with peers, tutors and a consultant surgeon with vast academic experience in surgical MDT meetings in the developmental phase of this study; it was felt appropriate to include open-ended questions to obtain qualitative data.

### **Survey Population and Recruitment**

Between March 2018 and June 2018, the survey questionnaire was sent to the surgical trainees (from levels CT1 to ST8), post-CCT/CESR fellows, and non-training grade junior doctors working within two training regions in South-East England (KSS, Wessex). A forwarded email with a link to the online survey questionnaire (Appendix 1) was sent out with the help of regional trainee coordinators. The responses were collated automatically by the provider website (Qualtrics—[www.qualtrics.com](http://www.qualtrics.com)).

### **Ethical Considerations and Data Handling**

Ethical approval for this survey study was obtained from the Biomedical Science Research and Ethics Committee of Warwick University. Additional approvals from the participating health education boards were obtained subsequently. Forwarding email with an attached link to the questionnaire clearly stated the purpose of the survey, dissemination of the results, and assurance of confidentiality. All data collected as part of this project has been handled in line with Helsinki declaration.<sup>21</sup> The data were completely anonymous from the point of collection in line with the deanery regulations. The researcher did not have any identifiable information from respondents.

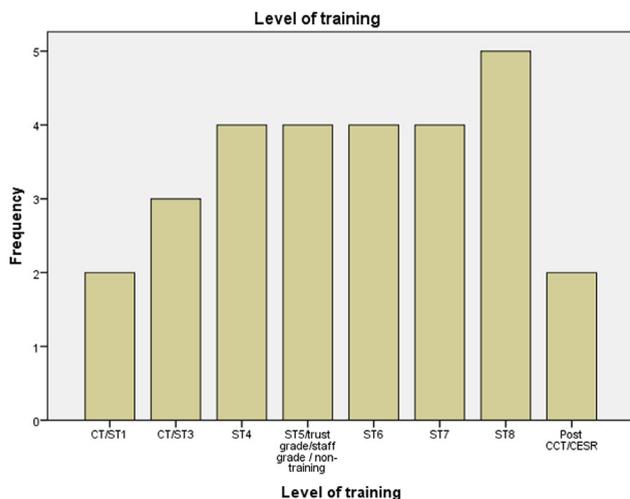
### **Data Analysis**

The qualitative dataset has been discussed narratively in broad themes tabulated with original answers for each question. Quantitative data has been analysed using SPSS version 24.0 software (SPSS Inc, Chicago, IL). Frequency graphs with actual number of respondents and percentage are presented. Cross-tabulations with bar diagrams were

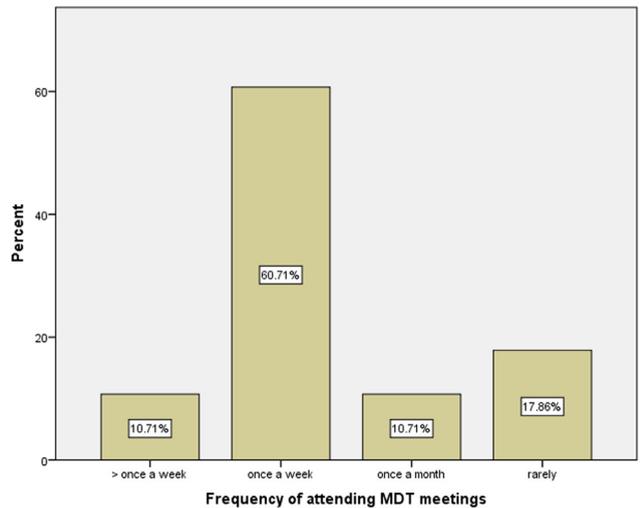
generated for individual question categories. For questions where multiple answers were possible, total scores were calculated for comparing trainees' views about different specialists demonstrating non-technical skills. Cronbach's alpha was calculated for internal consistency and Spearman's rank-order correlation test was used to identify relation between ordinal variables with non-parametric distribution. Non-parametric ( $\chi^2$ ) test and one sample Kolmogorov-Smirnov test with "exact significance" (two tailed) were used for testing significance of Likert scale values for individual sub-question within the theme as well as cumulatively for the theme. Significance was set at  $p < 0.05$ .

## RESULTS

Twenty-eight (28) out of four hundred and twenty (6.67%) trainee surgeons from two participating regions (Health Education KSS and Wessex) completed the survey questionnaire between March 2018 and June 2018. Median training level was year 6 (ST6). **Figure 3** describes the frequency distribution of trainees. For the purpose of simplicity, trainees were grouped in three levels of training; early (CT1 to ST3), mid (ST4-6, non-training grade) and senior (ST7-8, post CCT/CESR). **Figures 4** and **5** describe the trainee levels and attendance to the MDT meetings. 82.13% (23/28) respondents attended MDT at least once a month with 71.42% (20/28) attending at least once a week. Cronbach's Alpha for the Likert scale questions was 0.924, suggestive of high internal consistency with none of the questions affecting overall consistency on removal.



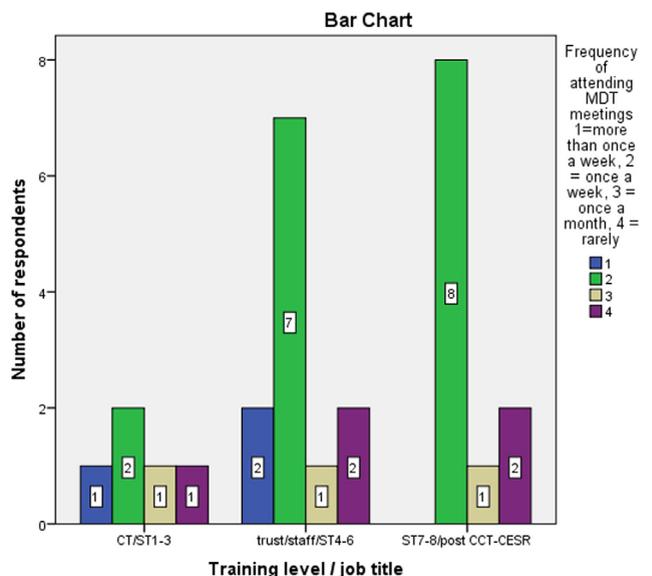
**FIGURE 3.** Distribution of trainees according to the level of training.



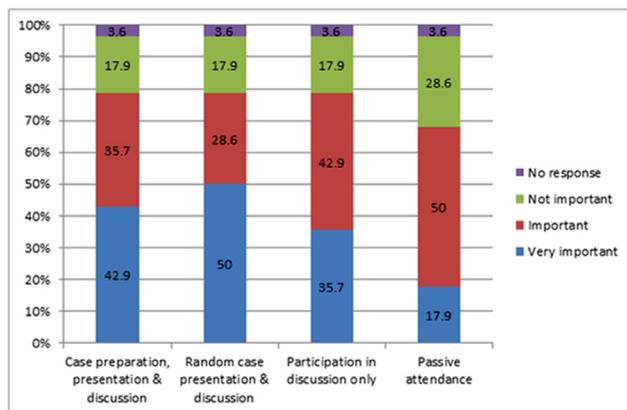
**FIGURE 4.** Frequency of attendance to the MDT meetings among responders.

## Level of Participation of Trainees in MDT Meetings

Four different levels of involvement in MDT meetings for surgical trainees were described as shown in **Figure 6**. These ranged from passive attendance at the lowest level of participation to active participation involving random case discussion, random case presentation or being allocated specific case/s for preparation, presentation and discussion by the trainee. More than three fourths (75.9%) of participants indicated the importance of attendance to MDT meetings with any level of involvement. Passive



**FIGURE 5.** Frequency of attendance to the MDT meetings according to the stage of training.



**FIGURE 6.** Perceived importance of the level of trainee participation in the MDT meetings.

attendance was considered important by least number of respondents (5/28, 17.9%,  $p = 0.005$ ) (Fig. 6, Table 1)

### MDT as a Learning Tool in General

Five statements based on “adult learning model in action” as described by Taylor and Hamdy<sup>19</sup> were designed to be agreed or disagreed on seven scales Likert response system (1 = strongly disagree, 7 = strongly agree) (Table 2 – Section 1, Fig. 7). Statistically significant agreement for the statement “MDT meetings make me feel included in the team” was shown with a mean score of 4.3 ( $p = 0.027$ ). Cumulative analysis of responses to the question theme suggested a positive trend without statistical significance (cumulative mean 4.6,  $p = 0.103$ ).

### Value of MDT Meetings in Learning NOTSS Components

64.3% trainees felt that MDT meetings were valuable in learning various components of NOTSS taxonomy. Consistently positive mean scores (out of 3) were observed with statistically significant positive influence for all four domains individually as well as cumulative analysis ( $p = 0.001$ ) (Table 2 – Section 2, Fig. 8).

### Trainee Perceived Educational Value of MDT Meetings for Non-Technical Skills

Four questions reflecting Miller’s pyramid of learning outcomes<sup>22</sup> were included in the survey, to identify respondents’ views on how the attendance to MDT meetings help them learn different non-technical skills. The results suggest significantly positive views from the respondents individually and cumulatively ( $p = 0.001$ ) (Table 2 – Section 3, Fig. 9).

### NOTSS Displayed by MDT Members in Action

Surgeons were most commonly reported displaying situation awareness (21/28), decision-making (26/28), and leadership skills (22/28). Communication and teamwork were displayed most frequently by the nurse specialists (25/28) according to the respondents. Given the possibility of each team member displaying all the qualities, a score of 0 to 168 was possible for each domain. Accordingly, communication and teamwork were the highest scoring domains of NOTSS taxonomy as evident in the surgical MDT meetings. Overall, the surgeons were considered displaying NOTSS domains more often than other specialists (89/112) whereas the managers displayed least of non-technical skills according to the respondents (Table 3, Fig. 10).

### Post Hoc Analysis

Spearman’s rank-order correlation test did not show a significant correlation between level of training and involvement in MDT meeting ( $r_s(8) = 0.108$ ,  $p = 0.585$ ). Similarly, perceived importance of involvement in the MDT meeting did not correlate with the level of training ( $r_s(8) = 0.179$ ,  $p = 0.362$ ). Neither did the level of training correlate with the perceived importance of the learning environment, opportunity and feedback provided by the MDT ( $r_s(8) = 0.271$ ,  $p = 0.163$ ), nor did the level of involvement in MDT correlate with the same ( $r_s(8) = 0.304$ ,  $p = 0.116$ ).

**TABLE 1.** Perceived Importance of Level of Trainee Participation in MDT Meeting (0=No Response, 1=Not Important, 2=Important, 3=Very Important)

	No Response	Not Important	Important	Very Important	Mean Score	Significance (X <sup>2</sup> Test)
Case preparation, presentation and discussion	1 (3.6)	5 (17.9)	10 (35.7)	12 (42.9)	2.2	<b>0.014</b>
Random case presentation and discussion	1 (3.6)	5 (17.9)	8 (28.6)	14 (50)	2.3	<b>0.005</b>
Participation in discussion only	1 (3.6)	5 (17.9)	12 (42.9)	10 (35.7)	2.1	<b>0.014</b>
Passive attendance	1 (3.6)	8 (28.6)	14 (50)	5 (17.9)	1.8	<b>0.005</b>
Cumulative					2.1	<b>0.008</b>

\*Actual responses (percent).

**TABLE 2.** Trainee Reported Educational Value of MDT Meetings

**Section 1: Trainee Perceived Educational Value of MDT Meetings (1=Strongly Disagree, 2=Disagree, 3=Somewhat Disagree, 4=Neutral, 5=Somewhat Agree, 6=Agree, 7=Strongly Agree)**

MDT Meetings	Mean Score	Median Score	Exact Significance (2 Tailed)
Provide a safe learning environment	5.3	6	0.27
Help me identify resources for my learning	4.9	5	0.097
Help me plan my learning	4.8	5	0.182
Provide useful feedback	3.4	3	0.188
Make me feel included in the team	4.3	5	<b>0.027</b>
Cumulative response	<b>4.6</b>		0.103

**Section 2: Trainee Perceived Educational Value of NOTSS Components Learned in MDT Meetings (1=Not Important, 2=Important, 3=Very Important)**

	Mean Score	Median Score	Significance (X <sup>2</sup> )
Situation awareness	2.3	2	<b>0.020</b>
Decision making	2.5	3	<b>0.010</b>
Leadership and management	2.3	2	<b>0.020</b>
Communication & teamwork	2.5	3	<b>0.005</b>
Cumulative response	<b>2.4</b>		<b>0.001</b>

**Section 3: Educational Value of MDT Meetings for Non-Technical Skills (1=Strongly Disagree, 2=Disagree, 3=Somewhat Disagree, 4=Neutral, 5=Somewhat Agree, 6=Agree, 7=Strongly Agree)**

	Mean Score	Median Score	Exact Significance (2 Tailed)
For non-technical skills, MDT meetings			
Provide valuable learning opportunity	5.5	6	<b>0.002</b>
Improve my competence	5.6	6	<b>0.002</b>
Help me change my clinical practice	5.1	5	0.142
Help me improve my performance	5.6	6	<b>0.045</b>
Cumulative response	<b>5.6</b>		<b>0.025</b>

**QUALITATIVE DATA**

Answers to the open questions were analysed to identify any broad themes represented within them. Table 4 demonstrates the thematic distribution and answers from the survey results. Three out of seventeen responses to the question about “how the MDT meetings help non-technical skills learning” suggested either no effect or uncertainty. Fourteen respondents suggested a positive influence of MDT meetings on learning different components of non-technical skills. Some of the benefits as mentioned by the respondents in addition to NOTSS domains are as below -

“Collaboration”

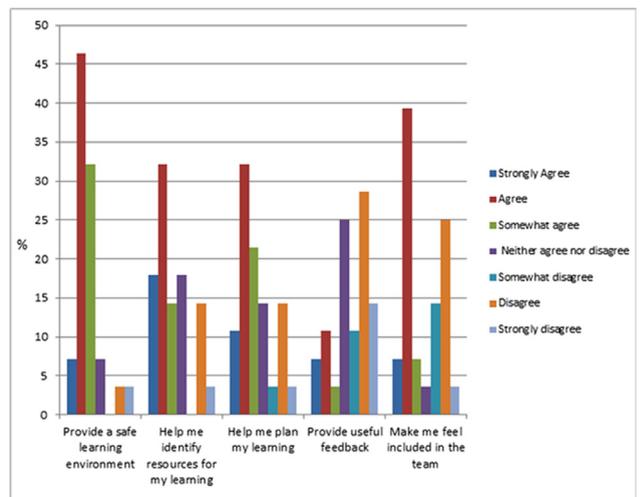
“By ST7/8. . . presentation of cases should be a key skill to obtain”

“Developing and maintaining professional relationship”

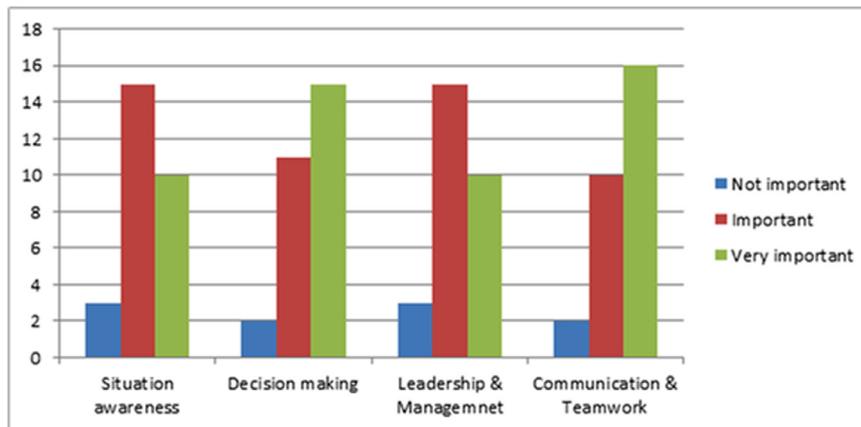
“Learn to work within a team to deliver best possible care”

“Encourages cohesive working . . . non-technical skills are key . . . to achieve a common goal”

Twenty-one (21) respondents commented on different strengths of the MDT meetings as an educational tool.



**FIGURE 7.** Trainee perceived educational value of MDT in general.



**FIGURE 8.** Trainee reported importance of NOTSS components learned in MDT meetings.

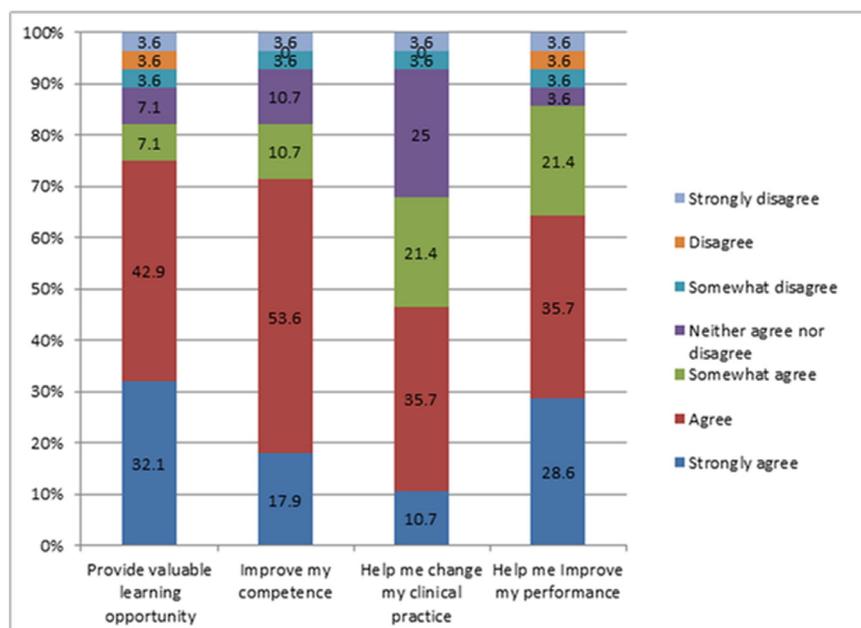
Eighteen (18) respondents identified strengths whereas three (3) respondents mentioned concerns over the educational value offered. Most recurring themes within the strengths identified, were knowledge acquisition (7/18) and decision-making (7/18). Among the concerns raised were, lack of trainee participation by two respondents and excessive number of cases by one respondent.

Nineteen (19) respondents commented on the improvements needed in the way the MDT meetings are conducted to increase its educational value. Three broad themes were identified based on the comments. Fifteen (15) respondents suggested increased and improved participation of the trainee surgeons in MDT meetings, mentioning case presentation, and participation in

discussion along with decision-making. Three (3) respondents suggested introducing some form of assessment of the trainee activities in MDT meetings (Case Based Discussion (CBD), “asking what would you do”). Two respondents suggested increasing the learning and teaching components within MDT meetings. Following are some interesting responses of note-

*“The structure of the current MDT results too much in a passive attendance”*

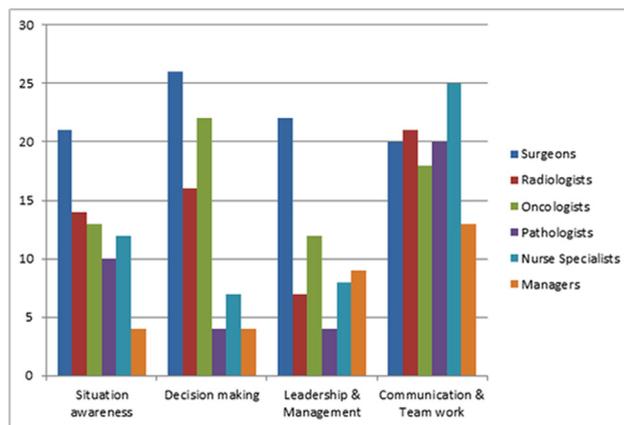
*“..... is all about improving education practice more generally ..... about culture, relationships more than “teaching” per se”*



**FIGURE 9.** Perceived educational value of MDT meetings for non-technical skills.

**TABLE 3.** Display of Non-Technical Skills by MDT Members According to Responding Trainees

Total Responses (N=28)	Situation Awareness	Decision Making	Leadership and Management	Communication and Team work	Total Score (0 to 112)
Surgeons	21	26	22	20	89
Radiologists	14	16	7	21	58
Oncologists	13	22	12	18	65
Pathologists	10	4	4	20	38
Nurse Specialists	12	7	8	25	52
Managers	4	4	9	13	30
<b>Total score (0 to 168)</b>	<b>74 (44.4%)</b>	<b>79 (47%)</b>	<b>62 (36.9%)</b>	<b>117 (69.6%)</b>	



**FIGURE 10.** Nontechnical skills demonstrated by the MDT members according to the trainees.

## DISCUSSION

In the UK, all cancer patients are required to be discussed by a team of multiple specialists from different clinical fields, and a patient centred collaborative best clinical care is recommended.<sup>3</sup> Surgeons, Pathologists, Radiologists, Oncologists, nurse specialists and management staff are the core team members of a standard specialist MDT meeting.<sup>4</sup> Within the Europe, specialist care providers attend the MDT meetings at least once a week according to an international survey of 152 MDT members.<sup>6</sup> There is growing evidence indicating better outcomes in the patients who have undergone specialist MDT discussion, in terms of improved staging, better access to adjuvant and neoadjuvant therapy, and eventually overall survival.<sup>5,27</sup> Teamwork, good communication among MDT members and between the providers of primary and secondary care, sound leadership qualities, and concerted decision-making are some of the essential characteristics of an effective MDT meeting.<sup>26</sup> These “non-technical skills” or “human factors” have been identified to reduce technical errors, generate positive morale, improve patient safety and improve overall patient outcomes within the operating room environment.<sup>9,15,28,29</sup> As a result, these non-technical skills have now been included in the surgical curricula within the UK and abroad.<sup>12,30</sup> Though it is feasible to teach these skills with various interventions, including didactic courses and simulated exercises, it is advocated that these skills are included in and beyond surgical training programmes as “hidden curriculum” in the form of “experiential learning” with regular feedback from trained teachers.<sup>13</sup>

**TABLE 4.** Thematic Tabulation of Responses to Open-Ended Questions (Q8, Q10 and Q11)

Theme	Question and Answers
	<b>Q8: How does the participation in surgical MDT meetings help your learning of Non-Technical Skills?</b>
<b>Positive</b>	<p><i>Helps in situation awareness and communication</i>  <i>Communication with different specialists, Management</i>  <i>Aspects of communication. Team-work. Collaboration.</i>  <i>This is a fundamental in the management of cancer patients, both seeing how clinical decisions are made and management planning, having a range of specialities comes together is key. As a trainee passive attendance helps observe this, however in units where I have presented, this has enforced the learning more so. By ST7/8 in your chosen speciality presentation of the cases you have enlisted on MDT should be considered a key skill to obtain.</i>  <i>Learn through team work and develop skills</i>  <i>All the above skills</i>  <i>It reminds and informs of the overview re patient factors in planning treatment. It also ensures focus on the limitations of resection and how decisions are made with borderline cases.</i>  <i>MDT working is a crucial part of modern healthcare. These meetings when run well are both an important stage of the patient pathway as well as developing and maintaining professional relationships.</i>  <i>Learn to work within a team to deliver best possible care</i>  <i>to learn how various disciplines interact</i>  <i>It highlights the importance of good multi-disciplinary communication skills.</i>  <i>Seeing the discussion of teams and how the responsibility of communication with patients changes depending on the MDT outcome for them. also discussion surrounding patients who may have slipped through the cracks and how to learn from that</i>  <i>MDT encourages cohesive working therefore non-technical skills are key in order to achieve a common goal</i>  <i>MDT should be an important learning moment where you develop leadership, decision making, and communication.</i></p>
<b>Negative</b>	<p><i>Nil</i>  <i>It doesn't</i>  <i>Unsure</i></p>
	<b>Q10: What do you think are strengths of surgical MDT meetings as an educational tool?</b>
<b>DM</b>	<p><i>Strengths</i>  <i>Identify learning opportunities, interesting cases, understand the decision making process</i>  <i>Learn decision making</i>  <i>Higher level decision making</i>  <i>As above: the opinion and strategy for the differing speciality understanding consensus opinion. Leadership and team working skills. In our current state of practice <b>MDT based decisions will be the way forward.</b></i>  <i>overview and seeing how decisions are made</i></p>
<b>L, DM, C</b>	<i>MDT should be an important learning moment where you develop leadership, decision making, and communication.</i>
<b>DM +KA</b>	<i>High volume of cases with decision making. It reinforces practice. It also highlights difficult cases and the decision making that goes with that. It is an opportunity to learn radiological / pathological / oncological skills and knowledge highly relevant to the surgeon.</i>
<b>KA</b>	<p><i>Covers pathology, radiology, oncology (chemo/ radio) and operative planning good overview.</i>  <i>learning from senior colleagues in various disciplines</i>  <i>It increases my knowledge base and helps identify areas to read about.</i>  <i>Holistic care to patient. Gain knowledge treatment options that are provided by others. Good to review radiology to improve those skills</i>  <i>Repetition of being able to look at scans and having radiologists explain what they are seeing. understanding the follow up process past the acute phase of patients</i>  <i>If presenting cases, can learn to present concisely and accurately. Can learn from others, often have invaluable radiology teaching during these sessions</i></p>
<b>Misc</b>	<p><i>Discussion of cases. Management protocols. Challenging cases. Collaboration</i>  <i>Management of patient seen in clinic.</i>  <i>Observing what the consultants do</i>  <i>Variety of specialist opinions</i>  <i>Lends a holistic approach to manage difficult cases</i></p>
<b>TI</b>	<p><b>Concerns</b>  <i>It can be educational <b>if trainee is involved</b></i></p>

(continued)

**TABLE 4** (continued)

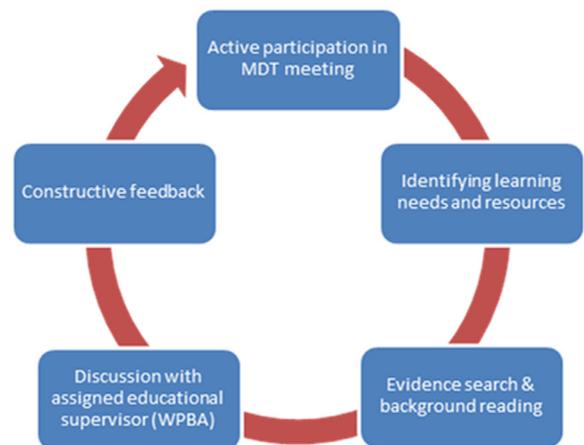
Theme	Question and Answers
<b>S</b> Q11: What can we do to improve the educational value of MDT meetings for surgical trainees?	<p>None but likely specific to the MDTs I attend where I am <b>not allowed to participate</b></p> <p>There are generally <b>too many cases</b> to get through for it to be an educational tool</p>
<b>TI</b>	<p>Involving the registrars and clinical fellows in case presentations</p> <p>Active role in MDT by presenting, take ownership of patients (it is up to the trainee though)</p>
<b>TI + A</b>	<p>More trainee participation, notably presenting of cases</p> <p>Be inclusive</p> <p>Mandatory 1-2 cases per meeting for teaching. Trainee radiologist/surgeons etc. to prepare and agree on management with supervision of consultant</p> <p>Ensure participation- either case presentations or at very least informing trainee why decision made/ why particular treatment.</p> <p>Encourage junior trainees to prepare and present the cases</p> <p>In general, the MDT is a very important learning point. However, I experience that it is only a show of the consultants. Registrars should be much more involved in preparation, presentation, discussions and decision making. The structure of the current MDT results too much in a passive attendance.</p> <p>Trainee level appropriate participation encouraged</p> <p>More involvement</p> <p>Allow trainees to present</p> <p>Increase trainee participation</p> <p>Case presentation and discussion</p> <p>Make juniors more involved in the discussions</p> <p>Encourage participation in discussion by asking the trainee <b>what they would do....</b></p>
<b>A</b> <b>T</b>	<p>Trainees at certain grades should be expected to get out certain skills of cases assessment and discussion.</p> <p>CBD after MDT (with Clinical Supervisor)</p> <p>Ensure radiologists engage in teaching as do the (surgical) consultants when in MDT. Succinct presentations of patients so you can understand the patient pathway</p> <p>It is about culture, relationships more than 'teaching' per se.</p>

TI, trainee involvement; T, training / knowledge acquisition; A, assessment; L, leadership; M, management; DM, decision making; S, structure; SA, situation awareness; Misc, miscellaneous.

Surgical training within the NHS is inseparable from the service provision. With the implementation of a 48 hours' week under the European Working Time Directive, it is advocated that the trainees must adopt a flexible approach and utilise every single opportunity for training. Working with a multi-disciplinary team has been shown to provide an important training opportunity in this context.<sup>25</sup> It is suggested that surgical trainees can attend the specialist MDT meetings under the supervision of a senior colleague or consultant, read about the subject afterwards, and have an educational discussion (WPBA) with the consultant followed by a constructive feedback.<sup>32</sup>

Kwakyee et al.<sup>16</sup> proposed an apprenticeship model for senior surgical trainees spread over four weeks to develop and assess teaching of non-technical skills. Both, the trainers (87.5%) and the trainees (85%) in their survey answers responded in favour of such an apprenticeship. The faculty members were more positive about improving non-technical skills of the residents in general. The authors advocated strongly in favour of such an apprenticeship, especially at the end of residency prior to starting as a junior consultant. Despite the small size of their study, there appears a feasible solution to the concerns raised by the respondents in our study,

regarding guidance for learning and feedback. Assigning a named MDT member as a mentor may provide the trainees with the necessary guidance and feedback as required (Fig. 11).



**FIGURE 11.** Proposed "model of learning" from specialist MDT meeting (Adapted from Monkhouse, 2010).

## Non-Technical Skills and MDT Meetings

Twenty-six out of 28 respondents felt that surgeons displayed decision-making quality in the present survey, which was also the second most common theme representing the trainee reported strengths of MDT meetings (Table 4). It is important to recognize that the specialist MDT meetings usually make recommendations for treatment based on available clinical information, best evidence, multi-specialty discussion, and loco-regional protocols. The MDT does not take decisions on behalf of the consultant in charge or the patient. However, the outcomes of MDT discussions are often termed as “decisions” and not as “recommendations.” Decision-making hence remains a core characteristic of the MDT meetings.<sup>4</sup> This has led to further research on the decision-making within the MDT meetings. Soukup et al.<sup>33</sup> in their multi-institutional observational study, including MDT meetings from four different specialities, studied the decision-making process in these meetings. They identified the availability of radiology and pathology inputs, meeting management, and overall clinical picture of the patient as important factors affecting decision-making process in the MDT meetings. Interestingly, all the participating MDTs were chaired by surgeons in their study, and the “dual task” of chairing, and participation in clinical discussion had a negative effect on the final decision-making.

“Leadership and management” was another quality reported being displayed by surgeons in the survey, which corroborates well with the previous work by Lamb et al.<sup>34</sup> In their survey of 61 oncologists, all of the respondents believed that the surgeons could chair the MDT meetings. Only one fourth of their responding oncologists believed that they could chair the MDT meetings. The authors argue in favour of oncologists chairing the MDT meetings, and rotating the chairperson regularly to enhance team-working and decision-making skills among other members of the MDT.

Situation awareness involves gathering and understanding the information, and anticipating the future state.<sup>11</sup> It is fundamental to forming a recommendation / decision plan for the patient discussed in the MDT meetings.<sup>4</sup> Again, the surgeons scored the highest in this domain as well, in our survey. Within the operating room environment, situation awareness; aided by clear communication and teamwork has been considered vital for patient safety.<sup>35</sup> Blazeby et al.<sup>36</sup> reviewed decision making in the context of surgical MDT meetings, and found that there were discrepancies in the management plans in around 15% of total patients as a result of lack of enough patient information or the information about patients’ decisions.

Interestingly, teamwork was one domain where surgeons were not given the highest scores. Nurse specialists were considered to be displaying team working skills by 25 out of 28 survey respondents. Teamwork includes exchange of information, shared understanding and coordinating teamwork apart from mutual respect and supporting each other.<sup>4,11</sup> Notably, the survey results show a significant inclination towards perceived inclusion in the team by attending the MDT meetings among the respondents (Table 2, Section 1). Teamwork was also identified as an important quality learned from the MDT meetings (26/28). Researchers have attempted to develop tools for quantifying teamwork in the MDT meetings to achieve better patient care with variable success.<sup>31,37</sup> It is hoped that in future these tools can be amended to include teamwork-training and assessment within the MDT meeting environment.

Finally, a consistent theme advocating active participation and involvement of trainees with appropriate support has been identified from the responses. In absence of evidence for or against involving trainee in the MDT meetings, it is difficult to predict the implications of such involvement. It can however be proposed that in the times when surgical trainees need to utilise every possible educational opportunity within limited working hours to achieve necessary competencies,<sup>25</sup> MDT meetings can offer an invaluable learning opportunity embedded within the service commitments.<sup>12,25</sup> Akin to surgical curriculum which requires trainees to be competent in working with the multi-specialty team,<sup>12</sup> the curriculum for radiology trainees in the UK also mandates participation in clinical MDT meetings under supervision of a mentoring consultant in the final years (ST4/5) of training. In the national survey of 611 radiology trainees only 22% of trainees had formal teaching to participate in the MDT meetings. Less than a third of responding trainees used the web assessment tool for MDT participation, and most of the trainees felt they should be running the MDT post fellowship exams (FRCR 2B level).<sup>38</sup> Though in different perspective, this is the only published study associating postgraduate specialty training with the specialist MDT meeting.

## LIMITATIONS

There are several limitations of this survey study. Sampling, coverage, measurement and non-response errors are inherent to any online survey questionnaire.<sup>23,24</sup> This is evident by the low response rate despite larger cohort receiving the invitation for online survey. Other stakeholders of MDT meetings, especially clinicians, are not included in this survey. They will be included in the future studies designed on the platform of current study.

Also not included in the survey population are the trainees from other clinical specialties. Hence the views expressed are likely to be skewed towards surgeons and surgery related opinions. This may be one of the reasons why surgeons scored the highest in most of the NOTSS domain. It is possible that the views from other trainees may generate different scores. Moreover, non-technical skills are not limited to the domains of NOTSS taxonomy alone. Though it is a validated and accepted tool, there are various other tools that include other explicit domains and have been validated by the researchers.<sup>14</sup> In the same context, we accept that the NOTSS assessment tool used to collect data from the survey has been primarily validated within the operating room environment.<sup>11</sup> Hence, the use of this tool outside the operation theatre setting may have affected the responses in the survey questionnaire. However, in the absence of another valid tool to evaluate non-technical skills outside the operating room, NOTSS taxonomy was chosen in light of current evidence.<sup>14</sup> Another drawback for the study is the absence of any similar study, which makes any discussion of the results of our study against the relevant evidence challenging. Exploratory statistical analysis in the form of multivariate ordinal regression analysis is intentionally excluded from the results as they are exclusively post-hoc and beyond the scope of this paper. Nevertheless, the present survey study provides a valuable starting point for future research and further evidence on the subject.

## CONCLUSIONS AND FUTURE IMPLICATIONS

To our knowledge, this survey study has attempted to explore the educational value of specialist MDT for the first time in the past thirty years since its conception in the United Kingdom.<sup>4</sup> The survey highlights the potential of an unexplored educational tool (MDT) which is an integral component of routine service commitments for most of consultant surgeons, radiologists, oncologists, pathologists, nurse specialists and service managers within the NHS. More trainee involvement in the form of designated case preparation, presentation and discussion has been suggested by a majority of the respondents in the survey. The results of our survey indicate that the trainees consider surgical MDT meetings a valuable tool for learning non-technical skills, and are able to identify different domains of NOTSS taxonomy<sup>11</sup> among the MDT members. Most of contemporary literature has focused to achieve better outcomes and evidence based best patient care by MDT meetings.<sup>5,31</sup> Whilst MDT meetings continued to be evaluated and improved, our survey study introduces a novel

educational perspective to this well established clinical commitment. Based on current evidence, a pragmatic model of utilising specialist MDT meetings to facilitate learning of non-technical skills and evaluation is proposed (Fig. 11). Future research based on this study is likely to identify the views of other MDT members from an educational perspective and eventually formalising trainee participation in specialist MDT meeting and its evaluation in the form of workplace based assessment. We believe that future work in this area will also help in development and validation of an assessment tool for non-technical skills beyond the operating room environment.

## POTENTIAL CONFLICT OF INTEREST

No conflict of interest to disclose.

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## SUPPLEMENTARY INFORMATION

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