BJU Int 2021 doi:10.1111/bju.15495

BJUI
BJU International

Review

The cancer multidisciplinary team meeting: in need of change? History, challenges and future perspectives

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Two decades since their inception, multidisciplinary teams (MDTs) are widely regarded as the 'gold standard' of cancer care delivery. Benefits of MDT working include improved patient outcomes, adherence to guidelines, and even economic benefits. Benefits to MDT members have also been demonstrated. An increasing body of evidence supports the use of MDTs and provides guidance on best practise. The system of MDTs in cancer care has come under increasing pressure of late, due to the increasing incidence of cancer, the popularity of MDT working, and financial pressures. This pressure has resulted in recommendations by national bodies to implement streamlining to reduce workload and improve efficiency. In the present review we examine the historical evidence for MDT working, and the scientific developments that dictate best practise. We also explore how streamlining can be safely and effectively undertaken. Finally, we discuss the future of MDT working including the integration of artificial intelligence and decision support systems and propose a new model for improving patient centredness.

Keywords

multidisciplinary teams, decision-making, quality improvement, optimisation, observation, assessment, streamlining, complexity

Why do we have multidisciplinary teams?

Multidisciplinary teams (MDTs) are widely regarded as the 'gold standard' of cancer care delivery. The concept of MDT working was introduced >20 years ago to address discrepancies in the quality of care and improve the timely coordination and delivery of care. Since then, the practice of MDT working has been adopted by many countries worldwide. Presentation of cancer cases at MDT meetings (MDTMs) is recommended by a number of professional bodies and international guidelines [1, 2].

The MDT generally consists of histopathologists, radiologists, surgeons, cancer nurse specialists, oncologists, and administrators, also known as MDT coordinators. Depending on tumour type, there may be other members such as chest physicians, haematologists, or allied health professionals. Central to MDT working is the MDTM, where cases are presented, information shared and reviewed, and care management discussed and documented. MDTMs typically occur weekly or fortnightly and can last several hours, with discussion of as many as, on average, 50 cases. The decision-making process in MDTMs should be driven by and is dependent on a combination of holistic and clinical inputs, including the patient history, comorbidities, psychosocial information, patient views on treatment options (if available at the point of the MDTM), pathology, and radiology, along with effective MDTM management [3].

Consistent with the objectives of multidisciplinary care at its inception, demonstrated benefits include improved adherence to best clinical practice, improved timeliness of diagnostics and treatment, and improved patient outcomes, including survival [4, 5]. In addition, other benefits that have become apparent include improved healthcare professional wellbeing, education, and quality assurance [6]. Moreover, the roles of healthcare professionals, e.g. pathologists and radiologists, have become embedded in and integral to the care pathway. The cost-effectiveness of MDT working remains contentious, but evidence is emerging of the financial benefits of MDTs through improvements in the organisation and delivery of care [7]. MDT working is strongly supported by the urological community and is regarded as a driver of improved quality of care. Following success of the MDT model in cancer care, it has now been extended to the management of benign diseases that involve complex care [8]. For instance, MDT working in urology is applied in some NHS Trusts to conditions such as stone management, urinary incontinence, reconstructive urology, and andrology [9].

What makes an MDT Meeting Effective?

Over the past decade, key performance indicators have been generated through research and stakeholder engagement, with high levels of agreement between different cancer teams in terms of what constitutes effective MDT working [10]. Improvement research focussed on cancer MDTs over the past 10 years, mostly in the UK, has provided a 'tool kit' with which MDT members can assure and improve the quality of their MDTs. Over this period, research into the workings of cancer MDTs has been undertaken, and an evidence base has been accumulated on the factors that promote or hinder teams to review patients holistically within a MDTM, and make recommendations that are both clinically sound and acceptable to patients [11].

Several evidence-based tools for the assessment and improvement of the performance of MDTs (Table 1; [11–19]) have been developed. These tools can be used by clinicians, administrators, or researchers to gain an objective understanding of how their teams are performing. They can be used as part of an audit or quality improvement initiative to improve the delivery of care for patients, and as an aid to streamlining MDTMs. Of particular relevance at present is an evidence-based stakeholder-driven algorithm (Measure of case-Discussion Complexity [MeDiC]) to aid streamlining of MDTMs through patient selection according to specific complexity indicators [20]; this is in line with the most recent initiative by the NHS England and NHS Improvement [21].

These tools can be applied at different points along the MDT pathway: for pre-MDTM case selection; for intra-MDTM streamlining; and post-MDTM, for team reflection, assessment and team building (Fig. 1; 23).

Challenges to MDT Meeting Effectiveness

Despite agreement in evidence and opinion on what constitutes MDT meeting effectiveness, variability remains in the functioning of MDTs. For example, in the UK, the Getting It Right Frist Time (GIRFT) Programme National Speciality Report for Urology found that there is variability between NHS Trusts in regard to treatment recommendations by MDTs including, in the proportion of patients who undergo radical prostatectomy for prostate cancer, or partial nephrectomy for renal cancer, even accounting for case mix [9]. Such variation in management, if not explained by demographic differences, suggests that some MDTs are not performing optimally.

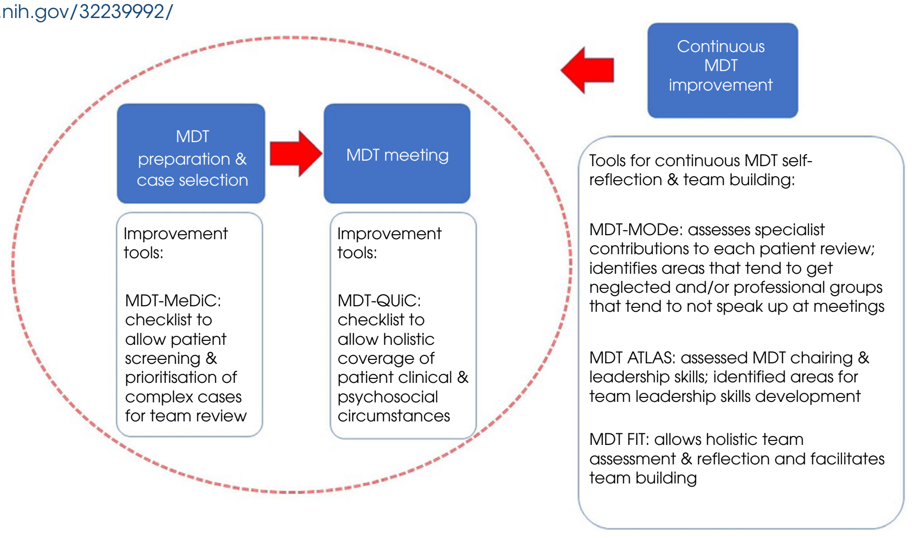
It is clear from the literature that inefficiencies in existing MDT processes are commonplace [6]. For example, failure of clinicians to submit adequate information at the point of referral means cases are rejected by the MDT and need to be re-presented. Failure to present adequate information means

Table 1 A list of instruments used to assess and improve MDT working.

Instrument (authors or source)	Brief instrument description	Methodology
MDT-OARS (Taylor *et al.*) [12]	'The MDT Observational Assessment Rating Scale' assesses 18 elements of good team functioning as expressed in national UK guidance	Observation
TEAM (Taylor *et al.*) [13]	'The Team Evaluation and Assessment Measure' assesses core functions of the team and their team meetings, based on the components defined in 'the characteristics of effective MDT'	Team self-assessment
MDT-QuIC (Lamb *et al.*) [14]	'The MDT Quality Improvement Checklist' is designed to aid decision-making in MDTMs by ensuring that all aspects of a case are reviewed by the team	Checklist
MDT-MODe (Lamb *et al.*) [38]	'The MDT Metric of Decision-Making' measures the quality of presented patient information, contribution to case review per specialty, and team ability to reach a decision in the MDTM	Observation
MODe-LITE (Lamb *et al.*) [15]	An assessment tool for MDTs in everyday practice. Designed to be used by healthcare professionals to give MDTs insight into the way they work to facilitate improvements in practice	Observation
MeDiC (Soukup *et al.*) [20]	'Measure of case-Discussion Complexity' assesses the complexity of the discussion on each patient. It is the first tool of its kind which reliably and validly captures the complexity of cancer cases put forward for MDT discussion	Medical record review and observation
MDT quality improvement bundle (Lamb *et al.*) [16]	A team improvement bundle including checklist application, team skills brief training, and guidance implementation	Quality improvement bundle
MDT-ATLAS (Jalil *et al.*) [17]	'A multidisciplinary Team Leadership Assessment Tool' that measures leadership and chairing skills in MDTMs	Observation
MDT-MOT (Harris et al.) [18]	'The MDT Meeting Observational Tool' assesses team attendance, leadership/chairing of the MDTM, teamwork and culture	Observation
MDT-FIT (www.mdtfit.co.uk) [19]	'The MDT Feedback for Improving Team Working' encompassing validated components of MDT-MOT and TEAM allows self-assessment of team working, combined with expert feedback from facilitator, and sharing of the outcome with the team as part of a team-reflective discussion	Team self-assessment and observation

FIT, feedback for improving team-working; MODe, metric of decision-making; MOT, meeting observational tool; OARS, Observational Assessment Rating Scale; TEAM, Team Evaluation and Assessment Measure. Adapted from Soukup et al. [11].

Fig. 1 Diagram representing systems model of input, pathway, output approach for improving cancer care. ATLAS, leadership assessment instrument; FIT, Feedback for Improving Team Working; MODe, metric of decision-making; QuIC, Quality Improvement Checklist. Reprinted with permission from https://pubmed.ncbi.nlm.nih.gov/32239992/



recommendations cannot be decided upon; cases with MDT recommendations that are clinically inappropriate or unacceptable to patients cannot be implemented. At each of these junctions, delays in patient care and waste of specialist staff's time occur with repeated listing for MDTM, consuming additional resources. Such inefficiencies arise from lack of understanding of what is required for effective clinical decision-making in MDTMs. A number of factors were found to have an adverse impact on effective clinical decision-making [11, 22–24]; these include professional hierarchies, lack of open discussion, failure to consider holistic information or patient views, lack of personal knowledge of the patient being discussed, as well as the logistical issues (administrative, process, attendance, and equipment issues), time and workload pressures, fatigue, gender imbalance on the team, and communication practices such as antagonism, tension and un-acknowledgment of other team members contributions. Where MDT working has been studied in detail, these themes have been found to some degree across all tumour types and all locations.

The difficulty MDTs have in achieving their potential is not the fault of the healthcare professionals who work hard for their patients and colleagues, but may instead be a limitation of the system in which we work. MDTs have become burdened by increasing workloads with an unmatched, limited increase in resources to support such work [25–29]. The result is that support services, such as radiology and pathology cannot meet their MDT commitments whilst supporting other essential non-MDT related work. The reasons for growing workload are numerous, including increased cancer incidence, cancer survival, comorbidities, population size, and longevity [11, 25–29]. In addition, perhaps due to the success of the MDT model, many straightforward or non-cancerous cases are put through the MDT meeting [30]. It appears that healthcare professionals appreciate the benefits of the MDT and feel confident in the safety net it provides for a range of cases, although there are growing concerns that clinicians now fear making clinical decisions without the approval of the MDT [31].

Evolution of the MDT Model

Recently, there has been a recognition that the current model of MDT working, as is mandated in the UK, needs to evolve. It has been recognised that the concept of reviewing every new cancer case of suspected or confirmed cancer, as well as some cases of recurrence, is not sustainable. A national UK report by Cancer Research UK into the challenges facing cancer MDTs highlighted the discrepancy between the demands placed on, and the resources available to MDTs, while making a number of recommendations for improvement [32, 33]. Subsequently, the UK Government Department of Health and Social Care commissioned a national pilot aimed at transforming the working of cancer MDTs to increase efficiency in the light of the growing service demands [31]. With the guidance on streamlining published by NHS England and NHS Improvement in early 2020, the mandate for discussing all cancer cases no longer exists in the UK [21].

Focus on Complex Cases

The greatest benefit of MDT working is seen in complex cases, e.g. unusual subtype of disease, failure of previous treatment, significant comorbidities, social or psychological problems. Indeed, evidence shows that the complex cases yield better quality decision-making and wider contributions to discussion by the participating MDT members [23, 24].

Complexity relating to cases discussed in an MDTM has been scientifically defined as involving patient factors (socio-economic, psychological comorbidity, patient preferences), disease factors (tumour type, stage, grade) and treatment factors (specialist input, toxicity, monitoring, follow-up, trials, conflicting data, application of guidelines) [20]. Indicators of case complexity have been found to be consistent across a range of tumour types [20]. These patients often do not fit guidelines, are not eligible for clinical trials, can be challenging to engage in healthcare services, and may require tailored individualised treatment plans. Although they represent a small portion of cases, a considerable amount of additional support is needed before and after diagnosis and treatment [34].

Most cases discussed in MDTMs are at the point of diagnosis, or treatment initiation, and most MDTMs are chaired by surgeons, with oncologists being less inclined to refer cases of more advanced disease [35]. However, the MDT is the ideal forum for making recommendations about changing treatment strategies for patients with advanced disease on systemic therapy both in terms of clinical- and cost-effectiveness [4, 5, 7]. Patients with advanced disease on systemic therapy are complex for various reasons. For instance, as a patient's disease progresses, their performance status may decline and the toxicity of systemic treatment increases, the potential benefits of coordinated, holistic MDT working become more apparent. Furthermore, systemic treatments, in particular immune therapies, carry a significant risk of toxicity. Immune-related adverse events are commonplace and can affect any organ. Accordingly, MDTs can provide substantial added value in managing immune-related adverse events and educating healthcare providers about them [36]. In addition, novel agents for treating advanced cancer are generally expensive. Weighing up the benefits and risks of these agents, with limited resources, treatment recommendations should be made carefully under the governance structures that exist in the MDT. Indeed, MDT working has been shown to increase cost-effectiveness [7]. As the complexity and cost of the management of advanced disease increases, the MDT approach becomes both necessary and desirable for these patients and healthcare professionals alike.

Streamlining MDT Working: Case Selection for MDT Presentation

It has been proposed that only complex patients, requiring true multidisciplinary input, would be discussed at MDTMs, whilst patients not meeting criteria for full discussion would be treated according to predetermined/agreed algorithms/guidelines [20, 21, 37]. This would reduce the time all MDT members, especially radiologists and pathologists, spent in MDTMs and actually increase the time such complex patients require for review, which is currently pressurised by the large volumes of simpler cases that are also mandatorily presented at the MDTM (such that urological MDTMs have been shown to spend a median 2–3 min per case discussion, hardly enough for a complex patient [38]). Evidence to support this initiative has been provided by several studies across different tumour types, which have reported reduced number of cases discussed at MDTMs and a reduction in MDTM duration. Two national surveys distributed by Cancer Research UK have shown that 87% of urologists agree that some patients could be managed outside of full MDT discussion [39]. Streamlining has be trialled in Urology across a number of NHS Trusts in the UK, with benefits becoming apparent [21, 31, 33]. For example, at Southport and Ormskirk cases were triaged and 15% not discussed that resulted in a reduction in MDTM duration of ~10 min [9]. This time saving could then be allocated to patients who truly benefit from a multidisciplinary approach, i.e. complex cases. NHS England guidance marked a formal endorsement of streamlining cancer MDTMs in the UK [21]. It may be desirable therefore to scientifically identify cases that are truly 'complex' and those that are 'simple' using available tools to for stratifying cases by complexity (e.g. the MeDiC tool; [20]).

There are concerns that patients not discussed at the MDT might receive suboptimal care compared to those being discussed. Given the paucity of regular and rigorous audit of MDT outcomes, these concerns should be taken seriously. There is an urgent need to take a scientific approach to streamlining MDT working, whilst at the same time maintaining patient safety and the quality of care. Failure to use best evidence to streamline MDT processes risks reducing workload at the expense of a return to unwarranted variation in patient care, as was the case before the introduction of MDTs in the UK [37, 40]. If this is to be avoided, a comprehensive approach will be needed (Box 1 [37]).

The careful, planned collection of clinical and process data is critical to assess and inform complex areas of healthcare such as care pathways and organisational changes. The recent NHS England and NHS Improvement report has highlighted that data collection and regular audit must accompany MDT transformation [21]. The collection and analysis of such data might provide a resource to benchmark processes and outcomes, thereby driving standardisation and convergence towards best practice [34]. Well-designed data collection supports quality improvement and clinical research, driving the development of new and better standards of care.

The time between MDTMs can present a period of significant stress and anxiety for patients with rapidly progressing disease waiting for MDT review and recommendations [34]. In such cases, the MDT Chair is well placed to endorse management proposals of clinicians out with the MDTM in order to avoid delays [34]. Such cases should still be registered with the MDT and could be reviewed *post hoc*. In order to enable the MDT Chair to assume an enhanced role, in particular as part of streamlining, triaging cases prior to the MDTM, and using the Chair's action for urgent management, the role needs strengthening. It is important, therefore, that the role has credibility, which could be enhanced by introducing competitive application, and also the necessary resources, by allocating increased time in the job planning for the MDT Chair. Administrative support for the MDT Chair would also need to be enhanced by increasing support and training for MDT coordinators, a professional group critical to effective MDT function, but historically with little training, low retention rates, and currently no professional representation at a national level [41].

The Future Role of Technology in MDT Working

Computerised Clinical Decision Support Systems

As the complexity of cancer care increases, consideration must be given to genomic and molecular information, novel treatments and clinical trials in order to provide patients with precise and high-quality care. Computerised clinical decision-support systems (CDSSs) have been developed to support the quality of care and improve decision-making. At one level, CDSSs capture patient data and identify eligible patients for clinical trials, and suggests evidence-based treatment recommendations [42]. Others may have additional functionality, such as those that can be integrated into electronic medical record (EMR) systems and harness artificial intelligence (AI); with the most advanced being cognitive computing systems that store and index current literature, protocols, and patient charts, learning from cases and improving the performance of the MDT [43–45]. Such systems have demonstrated improvements on process outcomes, such as preparation time and guideline adherence across a number of settings in oncology, including MDTMs. To date, no improvements in clinical outcomes have bene demonstrated [46]. Physicians appear to regard CDSSs favourably, with easy access to well-structured data, and reducing the time spent by clinicians on MDTM preparation and duration being desirable features [47]. However, concerns include incomplete or untrustworthy output generated by the system and insufficient adaptability of the system to local and contextual needs [47]. Going forward, CDSSs need further validation against improved clinical outcomes and demonstration of flexibility with application to local healthcare settings [47]. CDSSs have huge potential to improve the consistency of MDT management recommendations and their convergence with guidelines by assisting with the collation of all relevant information for case discussion, highlighting the current evidence base, and providing data on previous management decisions for similar cases. They also offer potential for personalisation of treatment plans with the integration of molecular medicine, genetics and clinical trials, including those beyond the immediate network.

Box 1 Steps for assuring the quality of the streamlining process

1. All referred cases must be registered with the MDT.
2. Provision of a comprehensive dataset at the point of referral.
3. Case preparation prior to MDTMs by clinical teams (radiology, histopathology and speciality team).
4. The method of selecting cases for MDT discussion, as well as the standards of care for patients not being discussed must be robust, coherent, and evidence-based.
5. Strengthening the role of the MDT Lead/Chair with competitive application and allocated time in the job plan; and also of the MDT coordinator with enhanced training and support to develop their role to allow them both to effectively execute and oversee the triage process.
6. Regular and frequent audit of the selection criteria, Standards of Care and patient outcomes must be undertaken, and the MDT must have the ability to modify them accordingly in light of the findings.
7. A maximum limit should be set on the number of cases discussed at a single MDTM.
8. A mandatory short break during the MDTM.
9. Better preparation is needed to smooth out logistical issues ahead of MDTMs, such as by using a checklist to ensure all the information is readily available at the MDTM.
10. An MDTM Chair who does not contribute to the clinical discussion could help the team effectively navigate through workload by reducing tensions, steering interaction and communication, and ensuring a more uniform decision-making process for all patients reviewed.
11. Staff selection for MDTs should factor in gender.

Artificial Intelligence and Machine Learning

Radiologists and pathologists spend significant amounts of time preparing for MDTMs, far in excess of other members of the MDTMs [48]. Whilst endeavours to streamline MDTMs are admirable, they may in fact put more pressure on histopathology and radiology services by demanding further preparation in advance of any triaging activity. The use of AI and machine learning (ML) in these two fields presents a great opportunity to reduce the workload of clinicians by accelerating the process of distinguishing investigations that show benign from malignant disease, as well as improving risk stratification.

Radiology

Convolutional neural network (CNN) algorithms have been applied to improve intra- and interobserver discrepancy in the Prostate Imaging-Reporting and Data System (PI-RADS) scoring from patients who underwent MRIs for suspicion of prostate cancer [49]. Other models have incorporated MRI radiomics data with Gleason scores to train a ML model to predict clinically significant prostate cancer on MRI images with some success [50]. In renal cancer, ML models have been developed to accurately differentiate benign oncocytomas from RCC [51, 52]. Similarly, AI has been used to help in the planning of surgery by constructing three-dimensional models of renal anatomy from CT scans. [53] Pattern recognition algorithms have been developed both to diagnose bladder cancer on cystoscopy, and also stage urothelial cancer from imaging studies. [54, 55]. To date, studies have been conducted on small samples, and further training on larger datasets is needed to improve accuracy to the level of specialist radiologists, but the results are encouraging.

Histopathology

The recently developed AI system, Paige Prostate Alpha, is a detection platform that can be utilised by pathologist to increase sensitivity of detection of prostate cancer on whole-slide images from 74% to 90%, with no significant decrease in specificity [56]. Deep learning systems have also been developed that can outperform pathologists in the application of Gleason scores to prostate cancer [57]. Such systems would work well clinically to screen out benign biopsies and prioritise high-risk biopsies for assessment by pathologists. AI has been used for the assessment of percutaneous renal biopsy to classify RCC subtypes and identify features that predict survival outcomes, as well as assessing the degree of kidney disease in biopsy samples [58–60].

Genomics

Advances in genomics may lead to increased precision in the management of certain cancers. Next-generation sequencing has been used to profile tumour DNA profiles provide active sites for targeted therapies [61, 62]. This can be used concurrently with high throughput screening (HTS). HTS has led to significant advances in the pharmacology sector [63]. It makes use of advances in robotics, genetics and data analysis to test potentially millions of different active reagents or antibodies to see if they interact with a target providing a building block in the development of novel therapies. In American Tumour Board Meetings there have been some studies showing that it is feasible to look at genomics to create tailor made cancer treatment regimens to help improve outcomes [64]. DNA sequences of interest could potentially be used alongside AI technology, and in the near future.

The Use of Videoconferencing to Improve Collaborative Decision-Making

Videoconferencing has been controversial in MDTMs, with apparent advantages and challenges. Regular regional and even supra-regional MDTMs are not feasible without some form of remote contact [34]. Technology failure and differences in communication styles can present challenges to the quality of MDT decision-making [23, 24]. Perhaps an ongoing effect of the coronavirus disease 2019 (COVID-19) pandemic will be the dramatic shift towards telemedicine, replacing many face-to-face interactions. Many MDTs now manage to operate remotely via video link. It may be desirable to supplement this with periodic face-to-face interaction that permit more nuanced communication regarding performance, operational policy, challenges, and future directions [65].

A New Strategy to Involve the Patient

As care pathways in the UK are getting shorter in an attempt to improve the timeliness of diagnosis and treatment for patients, patients often have not formally been given a diagnosis of cancer before their case is reviewed in the MDTM. Accordingly, when patients' cases are discussed in the MDT, data on their attitudes and preferences are frequently not known, and therefore cannot be incorporated into care management recommendations. Research suggests that this makes MDT recommendations less likely to be put into practice, but in truth little audit or research of the implementation of MDT outcomes has been published [66]. Researchers have been arguing for better representation of patients' interests in MDT decision-making for some time, but research has consistently shown that patients' views and holistic aspects of care are consistently underrepresented [3, 10, 11]. In fact, some researchers have tested the feasibility of having patients attending MDTMs [67, 68]. Despite the appeal of this strategy to those who hold strongly to the principles of patient-centred care, in practice in a system that is already under strain there might need to be an alternative way of integrating patients' interests into MDT decision-making at scale. One such approach might be to accept the difficulty in integrating patient-centred information into the MDTM and to focus instead on the synthesis of a precise biomedical picture in a streamlined MDTM. An enhanced post-MDT clinical consultation could then be focussed on personalising this precise biomedical picture. Resources saved through streamlined MDTMs could be redirected into the post-MDTM consultation involving patients, nurses, surgeons, oncologists and other healthcare professionals in face-to-face discussions. The result might be the application of a more precise clinical diagnosis with a personalised care plan for patients, tailored according to patient preferences, psychosocial circumstances and comorbidities.

Recommendations and Future Direction

From the present review we can make a number of recommendations with regards to the future direction of the MDT:

- Ensure that sufficient information is presented at the MDTM for each patient in order to reduce number of rejected cases or re-discussions.
- Increase utilisation of stakeholder-driven algorithms, such as the MeDiC screening tool, to triage cases, and aid streamlining of MDTMs and reduced MDT workload.
- Focus specifically on complex cases during the MDTM.
- MDT Chairs to take on an enhanced role, facilitating management of urgent cases prior to the MDTM to avoid delay, with *post hoc* review of management at the MDTM.
- Gradual implementation of new technologies such as CDSSs, AI and videoconferencing.
- Enhance post-MDTM out-patient consultations with a multidisciplinary clinic, using validated decision-making tools, to support patient decisions and decrease treatment regret.
- Invest in team development for MDTs (e.g. team development annual away day), to promote team cohesion and allow the team to plan how best to run their MDTMs, how to introduce new technologies and how to enhance their patient-centredness.

Conclusion

There is little doubt that the delivery of care of patients with urological cancers is enhanced through the cooperation and coordination afforded by a multidisciplinary approach. As the complexity of diagnostic and prognostic information, as well as treatments increases, this approach will become increasingly valuable for these patients specifically, and the health service in general. To allow us to absorb this extra work, changes will be necessary to streamline the MDT process and the MDTM in particular. Strategies for improving and streamlining MDT working have been set out, which may require enhancement of the post-MDTM consultation to ensure patients receive holistic care.

Funding

Nick Sevdalis research is funded by the National Institute for Health Research (NIHR) via the 'Applied Research Collaboration: South London' at King's College Hospital NHS Foundation Trust, London, UK. Nick Sevdalis is also a member of King's Improvement Science, which offers co-funding to the NIHR ARC South London and is funded by King's Health Partners (Guy's and St Thomas' NHS Foundation Trust, King's College Hospital NHS Foundation Trust, King's College London and South London, and Maudsley NHS Foundation Trust), and the Guy's and St Thomas' Charity. The funding agreement ensured the authors' independence in designing the study, interpreting the data, writing, and publishing the review. The views expressed are those of the authors and not necessarily those of the NHS, NIHR, or the Department of Health and Social Care. Tayana Soukup is supported by the Welcome Trust and Diabetes UK. David A. Winters, Benjamin W. Lamb, and James S.A. Green received no funding for this work.

Disclosure of Interests

Benjamin W. Lamb and Tayana Soukup have previously received funding from Health Education England and Cancer Alliances for training cancer MDTs in assessment and quality improvement methods in the UK. Tayana Soukup also received fees from Roche Diagnostics for research services in relation to innovations for cancer MDTs in the USA. Nick Sevdalis is the Director of London Safety and Training Solutions Ltd, which provides team working, patient safety and improvement skills training and advice on a consultancy basis to hospitals, training programmes and pharmaceutical companies in the UK and internationally. James S.A. Green is a Director of Green Cross Medical Ltd that developed MDT FIT for use by National Health Service Cancer Teams in the UK. David A. Winters has no competing interests to declare.

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Abbreviations: AI, artificial intelligence; CDSS, clinical decision-support system; HTS, high throughput screening; MDT(M), multidisciplinary team (meeting); MeDiC, Measure of case-Discussion Complexity; ML, machine learning.