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ANNALS OF ONCOLOGY DRIVING INNOVATION IN ONCOLOGY

SPECIAL ARTICLE

ESMO Precision Oncology Working Group recommendations on the structure and quality indicators for molecular tumour boards in clinical practice

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Background: With an increased uptake of genomic profiling in clinical practice and the evolving complexity of diagnostic modalities, vast amounts of complex data need to be properly interpreted and integrated into an individualised care plan. To address these challenges, molecular tumour boards (MTBs) have been widely established. As of today, no international recommendations regulating the composition and workflows of MTBs have been defined.

Methods: ESMO's Precision Oncology Working Group (POWG) established an international expert panel in precision oncology and defined core areas of interest. After several consultations and through an expert consensus process, the group reached a consensus level for each recommendation.

Results: The group defined five components in the MTB process that are critical to its function and clinical use: (i) the primary task of MTBs consists in providing genomic-informed clinical recommendations, particularly for cases exhibiting complex genomic alterations; (ii) to achieve this, MTBs should encompass interdisciplinary expertise, with key roles for

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oncologists with genomic expertise, pathologists with molecular training and clinical geneticists; (iii) MTBs' recommendations should be documented in a structured report that includes genomic-informed treatment strategies, management plans for potential tumour-detected germline alterations and guidance for additional genomic testing; (iv) structured follow-up processes should be implemented for monitoring the clinical effectiveness of MTBs recommendations and (v) finally, the panel proposed quality indicators for operating MTBs, including turnaround times for cases discussion and the proportion of cases for which actionable recommendations and clinical trial enrolments were successfully implemented.

Conclusions: These ESMO's POWG recommendations can serve as a guidance and help to define quality standards for MTBs to allow for harmonisation and to further expedite the integration of precision oncology into clinical practice.

Key words: molecular tumour boards, MTB, precision medicine, precision oncology, targeted therapy, ESMO

INTRODUCTION

A key aim of personalised medicine in oncology is to integrate complex biomarker testing and molecularly guided treatment options (MGTOs) into patient care.[1,2] Over the past decade, advanced molecular diagnostics have undergone major technological improvements and widespread adoption, evolving from limited use in the setting of translational research towards an integral component in the routine management of patients with cancer.[3] This progress has been driven by high-throughput technologies, such as next-generation sequencing (NGS), which allowed for a significant expansion of diagnostic capacities at decreasing costs.[4] In addition, due to a growing number of therapeutically relevant biomarkers and MGTOs, the use of genomic profiling in clinical practice has been steadily increasing.[5,6] In this setting, the need for structured clinical interpretation of genomic variants and peer-to-peer education has emerged.[7-9] Accordingly, building clinical infrastructures for multidisciplinary interpretations of genomic profiling results and integrating them into clinical care is of utmost importance.

To address this issue, molecular tumour boards (MTBs) have been established globally. MTBs consist of multidisciplinary teams of experts and their role can significantly vary based on national, regional and institutional settings. Generally, these expert panels aim to support clinicians in the interpretation and clinical implementation of genomic profiling in individual patient management. Importantly, MTB support has been consistently shown to improve clinical outcomes for patients with cancer.[10-14]

ESMO's Precision Oncology Working Group (POWG) has therefore assembled an international group of experts in the field to issue a set of recommendations (Supplementary Methods and Table S1, available at https://doi.org/10.1016/j.annonc.2025.02.009), describing the role, structure and function of MTBs, aiming to serve as a guidance and to define potential quality standards to further promote the integration of precision oncology into clinical practice.

RESULTS

Section 1. Task of an MTB

1A. Role of MTBs in clinical practice. MTBs facilitate the implementation of precision oncology, with the primary function of offering a systematic interpretation of genomic profiling data to result in clinically meaningful interventions (Figure 1). In certain circumstances, the role of MTBs is not only limited to providing therapeutic recommendations associated with somatic genetic testing, but also includes the interpretation of both confirmed and putative germline genetic alterations.[15] In addition, MTBs should aim to ensure peer-to-peer education in the setting of precision oncology to expedite its implementation in routine care. This can include taking responsibility for assessing the diagnostic capacity of a given genomic test being performed. In this setting, the expert panel could offer guidance as to the necessity of carrying out additional diagnostic steps or deciding upfront which genomic profiling platform to use for subsequent MTB discussions.

Recommendations
• MTBs should provide a systematic, clinically oriented interpretation of genomic profiling.
• Through comprehensive assessments of biomarkers, MTBs must aim to provide clinically meaningful treatment recommendations.
• MTBs should include an educational component in their responsibilities.
• MTBs should offer support in interpreting confirmed or putative germline genomic variants.
• MTBs should offer support in the optimal use of diagnostic tools.

1B. Patient selection for MTB discussion. MTBs should focus on cases in which interdisciplinary case discussions hold the highest potential for patients' benefit. In this regard, patient selection depends on the clinical, institutional and locational settings in which an MTB operates. To select patients that may potentially benefit from MTB discussions, the following criteria should be used:

(i) Potential for impact on treatment decisions. Cases should be chosen based on the potential impact that MTB recommendations can have on treatment decisions. These include settings in which genomic findings may influence the choice between different treatment options, contribute to the design of a personalised treatment strategy or facilitate patients' inclusion within clinical trials.

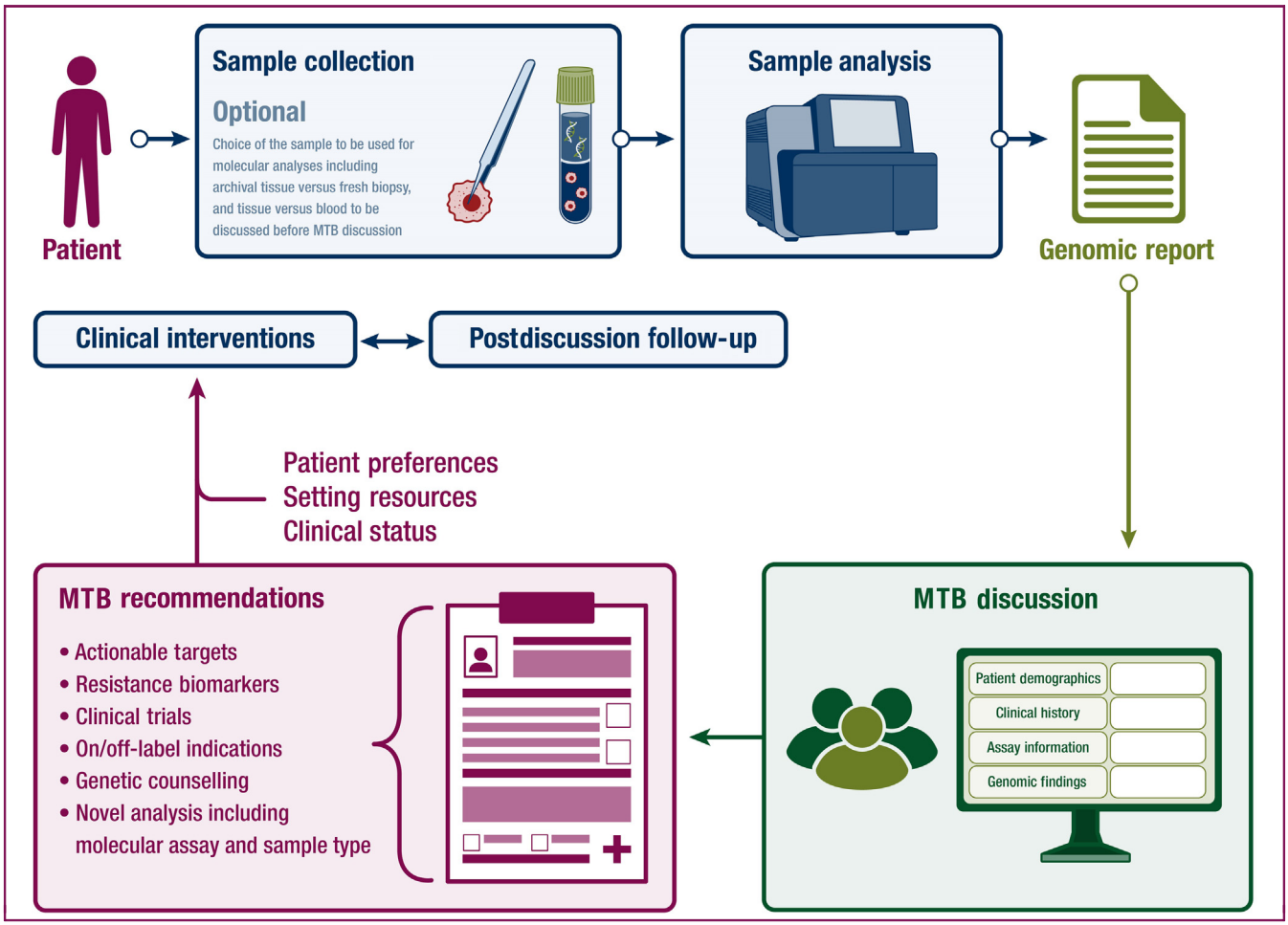

Figure 1. **Molecular tumour board (MTB) workflow.**

(ii) Complexity of genomic alterations and diagnostic challenges. Cases involving challenging genomic profiles are primary candidates for MTB discussions. These include cases exhibiting concurrent actionable genomic alterations in which MTBs may prioritise therapy selection, and cases showing putative biomarkers of resistance to standard or experimental therapy without a well-established clinical role. Moreover, MTB discussions should advise on unexpected genomic findings related to a specific tumour type or subtype that may yield novel diagnostic information. Lastly, cases with discordant testing results or exhibiting technical or analytical challenges should be presented to MTBs.

(iii) Cancers with limited treatment options and rare cancers. Patients with limited standard therapeutic options may particularly benefit from MTB discussion. In this light, ESMO recommends genomic profiling in all advanced rare cancers,[5,16] for which the subsequent MTB discussion could portend valuable clinical recommendations. Moreover, concentrating on these cohorts could help identify alternative and potentially innovative treatment options and facilitate patient inclusion in clinical trials.

(iv) Resource allocation. In resource-limited settings, such as high-volume community hospitals, MTBs should carefully select cases where the potential benefit to the patient aligns with the availability and affordability of diagnostic and therapeutic resources.

(v) Assessment of biomarkers with limited evidence for clinical actionability. In institutional settings where genomic profiling is standard-of-care and results are assessed routinely by the clinical care team, MTBs' discussion should prioritise cases in which molecular alterations are used to inform non-standard-of-care treatment options. This approach ensures that the expertise of the MTB is utilised effectively, and that MTB activity does not overlap or interfere with clinicians in the primary management of patients.

(vi) Cases of educational value. Cases in which a recent change in systemic standard-of-care, the identification of a new predicted biomarker of response to an older therapy or the adoption of a diagnostic platform results in the need for clinicians to change their

diagnostic workflow or interpretation should be considered for presentation as part of the education role of MTBs.

Recommendations

- MTBs should focus on cases in which discussions positively impact patient care through clarification of diagnostic findings, the prompting of additional diagnostic testing or the suggestion of investigational or off-label therapies.
- Cases with complex genomic profiles, unexpected genomic findings and putative biomarkers of resistance should be prioritised.
- Rare cancers and cancers with limited systemic treatment options undergoing genomic profiling should be addressed within MTBs.
- Depending on the institutional setting, MTBs may assist the primary care team to discuss all genomic profiling reports or conversely evaluate cases in which genomic profiling is used to identify non-standard-of-care treatments.

1C. Patient referral to MTBs. Referrals to MTBs should primarily come from the treating oncologist or interdisciplinary tumour boards. In addition, pathologists and genetic counsellors recognising unique or ambiguous genomic alterations during their analyses may also play a role in referring cases. In multidisciplinary health care settings, referrals can extend to other specialists involved in cancer care who identify potential candidates for genomic-based therapy decisions, ensuring comprehensive and inclusive case selection for MTB discussions. This expert panel recommends establishing clear institutional standard operating procedures (SOPs) defining a structured referral process with clear guidelines for submitting cases for MTB discussion.

Recommendations

- Any specialist involved in the clinical management of patients with cancer should be encouraged to refer cases satisfying the requisites for discussion to MTBs.
- Institutional SOPs should define a clear path to patients' referral.

1D. Inclusion of external patients to an MTB. MTBs should be available to discuss patients referred from external institutions. Besides offering case discussion and resulting clinical recommendations, such collaboration promotes educational feedback to the submitting physicians and the broader medical community. Furthermore, external referrals can offer patients a path to MGTOs in the setting of clinical trials at academic medical centres.

Besides external referrals, this expert panel recognises the possibility of establishing multi-institutional MTBs, which involve the discussion of patients at the regional or national levels to ensure standardisation and high-quality standards for discussing patients coming from minor institutions without the resources required to establish local MTBs.

Importantly, SOPs should be defined to establish a consistent structured process for case submission, including guidelines concerning the documentation required for a comprehensive patient evaluation. Moreover, robust data protection measures and secure virtual accessibility should be guaranteed to protect patients' privacy and to permit the attendance by referring physicians and support multi-institutional tumour boards.

Recommendations

- MTBs should optimally be available to discuss patients from external institutions.
- SOPs defining guidelines for clinical case submission including the requested clinical documentation should be established.
- The discussion of external patients should guarantee the protection of patients' privacy and the participation of submitting physicians.

1E. Informed consent in the setting of an MTB. Ideally, patients should be fully informed that their genomic profiling results will be discussed in the setting of an MTB and the potential implications resulting from the discussion. At the same time, case discussions should not rely on the provision of informed consent by patients, as the evaluation by MTBs should be considered as a standard path following genomic profiling for cases satisfying the requisites for discussion within an MTB.

In any case, informed consent is required in cases involving germline sequencing and to facilitate longitudinal follow-up. An informed consent should also be collected for the intent of using secondary data in the setting of clinical research.

Acknowledging institutional, regional and national legislative requirements, this expert panel recommends establishing firm SOPs regulating the process of patients' consent and its content in relation to clinical case discussion and secondary data use.

Recommendations

- In a clinical setting, patient-informed consent is generally not required before an MTB discussion, although this expert panel recognises the impact of local legal requirements.
- This expert panel considers informed consent mandatory when discussing germline sequencing results and recommends the structured collection of data for research purposes.

1F. DATA REQUIREMENTS FOR MTB DISCUSSION

An effective MTB discussion does not rely uniquely on genomic reports but rather depends on all-inclusive patient medical information and pathological reports. This expert panel acknowledges national, regional and institutional differences might subsist and recommends that MTBs establish SOPs defining the data required for case

discussions. Ideally, such SOPs could include a checklist to support systematic data collection.

Based on the comprehensiveness of data collection, this expert panel considers the following quality tiers:

Minimum level:

- Clinical data. Patient demographics including age, sex/gender, ethnicity, performance status, comorbidities, concomitant medications, family and personal oncological history; pathological tumour information (including the pathology report of the tissue subjected to genomic profiling) and previously tested clinically relevant biomarkers and NGS reports; list of previous local and systemic treatments and current disease status; and information on known cancer predisposition genes whenever available.
- Assays and genomic data as per ESMO recommendations for NGS reporting.

Recommended level:

- Additional clinical data. Timeframe of previous systemic therapies; detailed data from all previous pathological reports, including previously tested biomarkers and past genomic profiling reports including MTB recommendations, which might inform the biological trajectory of tumours and potentially influence treatment or diagnostic recommendations.

Optimal level:

- Additional clinical data. The best overall response to previous systemic treatments; tolerability and relevant adverse events from previous systemic treatments; patient social context and preferences.

Recommendations

- A comprehensive patient dataset is needed for an effective and valuable MTB discussion. This includes a structured NGS report as per ESMO recommendations and comprehensive clinical and pathology data.
- The comprehensiveness of clinical and genomic data should be adapted to local resources and expert availability and should be regulated by SOPs.

Section 2. Structure of an MTB

2A. Composition of an MTB. MTBs involve a multidisciplinary team of experts with different backgrounds to provide distinct perspectives and insights into the different aspects of the MTB discussion. The composition of an MTB depends on the level of expertise at the centre, the availability of resources and the specific needs of the patient population served. This expert panel recommends establishing institutional SOPs defining the composition of the MTB. This expert panel highlights the critical role of access to innovative care via clinical trials and a requisite bidirectional collaboration between the institutional clinical trials unit and the MTB.

In addition, this expert panel acknowledges the critical role of the primary oncological care team. Thus, the treating physician should optimally participate in the MTB discussion, as their involvement in discussions can greatly enhance the collaborative nature of patient care, especially in complex cases where multidisciplinary input is valuable, and could provide immediate feedback about the feasibility of MTB recommendations.

Considering resource allocation and institutional capabilities, a tier-based system can be defined as follows:

Minimum level:

- (Medical) oncologist with genomic expertise: provides clinical perspective and insights regarding the therapeutic implications of genomic findings. Oversees the evaluation of potential clinical trial participation based on trial availability and potential patient eligibility.
- Pathologist with dedicated molecular training: contributes to the integration of histopathological data with molecular findings and evaluates potential tumour-specific or pathological sample factors that may affect the accuracy of the diagnostic analyses under evaluation, for which additional molecular analyses may be required. Moreover, in settings in which resources enable a two-step MTB to have a preliminary evaluation of discussed cases, pathologists could evaluate the analytical validity of genomic profiling under evaluation (e.g. cellularity, purity and quality of the sample according to preanalytical parameters) before the MTB main discussion.
- Clinical geneticist: Assists in the evaluation of tumour-detected genomic variants for providing recommendations regarding genetic counselling and eventual germline testing. Moreover, aids in understanding hereditary factors and the implications of germline genomic variants.

Recommended level:

- In addition to the previous team members, include an MTB administrator/coordinator, a bioinformatician with expertise in NGS and cancer genomics and a clinical trial team that offers additional expert insights in the individual case discussions.

Optimal level:

- Surgical oncologist, radiation oncologist, radiologist, pharmacist, pharmacologist and data manager.

Recommendations

- A tier-based system is recommended to define the team composition, and adapting to the levels of expertise and resources available at different institutions.
- Minimum requirements involve the participation of medical oncologists, pathologists with training in molecular pathology and clinical geneticists.
- Independent of the core MTB personnel, close collaboration with the clinical trial unit is critical to ensure optimal patient care.

Section 3. Contents of the MTB report

3A. Structure of an MTB report. Following the MTB discussion, the latter should be synthesised in structured documentation, optimally in the form of a report. This report must inform the referring physician about factors underlining MTB recommendations and clearly outline the diagnostic, logistic and clinical consequences of the MTB discussion. Accordingly, a brief yet inclusive description of both clinical and genomic data should be optimally included in the MTB report. Acknowledging institutional procedures, the report should cover the following aspects (Figure 1):

(i) Assessment of the genomic profiling analysis that has been discussed. This step includes expert evaluation of preanalytical and analytical variables influencing the diagnostic and clinical pertinence of the genomic profiling under discussion. This includes but is not limited to the type and age of the sample used for genomic profiling and assay characteristics in relation to the clinical setting under evaluation.
(ii) Recommendation for additional genomic testing or pathology analyses. Comprises eventual recommendations by MTBs to repeat analyses, including the type of test and sample on which to perform the analysis.
(iii) Treatment recommendations (see Section 3B).
(iv) Recommendation for genetic counselling (see Section 3C).

Recommendations
• The MTB report should be a clear, concise document that describes the clinical relevance of the molecular data, considering the clinical data of each individual case.
• The MTB report should follow a structured format, integrating each activity taking place during the MTB discussion.
• This expert panel recommends establishing institutional SOPs regulating the content of MTB reports.

3B. Reporting treatment recommendations

Treatment recommendations in MTB reports should be clear, concise and informative to enable their understanding and implementation by the treating physician. Importantly, a grade of clinical actionability should be assigned to each MTB recommendation to inform their potential clinical relevance and to prioritise therapeutical options. Accordingly, standardised scales of clinical actionability should be used, including the ESMO Scale for Clinical Actionability of molecular Targets (ESCAT),[17] or comparable local or national scales which align with institutional protocols and consensus.[18]

Considering the type of information included, this expert panel recognises the following tier-based system for reporting treatment recommendations:

Minimum level: includes viable treatment options based on the molecular and clinical data, with treatment options prioritised according to the expected degree of clinical benefit.

Recommended benchmark: in addition to listing MGTOs, include the prospect of drug access (i.e. reimbursed options, clinical trials, off-label prescriptions), along with a list of clinical trials in which the patient could be potentially eligible based on the molecular and clinical profile, prioritised according to the local availability related to the region in which the patient discussed resides. Recommended reporting systems should also include recognised or putative biomarkers described to confer resistance to MGTOs.

Optimal benchmark: reflection of timing to implement MTB recommendation into the care plan (next line of treatment versus after exceeding standard therapeutic options). Moreover, incorporate patient-specific factors such as performance status, comorbidities and preferences that have influenced the recommendation. Optimal treatment recommendations should also outline the suggested follow-up for monitoring treatment response and managing potential side-effects.

Recommendations
• Treatment recommendations should list and prioritise viable treatments, supported by the corresponding level of evidence from actionability scales.
• Recommended level reporting should list options for drug access.
• Patient-specific factors such as performance status, comorbidities and preferences should be integrated into optimal recommendations. A defined follow-up plan for treatment monitoring is also preferable.

3C. Assessment of potential tumour-detected germline alterations and incidental findings

For patients receiving tumour-only genomic profiling, MTBs should assess potential germline alterations occurring in cancer-predisposition genes to inform the decision to perform germline follow-up testing. ESMO's POWG has established recommendations to help caregivers determine the need for follow-up germline analysis of tumour-detected genomic variants.[15,19] In this context, MTBs can further assist by strategically filtering such tumour-detected genomic variants or by identifying unnoticed gene alterations that require additional genetic assessment. As such, MTB reports should include the presence of potential germline variants in cancer-predisposition genes, including eventual recommendations for further genetic follow-up. In the setting of tumour-normal NGS and confirmed pathogenic germline variants, MTBs should report and facilitate the appropriate clinical follow-up to further increase the level of clinical efficacy of an MTB operation.

In addition to potential pathogenic germline variants in cancer genes, particularly for whole exome sequencing and whole genome sequencing-based tests, genomic profiling may reveal incidental findings consisting of genomic variants in genes associated with elevated risk for diseases other than cancer. In this setting, it is imperative to follow local legislation to obtain informed consent to report these

results. In cases in which patients consented to the reporting of incidental findings, appropriate follow-up by a clinical genetics service should be facilitated by the MTB.

Recommendations
• Clear protocols for informed consent, reporting of test results and counselling are crucial to ensure adequate patient care in the setting of potential germline variants and incidental findings. • Potential germline variants detected on tumour-only sequencing platforms should prompt evaluation for genetic counselling and germline testing as per ESMO POWG recommendations. • Incidental findings with clinical significance unrelated to cancer susceptibility should only be reported if prior patient consent has been provided.

3D. Factors determining the level of consensus in MTBs recommendations. The consensus for MTB recommendations is a critical process, integrating patient-specific factors, available evidence and accessibility to MGTOs. This expert panel considers the following principles essential to ensure the quality and reproducibility of treatment recommendations:

(i) Patient-centric approach. Recommendations must be tailored to individual patients and adapted to factors such as disease status, treatment history and resource availability.

(ii) Institutional standards for reproducibility. Institutional-specific standards should be implemented to ensure reproducibility in MTB activity and framework operations. SOPs should be defined within the institutional context to maintain the reliability and consistency of MTB recommendations.

(iii) Access to (targeted) treatment options. Consensus must consider variability in access to recommended therapies.

(iv) Adaptation to evolving evidence. MTBs must adapt their recommendations to the evolving preclinical and clinical knowledge to reflect the latest research and evidence.

(v) Societal-centric approach. In addition to a patient-centric focus, the MTBs consensus should be structured to ensure that local resources are effectively allocated toward clinically meaningful diagnostics and therapeutic interventions, thereby avoiding costs associated with low-value clinical recommendations.

Recommendations
• MTB recommendations should adapt to individual cases to portend clinically meaningful patient-centric interventions adapted to the evolving clinical evidence.

Section 4. Structured follow-up of patients discussed by MTBs

4A. Purpose of structured follow-up after MTB discussions. Monitoring patients following the MTB discussion represents an essential task in the MTB activity. However, this task goes beyond the primary clinical task of an MTB and potentially evolves into a dedicated precision oncology programme (see the 'Conclusions and outlook' section). This expert panel acknowledges the fundamental differences in the setup and conduct of global MTBs and, as such, the following recommendations need to be assessed in the light of the institutional settings in which an MTB operates.

(i) Monitoring of recommendations. Assessing the proportion of patients ultimately receiving a treatment recommendation enables MTBs to measure the quality and feasibility of treatment recommendations (see Section 5C). In addition, evaluating factors related to patients not receiving MTB recommendations, particularly in settings in which the recommended therapies are directly available, could promote measures aimed at increasing awareness of MTBs' activity and value.

(ii) Monitoring of outcomes. Establishing a systematic re-evaluation of clinical outcomes resulting from MTB recommendations informs and sustains a self-learning process, enabling MTBs to adjust their operating procedures and recommendations accordingly.

(iii) Patients' re-evaluation. Follow-up allows for the reassessment of genomic variants gaining therapeutic potential based on novel therapeutic approaches,[20] and enables eventual recommendations for novel genomic profiling to investigate the emergence of novel actionable alterations or resistance mechanisms to implemented MGTOs.

(iv) Research scope. Cohorts of well-annotated patients are of invaluable scientific interest within a precision oncology programme. Accordingly, the collection of genomic and clinical data should be prioritised (see Section 4C), provided informed consent from patients has been collected (see Section 1D).

Recommendations
• This expert panel acknowledges the critical role of a structured follow-up for patients discussed in MTBs. • This expert panel recommends implementing SOPs to ensure standardised follow-up activities yield high-quality real-world data.

4B. Recommended follow-up duration. Informed by local resources and the scope of the MTB, this expert panel recommends standardising follow-up durations after MTB discussions. For the scope of MTBs follow-up, this should include both patients receiving and not receiving treatment recommendations.

Minimum level: after issuing an MTB recommendation, follow-up data should be collected after 6 months to allow for monitoring the access to the recommended therapies, results of endorsed additional tests and preliminary efficacy of the MGTOs.

Recommended level: extended follow-up to 12-18 months for a comprehensive assessment of treatment outcomes.

Optimal level: aim for >24 months to gauge sustained treatment effectiveness, long-term side-effects and overall survival.

Recommendations
• Follow-up programmes should be adapted to local resources. • This expert panel recommends establishing a minimum of 6 months of follow-up after the MTB discussion.

4C. Principles of MTB follow-up. This expert panel recommends establishing principles for structuring MTB follow-up, focusing on:

(i) Robust data collection. Implement systems to capture key outcome metrics (treatment response, survival rates, adverse events and quality-of-life) prospectively and retrospectively and integrate these into the health care information technology infrastructure.

(ii) Regular outcome reviews. Conduct quarterly or biannual MTB sessions to review and analyse patient outcome data, assessing treatment efficacy and safety.

(iii) Feedback loop for workflow improvement. Utilise outcomes resulting from MTB recommendations for continuous MTB strategy refinement, including updating SOPs.

(iv) Data privacy and compliance. Ensure adherence to data protection and patient privacy regulations, with regular audits to maintain compliance.

(v) Collaboration and data sharing. Engage in data sharing with other MTBs, institutions or research bodies, respecting ethical standards and patient privacy (see Section 1D), to enhance standardisation, impact and educational processes.

Recommendations
• MTBs should establish data collection SOPs for longitudinal follow-up. • Outcome data should be periodically evaluated by MTBs to refine their activity and decision-making processes. • This expert panel acknowledges the value of collaboration and data sharing, provided informed consent has been collected from patients and strict data protection and patient privacy are guaranteed.

Section 5. Potential quality indicators to assess the performance of MTBs

Owing to the transition of MTBs (and precision oncology programmes) from the setting of translational research into clinical care, various countries have started the formalisation of MTBs and implemented certification of precision oncology programmes.[21-27] This expert panel acknowledges that institutional, regional, national and international circumstances critically impact the conduct and logistics of MTBs as well as their performance assessment. Accordingly, these potential quality indicators are suggestions and need to be adapted, implemented and evaluated according to local resources and requirements.

5A. Turnaround time for MTB discussions and recommendations. The turnaround time for MTB discussions critically depends on the frequency of MTB sessions. Weekly or biweekly MTB discussions can now be considered standard in the setting of dedicated precision oncology programmes. Ideally, after completion/submission of genomic profiling results, cases should be discussed within a 2-week period. In situations where feedback is critically needed, consultation mechanisms should be in place. After MTB discussion, final recommendations should be distributed to the referring physician in a week's time. This expert panel recommends closely monitoring referral practices and turnaround times as a patient-centric outcome parameter.

Recommendations
• MTBs should ensure timely case discussion. • After MTB discussions, recommendations should be issued within a week. • Consultation mechanisms should be in place to allow for immediate feedback in cases of clinical need.

5B. Proportion of patients discussed in the MTB. Within institutions and particularly in the setting of dedicated precision oncology programmes, MTBs should be optimally integrated into the management of patients with cancer to further increase the clinical value derived from implementing genomic-driven clinical interventions. Optimally, every patient satisfying requisites for MTB discussion should be evaluated accordingly (Section 1B). Regardless, a minimum proportion of patients undergoing genomic profiling should be evaluated by MTBs. This ensures optimal integration of MTBs into routine patient care, provides a continuous educational process for both MTB members and external attendees and helps identify eligible cases for MTB discussion that may have been mistakenly overlooked. However, especially in large referral centres, the caseload and the resulting number of potential MTB candidates can quickly reach a level at which demand exceeds available resources, and in such settings, further patient selection may be required. Again, reflecting on the heterogeneous nature of international MTBs and precision oncology

programmes, this expert panel suggests the implementation of local metrics to monitor MTBs' caseload and activity.

Recommendations
• To ensure building and maintaining institutional expertise, MTBs should discuss an adequate number of yearly cases satisfying the (local) requisites for MTBs discussion.

5C. Quality assessment of treatment recommendation. Based on historical data, the proportion of cases receiving a treatment recommendation by MTBs greatly varies, ranging from 20% to 90%.[14] Previous studies demonstrated that ~30% of patients achieve a significant degree of clinical benefits from molecular-matched treatment recommendations,[13,28-30] which holds particularly true for recommendations supported by a higher degree of clinical evidence.[13,30-34] Accordingly, MTB treatment recommendations should carefully assess the potential degree of clinical benefits, which would consider patients' clinical status, availability of standard treatment options, trajectory of the disease and potential access to proposed drugs, which should be supported by recognised scales of clinical actionability.

Recommendations
• MTBs should critically evaluate the quality of MTB recommendations, avoiding low-value treatment endorsements by prioritising MGTOs with the highest supporting degree of potential clinical benefits.

5D. Proportion of patients receiving a recommendation for clinical trial screening. Including patients in clinical trials is challenging and depends on patient-specific, institutional, regional and national circumstances. At the same time, inclusion in a clinical trial might not always be the optimal outcome of an MTB discussion. However, as outlined above, integration of the MTB into an institutional clinical trial concept is critical for sustainability in the setting of limited health care resources. Accordingly, this expert panel recommends monitoring both recommendations for clinical trial screening and inclusion into a clinical trial as an outcome following MTB discussions. These assessments can support the strategic development of the clinical trial portfolio and expand access to innovative care.

Recommendations
• This expert panel recommends collecting data on recommendations for clinical trial screening and ultimately inclusion into clinical trials.

5E. Proportion of patients receiving MTB treatment recommendations. The proportion of patients ultimately treated with MGTOs following MTB endorsements depends on several factors, including availability of clinical trials and reimbursement programmes, patients' conditions and local regulatory factors among others, with a significant variability reported to range from 20% to 70% in the literature.[13,35-40] In this setting, treatment recommendations, besides considering the patient's clinical and genomic factors, should adapt to the availability of recommended drugs. This approach ensures that MTB recommendations are practical, feasible and align with patient expectations. Consequently, the following benchmarks can be defined.

Minimum benchmark. At least 10% of patients for which MTBs endorsed a treatment recommendation receive an MTB-guided therapy.

Recommended benchmark. At least 25% of patients receiving an MTB-guided therapy.

Optimal benchmark. At least 33% of patients receiving an MTB-guided therapy.

Recommendations
• The proportion of patients ultimately receiving MTB-guided treatments represents a measure of the feasibility of MTBs treatment recommendations.

CONCLUSIONS AND OUTLOOK

MTBs carry a critical role to expedite the integration of precision oncology into routine care for patients with cancer. To support this and based on international expert feedback, this expert panel on behalf of the ESMO's POWG developed principles and potential quality benchmarks for the structure of MTBs. These recommendations can serve as a roadmap for implementing effective and well-functioning MTBs in daily practice. However, it is critical to recognise the heterogeneity in the philosophy around, the logistics involved and tasks attributed to global MTBs. Accordingly, our recommendations should be seen in the light of institutional requirements, resources available and the surrounding health care system.

Finally, MTBs are increasingly recognised as integral components of dedicated precision oncology programmes, extending beyond case discussions to encompass a broad spectrum of functions. These include, but are not limited to, ensuring comprehensive patient care, supporting clinical trial access, harmonising biomarker-driven treatment strategies, facilitating data standardisation and integration and contributing to real-world evidence generation in dedicated registries. In addition, MTBs play a pivotal role in peer-to-peer education, interdisciplinary collaboration and the continuous refinement of precision oncology workflows through structured follow-up and outcome monitoring.

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During the preparation of this work the author(s) used OpenAI ChatGPT to improve readability. After using this tool/service, the author(s) reviewed and edited the content

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