Essential Features of an Interstitial Lung Disease Multidisciplinary Meeting: An International Delphi Survey

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Abstract

Rationale: The interstitial lung disease (ILD) multidisciplinary meetings (MDM) composing of pulmonologists, radiologists and pathologists, is integral to the rendering of an accurate ILD diagnosis. However, there is significant heterogeneity in the conduct of ILD MDMs and questions regarding its best practice remain unanswered.

Objective: To achieve consensus among ILD experts on essential components of an ILD MDM.

Methods: Using a Delphi methodology, semi structured interviews with ILD experts were used to identify key themes and features of ILD MDMs. These items informed two subsequent rounds of online questionnaires that were used to achieve consensus among a broader, international panel of ILD experts. Experts were asked to rate their level of agreement on a five-point Likert scale. An *a priori* threshold for consensus was set at a median score 4 or 5 with an interquartile range of 0.

Results: We interviewed 15 ILD experts and 102 ILD experts participated in the online questionnaires. Five items and two exploratory statements achieved consensus on being essential for an ILD MDM following two questionnaire rounds. There was consensus that the presence of at least one radiologist, a quiet setting with a visual projection system, a high-quality chest high resolution computed tomography and a standardized template summarising collated patient data are essential components of an ILD MDM. Experts also agreed that it would be useful for ILD MDMs to undergo an annual benchmarking process and a validation process by fulfilling a minimum number of cases annually. Twenty-seven additional features were considered to be either highly desirable or desirable features based on the degree of consensus. Although our findings on desirable features are similar to the current literature, several of these remain controversial and warrant further research.

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The study also showed an agreement among participants on several future concepts to improve the ILD MDM such as performing regular self-assessments and conducting research into shared practices to develop an international expert guideline statement on ILD MDMs.

Conclusion: This Delphi study showed consensus among international ILD experts on essential and desirable features of an ILD MDM. Our data represents an important step toward potential collaborative research into future standardisation of ILD MDMs.

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Interstitial lung disease (ILD) is a heterogeneous group of disorders that cause varying degrees of lung parenchymal inflammation and fibrosis. While there is an array of specific ILD diagnoses, the clinical presentations of ILD are protean and the precise recognition of specific ILD groups remains difficult (1). Over the last two decades, there have been increasing efforts to improve the accuracy of the diagnostic pathway for these diseases. In 2002, the American Thoracic Society (ATS) and European Respiratory Society (ERS) released a joint statement on the classification of idiopathic interstitial pneumonia (IIP) (2) recommending the use of a multidisciplinary meeting (MDM) that included a respiratory clinician, a radiologist and a histopathologist at its core. These recommendations have been echoed in several subsequent guidelines and position statements (3-5).

The ILD MDM allows for integration of available clinical, radiological and pathological data with the aim of rendering an accurate ILD diagnosis. Flaherty et al. reported significantly increased interobserver diagnostic agreement and confidence when relevant clinical, radiological and pathological data were dynamically exchanged in an MDM setting (6). This approach has also been validated in several other studies (7-9). Furthermore, the diagnostic performances of physicians regularly attending ILD MDMs, irrespective of experience level, were greater than those without access to these meetings (10), suggesting an educational benefit of ILD MDMs. While these findings demonstrate the integral role of ILD MDMs as the 'gold standard' role for ILD diagnosis, many questions regarding the best practice for ILD MDMs remain unanswered (10). Although current international guidelines are able to recommend the basic membership of an ILD MDM, little beyond that is known (11). The member composition, level of expertise required, the amount of patient data required and whether all ILD cases should be discussed at the MDM, are just few of the many ambiguities left unanswered. Several studies have described significant heterogeneity

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in the manner in which ILD MDMs are conducted, making it difficult to recommend a 'minimum standard'(12, 13). Given these inconsistencies, an international standardised approach or guide for conducting ILD MDMs is required, to ensure high quality discussions on the diagnosis and management of ILD.

We conducted a Delphi survey among international ILD clinicians to explore the necessary components of the ILD MDM. The aim of the study was to achieve consensus among ILD clinicians regarding the key components of an ideal ILD MDM. The Delphi model is a well described approach frequently used to establish consensus among various health professionals on topics where an established evidence base does not exist (14, 15). This approach provides participant anonymity, ensuring that each individual input carries equal weight.

Methods

To inform development of the Delphi survey, recognized experts in the field of ILD were invited by e-mail to participate in individual interviews to identify potential key features of ILD MDMs. These experts were identified from the professional contacts of T.J., J.M. and S.W. Invited experts also had contributed in the field of ILD either by research publications, participation in thoracic societies research working groups or clinical contribution to the care of ILD patients in their respective centres of practice. We aimed to have a wide geographical representation (North America; C.R., D.L., H.C., M.S., South America; J.E., M.M., Europe; J.B., K.A., T.M., V.C., Asia; Y.K., Y.I., Australia and New Zealand; D.C., N.G., M.W.) to ensure diversity of each participant's local ILD MDM experience. The interviews were conducted either in person or over the telephone in a semi structured format. A.T.

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conducted all interviews which were guided by a list of open-ended questions (Table 1). The interviews were digitally-recorded and transcribed verbatim. Two reviewers analysed the transcripts independently. The transcripts were analysed using a qualitative approach to content analysis, allowing for common themes to be extracted and be used to identify key items or features of an ILD MDM (16). These items were used to form a list of statements for the first round of the modified Delphi survey. These statements were organised into major domains, reflecting a variety of aspects involved in the efficient running of an ILD MDM. We invited a broader international panel of ILD experts with a range of clinical and research experience in the field of ILD to participate in the Delphi surveys. Participants were identified to be attending an ILD MDM on at least a monthly basis, having previously consented to further research involvement from a previous study (10). ILD experts who participated in the semi-structured interviews were excluded from subsequent survey rounds. The ILD experts were invited by e-mail to participate in each round of the Delphi survey.

We conducted a two-round web-based survey between July 2019 and February 2020 in accordance with defined standards of the Delphi methodology (17). The surveys were published in English on a secure online survey platform (Qualtrics, LLC). An online platform was chosen for the ease of disseminating surveys to an international group of participants and allowing responses to be collected within a short period of time. Consent to the study was implied if the participants completed the questionnaires. Participants completed a short baseline demographic section regarding their medical practice and experience prior to the surveys. In the first round, participants were asked to rate their level of agreement on a list of statements detailing key features of an ILD MDM using a five-point Likert scale. Each item was scored as 1 (strongly disagree), 2 (disagree), 3 (neutral), 4 (agree) and 5 (strongly

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agree). Experts were allowed to provide feedback following each statement and could add statements they considered relevant if they were not included in the original list. An *a priori* threshold of consensus was defined for the study as a median score of 4 or 5 with an interquartile range (IQR) of 0 for an essential feature of an ILD MDM. An interquartile range of 0 ensures that the distribution of responses truly reflects agreement and excludes a bimodal distribution where a smaller but important proportion of respondents may disagree. A median score of 4 or 5 with an IQR of 1 was considered to be desirable features. Other statements that did not meet these criteria were considered as 'disagreement'. In round 2, participants were given the distribution of group answers for statements that did not reach consensus. Participant comments and feedback for each statement were also provided. Participants were then asked to once again rate their level of agreement on a five-point Likert scale for statements that did not reach consensus and any additional statements identified in round 1.

We reported the results of this study according to the proposed methodological standards for Delphi studies (17). Participant responses remained anonymous during result analysis. STATA v15.1 (StataCorp, College Station, TX, USA) was used for all statistical analyses. The study was approved by the human research ethics committee of Royal Prince Alfred Hospital, Sydney (Protocol No X18-0354 & LNR/18/RPAH/497).

Results

Expert Qualitative Interviews

15 of 17 (88%) invited ILD experts agreed to participate in the semi-structured individual interviews. All experts were based in ILD referral centres across 9 countries with 13/15

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(87%) being involved in weekly ILD MDMs. Common themes were identified from the interview transcripts and informed development of the Delphi surveys (Table S1). These were subsequently organised into five major domains, namely 'MDM team structure', 'MDM infrastructure', 'MDM organization and administration' and 'MDM clinical decision-making process' and 'Future concept and directions'.

Delphi Survey Results

A total of 134 ILD experts were invited by e-mail to participate in the Delphi survey, of which 102 (76%) from 29 countries completed the first Delphi round. Subsequently, 94 out of 102 (92%) responded in the second round. 91% of the experts actively participated in an MDM at an ILD referral centre and 97% reported that their MDMs were attached to a university or academic hospital. Their characteristics are presented in Table 2.

First Round

Out of the 50 statements that were included in the first Delphi round, consensus was reached for a total of five statements (median 4 or 5 and IQR 0) (Table 3). Experts agreed that the presence of at least one radiologist is essential for an ILD MDM to function. Experts also agreed that it is essential that the ILD MDM has access to a visual projection system allowing real time viewing of radiological images and that a, high quality chest high resolution computed tomography (HRCT) is required for the discussion of cases. The two remaining statements that met consensus were considered to be explorative statements rather than current features of ILD MDMs (Table 6). 36 statements met the threshold for being desirable features of an ILD MDM (median 4 or 5 and IQR 1) while 9 statements that did not meet either thresholds were labelled as 'disagreement'.

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Second Round

Out of the 45 statements that did not reach consensus in the first Delphi round, 39 were taken forward into round 2 without alterations. Five statements were rephrased to improve clarity based on study participants' feedback while one statement was divided into two questions to enable a more accurate rating. Participants' feedback in round 1 generated four additional statements. The final list for round 2 contained 50 statements.

Two further statements achieved the a priori threshold for consensus in the second round (Table 3). Experts agreed that it was essential for an ILD MDM to be conducted in a quiet setting, allowing for easy interaction amongst its members. There was also consensus that it was essential for the ILD MDM to summarise collated patient data and information onto a standardised template. A total of 27 statements met the a priori threshold for being desirable features of an ILD MDM with a median score of either 4 or 5 and an IQR of 1. These statements were further subcategorized based on the level of agreement amongst experts. 10 statements with a median score of 5 were considered 'highly desirable' features of an ILD MDM (Table 4) while 13 statements with a median score of 4 were listed as 'desirable' features (Table 5). Similar to round 1, the remaining four statements describing future concepts of ILD MDMs were listed separately.

Concepts and Future Direction

A total of six statements from both Delphi rounds fulfilled criteria for either being essential or desirable, were conceptual and explored possible methods of improving the quality of ILD MDMs (Table 6). There was consensus among the experts that MDMs undergoing an annual benchmarking process once an international minimum standard has been established would be a useful approach to improve ILD MDMs. Experts also agreed that ILD MDMs should

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undergo a validation process by fulfilling a minimum number of case discussions annually. Experts felt that it would be highly desirable for ILD MDMs to occur on a regular basis to maintain its members' expertise, to perform self-assessments using an internationally-collated case database, and for further research to be conducted into shared practices among ILD MDM to develop an internationally-agreed minimum standard. Lastly, experts agreed that the development of an international expert statement or guideline would be useful to provide guidance on running an optimal ILD MDM.

Discussion

In this study, we conducted semi-structured interviews with a panel of ILD experts and identified items representing various aspects of an ideal ILD MDM, ranging from its member composition to the clinical decision-making process involved. Following a Delphi process involving an international panel of ILD experts, we identified seven items that achieved consensus as essential features of an ILD MDM. We also further identified a total of 27 items which experts considered to be desirable features that could be incorporated into an ILD MDM, so allowing a standard set of criteria for an ideal ILD MDM to be constructed for standardisation purposes.

The strong agreement among experts on the presence of at least one radiologist at an ILD MDM is in accordance with multiple iterations of international guidelines supporting radiologists as core members. Unsurprisingly, experts also strongly agreed that a high-quality HRCT was essential for all cases being discussed at the ILD MDM. This finding attests to the impact of having radiological data in rendering a consensus ILD diagnosis, with a previous study demonstrating that incorporation of HRCT data led to a change in >50% of

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clinician's first-choice diagnoses and an improvement in diagnostic confidence (18). The technical requirements of an HRCT for the diagnosis of ILD have also been described by the Fleischner Society (19). The importance placed by experts on having a visual projection system for real-time review of HRCT images is also paramount, where the ability for radiologists to convey specific information of an image and the educational benefit obtained from other clinicians have been described in other medical MDMs (20). Similarly, the strong agreement on having the ILD MDM in a quiet setting, likely stems from experts' recognition of the negative impacts of background noise on member interactions and discussions during an MDM (21). Although not specific to ILD MDMs, these have yet to be mandated in official guidelines or statements. Experts agreed on the importance of using a standardised template to be used to collate patient data for an ILD MDM. The Thoracic Society of Australia and New Zealand (TSANZ) recently published a position statement advocating for a standardised format for data presentation, an approach which unfortunately remains variable (5).

Somewhat surprisingly, there was expert agreement on the merit of ILD MDMs undergoing a validation process by fulfilling a minimum number of case discussions annually and to undergo a benchmarking process against an international minimum standard. In the absence of a standardised validation process, an argument can be made that the expertise of an ILD MDM will increase over time with increasing numbers of case discussions. However, participant feedback from the survey highlighted concerns that validation of an ILD MDM merely by annual case numbers could deter smaller and newer ILD MDMs. Furthermore, case quantity as a sole criterion to validate ILD MDMs is surely inadequate. The ability of an ILD MDM to improve diagnostic agreement stems from a linked evidence approach, by which its efficacy is defined by its ability to change a clinical diagnosis and

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subsequent management, rather than direct evidence of its impact on patient health outcomes (22). However, Walsh et al. previously showed poor agreement between expert MDMs for hypersensitivity pneumonitis and nonspecific interstitial pneumonia (8). Quality assurance approaches such as using peer observers to review the quality of MDMs have been explored in the field of oncology, and could be explored in ILD MDMs (23, 24). However, the diagnostic accuracy of ILD MDMs has never been validated and consequently, the best approach to benchmark an ILD MDM remains elusive. Nonetheless, the consensus among participants in our study highlights the strong international collective desire for the development of a validated minimum standard of an ILD MDM and a framework for a benchmarking process of ILD MDMs.

The degree of agreement seen with several highly desirable statements warrants further discussion. In our study, the presence of a pathologist at an ILD MDM was considered to be a highly desirable feature, while current guidelines recommend them as core ILD MDM members. A possible explanation is that experts viewed that clinicians and radiologists are more well-placed to contribute in discussions of a greater case spectrum in the ILD MDM, while pathologists contributed only in cases with available histopathological data. However, when the statement was rephrased in round 2 to address this, the degree of agreement did not change. A more likely explanation is the potential challenges encountered in smaller MDMs or geographically remote centres, where access to pathologists may be limited. Certainly, our findings should not imply a lack of importance of the crucial role of an expert ILD pathologist in the discussion of an ILD patient where which histopathology is available. Experts also agreed that it would be highly desirable to have at least one member with five years of ILD-focused experience attending the MDM. The proposed threshold of five years was derived from the expert interviews and has not been

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studied. Furthermore, the exact definition of experience and which ideal member requiring the additional experience have not been established.

Additionally, the finding that it was highly desirable for ILD MDM to deliver management recommendations is somewhat controversial. The role of MDMs in the management of oncological patients is clear where the diagnosis has already been established and evidence-based treatment options are available. In contrast, ILD MDMs have historically focused on disease characterisation and diagnosis formulation (25). Major recent advances in therapeutic options may account for the expanded role of the ILD MDM, where clinicians may need more guidance in managing their patients. However, treatment often depends on individual patient factors such as frailty, comorbidities and personal wishes, many of which cannot be addressed by an MDM panel who have not met the patient. However, our findings do suggest that there is a broad desire for cooperative assistance and advice in the development of therapeutic management plans for the complex ILD patient – albeit if the potential role of the ILD MDM in this is yet to be established.

Experts also agreed that it was desirable for ILD MDMs to adhere to available standardized ILD clinical practice guidelines. These guidelines provide a framework that clinicians can use to evaluate patients presenting with ILD. However, it is important to recognise that the fundamental hallmark of the ILD MDM is the integration of multidisciplinary data to render a diagnosis, one that is particularly important in ILD cases that do not fit into clinical practice guidelines. Surprisingly, there was also agreement among experts that research terminologies such as idiopathic pneumonia with autoimmune features (IPAF), could be used as consensus diagnoses. IPAF was proposed as a standardized research term to define patients with overlapping features that do not fit established

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diagnostic criteria for a connective tissue disease-associated ILD (26). Our findings suggest that there is an international recognition of this IPAF cohort in clinical practice, and that clinicians are keen to use the term in their clinical practice. However, it remains uncertain whether IPAF does indeed represent a separate clinical entity, with implications on prognosis and management remaining unknown.

Nonetheless, the majority of desirable features are already present at ILD MDMs in varying degrees with similar findings reported in a recent systematic review on ILD MDMs (27). Despite the agreement seen in our study, standardisation and incorporation of these features are very often constrained by geographical distances and local resource availability. This can potentially account for the small number of statements reaching consensus in our study. However, this could also reflect the collective notion among study participants that only a small number of features are truly essential to run a high-quality ILD MDM without hindering the applicability of these features to smaller and newer ILD MDMs. The burgeoning number and frequency of MDMs are likely to increase workloads of radiologists and pathologists involved, potentially impacting negatively on the MDMs ability to function effectively (28). The recent COVID-19 pandemic has resulted in the rapid uptake of videoconferencing technologies in ILD MDMs (29). Our study findings on essential and desirable features are likely to remain relevant in such hybrid or virtual MDMs. Despite these recent advances in data sharing and videoconferencing technologies providing viable platforms for MDMs, the ideal format remains unknown and further research is needed to evaluate the benefits of virtual discussions (30, 31). Research into shared ILD MDM practices, collaborative data sharing and self-assessments are suggested approaches that warrant further consideration. The United Kingdom's National Health Service is one example where an established programme of national clinical audits informed a range of

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policy changes leading to improved patient health outcomes (32). However, successful audits require robust evidence-based guidelines, clinical leadership and buy-in by professional bodies and stakeholders. Perhaps, an initial approach is to explore the practicalities of performing self-assessments at an individual and local level, where resources may be more readily available.

Our study has several limitations. Participants recruited were predominantly pulmonologists (93%) with the remainder from other medical specialties (radiology, academic research, immunology, rheumatology). Of note, no pathologists were recruited onto the study, and their absence as a recommended core member of an ILD MDM could potentially bias our results. Furthermore, we did not have demographic data from participants who did not respond to the invitation, hence will not be able to determine if potential bias was solely from the recruitment strategy or from a lack of response from other specialties. A majority of participants were from ILD referral centres and expert MDMs attached to academic hospitals. Hence, our study was unable to capture sentiments or opinions of clinicians participating in smaller or newer MDMs. However, we sought to establish consensus in an area with limited evidence and we believe that our participant cohort enabled us to achieve this aim. We used a rigorous definition of consensus, which resulted in a small number of essential features and a larger number of desirable features. A more lenient definition of consensus would have resulted in more features classified as ‘essential, however this could deter establishment of MDMs in less resource-rich settings. Some potentially important aspects of an MDM were not included in the Delphi, such as the number of participants, level of expertise required, frequency of meetings and number of case discussions per meeting. However, the experts did not identify these issues for inclusion in round 2. Lastly, opinions captured in a Delphi process are not equivalent to

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evidence-based facts. Expert opinions from the Delphi process should be subjected to further studies to validate any proposed future ILD MDM models, ideally by demonstrating impact on patient outcomes.

Conclusion

In conclusion, using a Delphi model surveying an international panel of ILD experts, our study was able to identify the essential and desirable features of an ILD MDM. Our study is an important step towards standardisation of ILD MDMs. Our data may guide future collaborative research into development of international guideline recommendations for ILD MDMs, based on high-quality evidence.

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Table 1. Questions for initial expert interview guide.

	Questions
1	Could you describe your experience in the field of ILD and your involvement in ILD MDM(s)?
2	What do you think the role of the ILD MDM is?
3	Who do you think should be involved in the ILD MDM?
4	What do you think are the key elements in an ILD MDM?
5	How much preparation goes into the ILD MDM?
6	How do you come to a consensus for each case discussed at the MDM?
7	What do you think are challenges that ILD MDM commonly face?
8	How do you think an ILD MDM could improve itself?

ILD: interstitial lung disease; MDM: multidisciplinary meeting

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Table 2. Expert characteristics.

Characteristics	Delphi survey	
Female gender, n/total (%)	39/102 (38%)	
Specialty, n (%)	Pulmonologist	95 (93%)
	Radiologist	2 (2%)
	Research/academic	2 (2%)
	Other	3 (3%)
Years of experience, n (%)	<5 years	9 (8.8%)
	5-10 years	27 (26.5%)
	11-15 years	25 (24.5%)
	16-20 years	16 (15.7%)
	20-30 years	19 (18.6%)
	>30 years	6 (5.9%)
Referral centre MDM, n/total (%)	93/102 (91%)	
MDM attached to university/academic hospital, n/total (%)	99/102 (97%)	
Frequency of MDM, n (%)	More than once/weekly	8 (7.8%)
	Weekly	55 (53.9%)
	Fortnightly	26 (25.5%)
	Monthly	10 (9.8%)
	Other	3 (3.0%)
Duration of MDM, n (%)	30 minutes	6 (5.9%)
	31-60 minutes	48 (47.0%)
	61-90 minutes	30 (29.4%)
	90-120 minutes	16 (15.7%)
	>120 minutes	2 (2.0%)
Number of cases discussed per meeting, n (%)	1-5 cases	38 (37.3%)
	6-10 cases	19 (18.6%)
	11-15 cases	4 (3.9%)
	15-20 cases	39 (38.2%)
	>20 cases	2 (2.0%)

MDM: multidisciplinary meeting

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Table 3. Statements meeting consensus for essential features of an ILD MDM (Median 4/5; IQR 0).

Consensus – Essential items
It is essential to have at least one radiologist present at an ILD MDM.
It is essential for the ILD MDM to have access to a visual projection system allowing real time viewing of CT scan images.
A good quality high resolution CT scan is required for every case being discussed at the ILD MDM.
It is essential for the ILD MDM to be conducted in a quiet setting which allows for easy interaction amongst members. *
It is essential for the ILD MDM to summarize collated patient information onto a standardized template. *

CT: computed tomography; ILD: interstitial lung disease; MDM: multidisciplinary meeting
* Statements that met consensus after 2nd Delphi round.

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Table 4. Items meeting criteria for highly desirable features of an ILD MDM (Median 5; IQR 1).

Highly desirable items
More than one pulmonologist present at an ILD MDM.
At least one pathologist present at an ILD MDM when there are histopathological data available.
At least one member of the ILD MDM has at least five years ILD-focused experience/training.
ILD MDM to serve as an education platform for specialist trainees and fellows.
Pathologists should review biopsy specimens prior to the ILD MDM.
Clinical history, a high-resolution CT scan and autoimmune serology should be available as a minimum dataset before a case can be presented at the ILD MDM.
Pulmonary function testing comprising of at least spirometry and DLCO is required for every case being discussed at the ILD MDM.
ILD MDM should report a consensus diagnosis.
ILD MDM should discuss initial treatment and management recommendations.
An ILD MDM diagnosis should be a provisional diagnosis that may require a re-presentation at an MDM at a later date when new information is available.

ILD MDM: interstitial lung disease multidisciplinary meeting; CT: computed tomography; DLCO; diffusing capacity for carbon monoxide

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Table 5. Items meeting criteria for desirable features of an ILD MDM (Median 4; IQR 1).

Desirable items
Having more than one member from each discipline attending the ILD MDM to generate a more dynamic discussion.
ILD MDM should have a chair to moderate and guide its discussions.
The ILD MDM should allow the attendance of external physicians, either in person or via video-conferencing to present their cases.
The ILD MDM should be a stand-alone meeting dedicated to the discussion of ILD cases only.
A meeting coordinator should be present to collate essential information required for every case prior to the meeting.
Histopathology images are required for cases that are being discussed at the ILD MDM in which lung biopsies have been performed.
There should be processes in place for communicating MDM outputs to relevant stakeholders (i.e. referring physicians, other clinical service providers).
The ILD MDM should report on the degree of confidence of the diagnosis.
The ILD MDM should report a list of differential diagnoses if a confident diagnosis was not achieved.
The ILD MDM should adhere to current and available standardized diagnostic guidelines.
The ILD MDM should have a documented strategy on prioritizing urgent cases for the meeting. †
Research terminologies (e.g. IPAF) can be used as consensus final or provisional diagnoses. †
The ILD MDM should review its policies and protocols at least annually. †

ILD MDM: interstitial lung disease multidisciplinary meeting; IPAF: idiopathic pneumonia with autoimmune features

† Items with interquartile range of 3-4.

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Table 6. Future concepts that met criteria for either being essential or desirable features to be incorporated into ILD MDMs.

Future concepts and direction	Median (IQR) score
It would be useful for every MDM to undergo an annual benchmarking process once an international minimum standard has been established.	4 (0)
It would be useful for every ILD MDM to undergo a validation process by fulfilling a minimum number of case discussions annually.	4 (0)
It would be useful for every ILD MDM to occur on a regular basis to maintain its expertise. §	5 (1)
It would be beneficial to conduct further research into shared practices in ILD MDM to develop an internationally-agreed minimum standard. ‡	4 (1)
It would be useful for every ILD MDM to regularly perform a self-assessment using an internationally-collated database of cases. ‡	4 (1)
It would be useful for an international expert statement/guideline to be developed to provide guidance on running an optimal ILD MDM. ‡	4 (1)

ILD MDM: interstitial lung disease multidisciplinary meeting
‡ Items identified following round 2.

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Online Data Supplement

Essential Features of an Interstitial Lung Disease Multidisciplinary Meeting: An International Delphi Survey

Alan K. Y. Teoh, MBBS FRACP, Anne E. Holland, PhD, FThorSoc, Julie Morisset, MD, Kevin R. Flaherty, Athol U. Wells, Simon L. F. Walsh, MD MRCP FFRRCSI, Ian Glaspole, Wim A Wuyts, Tamera J Corte, MBBS FRACP PhD and the ILD MDM Delphi Collaborators.

Table S1. Online Delphi questionnaire. ILD MDM: interstitial lung disease multidisciplinary meeting; CT: computed tomography; DLCO: diffusing capacity for carbon monoxide; IPAF: idiopathic pneumonia with autoimmune features

* Statement rephrased in round 2 from; 'It is essential to have at least one pathologist present at an ILD MDM.'

† Statement rephrased in round 2 from; 'It is essential to have a rheumatologist present at an ILD MDM.'

‡ Statement rephrased in round 2 from: 'It is essential that at least one member of the ILD MDM has ILD subspecialty training.'

§ It is essential for the ILD MDM to allow the attendance of external physicians, either in person or via video-conferencing.

|| Statement divided into two statements in round 2 from: 'A CT scan with expiratory and prone views is required for every case being discussed at the ILD MDM.'

¶ Statement rephrased in round 2 from: 'A full pulmonary function test is required for every case being discussed at the ILD MDM.'

** Additional statements incorporated in round 2.

Team structure
It is essential to have more than one pulmonologist present at an ILD MDM.
It is essential to have at least one radiologist present at an ILD MDM.
It is essential to have at least one pathologist present at an ILD MDM when there are histopathological data available. *
It is essential to have a rheumatologist or immunologist present at an ILD MDM. †
Having more than one member from each discipline attending the ILD MDM will generate a more dynamic discussion.
It is essential that at least one member of the ILD MDM has at least five years ILD-focused experience/training. ‡
It is essential to maintain an attendance list at the ILD MDM.
It is essential for the ILD MDM to have a chair to moderate and guide its discussions.
It is essential for the ILD MDM to allow the attendance of external physicians, either in person or via video-conferencing to present their cases. §
It is essential for the ILD MDM to serve as an education platform for specialist trainees and fellows.
Infrastructure

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It is essential for the ILD MDM to be a stand-alone meeting dedicated to the discussion of ILD cases only.
It is essential for the ILD MDM to be conducted in a quiet setting which allows for easy interaction amongst members.
It is essential for the ILD MDM to have access to a visual projection system allowing real time viewing of CT scan images.
It is essential for the ILD MDM to have access to a visual projection system or a multi-view microscope, allowing real time viewing of histopathological images.
It is essential for the ILD MDM to have access to videoconferencing equipment to allow remote access for offsite participants.

Organization and administration

It is essential for the ILD MDM to have a documented strategy on prioritising urgent cases for the meeting.
It is essential for the ILD MDM to have a meeting coordinator to collate essential information required for every case prior to the meeting.
It is essential for the radiologists to review the CT scans prior to the ILD MDM.
It is essential for the pathologists to review biopsy specimens prior to the ILD MDM.
It is essential for the clinical history, a high resolution CT scan and autoimmune serology to be available as a minimum dataset before a case can be presented at the ILD MDM.
It is essential for the ILD MDM to summarize collated patient information onto a standardized template.
It is essential for the primary treating physician present the case at the MDM.
It is essential for a meeting coordinator to document and capture discussions and outputs generated by the ILD MDM.
It is essential for the ILD MDM to have processes in place for communicating MDT outputs to relevant stakeholders (i.e. referring physicians, other clinical service providers).
It is essential for the ILD MDM to have processes in place to follow up on whether its recommendations were enacted.

Clinical decision-making process

A good quality high resolution CT scan is required for every case being discussed at the ILD MDM.
A CT scan with expiratory views is required for every case being discussed at the ILD MDM. ||
A CT scan with prone views is required for every case being discussed at the ILD MDM. ||
A complete autoimmune and myositis serology panel is required for every case being discussed at the ILD MDM.
Pulmonary function testing comprising of at least spirometry and DLCO is required for every case being discussed at the ILD MDM. ¶
A 6 minute-walk test is required for every case being discussed at the ILD MDM.
Histopathology images are required for cases that are being discussed at the ILD MDM in which lung biopsies have been performed.

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It is essential for cases to be discussed at the ILD MDM prior to proceeding with a lung biopsy.
It is essential for the ILD MDM to report a consensus diagnosis.
It is essential for the ILD MDM to report on the degree of confidence of the diagnosis.
It is essential for the ILD MDM to report a list of differential diagnoses if a confident diagnosis was not achieved.
It is essential for the ILD MDM to discuss initial treatment and management recommendations.
It is essential for the ILD MDM to report a disease behaviour category.
It is essential for the ILD MDM to adhere to current and available standardised diagnostic guidelines.
An ILD MDM diagnosis is a provisional diagnosis that may require a re-presentation at an MDM at a later date when new information is available.
Research terminologies (e.g. IPAF) can be used as consensus final or provisional diagnoses.
In cases where the MDM members did not agree on the diagnosis, it is essential to document the differing opinions and reasons in the final report.

Future concepts and directions

It is essential for each ILD MDM to have a documented policy statement, which clearly defines its purpose and intended outputs.
It is essential for the ILD MDM to discuss every ILD case seen at their centre.
It is essential for the ILD MDM to review its policies and protocols at least annually.
It would be beneficial to conduct further research into shared practices in ILD MDM to develop an internationally-agreed minimum standard.
It would be useful for every MDM to undergo an annual benchmarking process once an international minimum standard has been established.
It would be useful for every ILD MDM to regularly perform a self-assessment using an internationally-collated database of cases.
In an ILD MDM, a majority vote is required to allow a case discussion to achieve consensus.
It would be useful for every ILD MDM to undergo a validation process by fulfilling a minimum number of case discussions annually.
It would be useful for every ILD MDM to occur on a regular basis to maintain its expertise.

Additional statements

It is essential to have a thoracic surgeon attend the ILD MDM. **
It is essential to have a clinical nurse attend the ILD MDM. **
It is essential for cases to be presented at the ILD MDM prior to proceeding with a lung biopsy. **
It would be essential for an international expert statement/guideline to be developed to provide guidance on running an optimal ILD MDM. **

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Table S2. Geographical distribution of online questionnaire participants

Country	Number (n)	Percentage (%)
Argentina	3	2.9
Australia	12	11.8
Brazil	8	7.8
Costa Rica	2	2.0
Canada	2	2.0
Chile	2	2.0
Croatia	1	1.0
Czech Republic	2	2.0
Denmark	1	1.0
Egypt	1	1.0
France	3	2.9
Greece	2	2.0
Germany	3	2.9
India	1	1.0
Italy	6	5.9
Japan	5	4.9
Mexico	2	2.0
Netherlands	2	2.0
New Zealand	2	2.0
Poland	2	2.0
Portugal	1	1.0
Republic of Korea	1	1.0
Romania	3	2.9
Russia	2	2.0
Singapore	1	1.0
Spain	5	4.9
Turkey	5	4.9
United Kingdom	9	8.8
USA	13	12.7
Total	**102**	**100**

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Table S3. Geographical distribution of invitees that did not complete the first Delphi round.

Region	Number of invitees
North America	8
South America	8
Europe	9
Asia	6
Australia & New Zealand	1

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