The interstitial lung disease patient pathway: from referral to diagnosis

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Differences in ILD patient pathways exist between ILD-specialist and non-ILD centres in diagnostic approach and resource availability. Utilising telehealth may enhance collaboration and alleviate disparities in access to specialised care and resources. https://bit.ly/3ZFq49a

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Abstract

Background Suspected interstitial lung disease (ILD) patients may be referred to an ILD-specialist centre or a non-ILD-specialist centre for diagnosis and treatment. Early referral and management of patients at ILD-specialist centres has been shown to improve survival and reduce hospitalisations. The COVID-19 pandemic has affected the ILD patient diagnostic pathway and prompted centres to adapt. This study investigates and contrasts ILD patient pathways in ILD-specialist and non-ILD-specialist centres, focusing on referrals, caseloads, diagnostic tools, multi-disciplinary team (MDT) meeting practices and resource accessibility.

Methods Conducted as a cross-sectional study, a global self-selecting survey ran from September 2022 to January 2023. Participants included ILD specialists and healthcare professionals (HCPs) from ILD-specialist centres and non-ILD-specialist centres.

Results Of 363 unique respondents from 64 countries, 259 were from ILD-specialist centres and 104 from non-ILD-specialist centres. ILD centres had better resource availability, exhibiting higher utilisation of diagnostic tests (median: 12 tests) than non-ILD centres (nine tests) and better access to specialist professions attending MDT meetings (median: six professions at meeting) in specialist centres than non-ILD centres (three professions at meeting). Transitioning to virtual MDT meetings allowed HCPs from other locations to join meetings in nearly 90% of all centres, increasing regular participation in 60% of

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specialist centres and 72% of non-ILD centres. For treatment of patients, specialist centres had better access to antifibrotic drugs (91%) compared to non-ILD centres (60%).
Conclusions Diagnostic pathways for ILD patients diverged between specialist centres and non-ILD centres. Disparities in resource and specialist availability existed between centres.

Introduction

Interstitial lung diseases (ILDs) encompass a complex group of conditions characterised by inflammation and scarring of the lung interstitium, often leading to irreversible progression and early death [1]. Early diagnosis and the ability to differentiate between various ILDs are important to enable timely, targeted therapy to slow disease progression and enhance the survival rates of ILD patients [2].

The heterogeneity of ILDs and the nonspecific nature of initial symptoms frequently lead to misdiagnosis and delayed referrals [3, 4], particularly in countries of lower income [5]. Suspected ILD patients may be referred to an ILD-specialist centre or a non-ILD-specialist centre for diagnosis and treatment. Management of patients at ILD-specialist centres has been shown to improve survival [6] and reduce all-cause hospitalisation of ILD patients [7]. Delayed referrals to specialist ILD centres have been associated with increased mortality rates in ILD patients [7].

As an integral part of ILD diagnosis and management, multidisciplinary team (MDT) meetings ensure access to key specialists [8], thereby enhancing diagnostic accuracy and confidence [9]. The MDT approach recognises the key roles played by clinical features, imaging [10] and pathology [11] in establishing an accurate diagnosis. Regular MDT meeting attendance has been shown to facilitate knowledge transfer, improve diagnostic reproducibility [12] and potentially influence diagnostic outcomes [13]. It has been recommended that MDTs should include at least a pulmonologist, a radiologist and a pathologist [8].

Telemedicine has become integral components of patient diagnosis and management [14], particularly in the context of the COVID-19 pandemic, which profoundly impacted all aspects of ILD patient management [15]. The ongoing transition into the post COVID-19 era may reflect further changes.

Antifibrotic agents have emerged as a significant advancement in treatment of certain ILDs, with approved indications for idiopathic pulmonary fibrosis (IPF) (pirfenidone and nintedanib) [16, 17] and progressive fibrosing interstitial lung diseases (PF-ILDs) (nintedanib) [18], which can slow the decline in lung function and reduce exacerbations. Their suitability is often assessed and agreed in MDT meetings [19]. The availability of antifibrotics, however, varies between centres [20].

This research aimed to compare the current patient diagnostic pathway between ILD-specialist centres and non-ILD-specialist centres, focusing on:

- referral patterns and ILD caseload,
- availability of diagnostic tools and resources,
- MDT structure, and
- availability of treatment resources.

Methodology

This study adopted a cross-sectional approach. A comprehensive perspective was sought by inviting participation across countries. A survey was adapted from Richeldi *et al*. [20] and refined through ILD physician expert consensus. Centres were invited to participate through an electronic survey format, developed using Qualtrics (Qualtrics Research Suite; Qualtrics, Provo, UT, USA), which included study background and instructions. To ensure that responses were relevant to the study objectives, only respondents directly involved in ILD diagnosis and management were eligible to participate. Surveys were distributed *via* local consortia, professional networks and respiratory society email lists. The protocol was approved by the Anonymised Data Ethics and Protocol Transparency committee.

Survey design

Informed consent was taken from respondents. To ensure anonymity, no identifying information was collected unless respondents wished to be included as collaborators (supplementary material E1).

The survey design encompassed 54 questions (multiple-choice and open-ended responses) grouped into seven domains, as follows (supplementary material E2):

1) respondent demographics,
2) characteristics of the respondent's centre,

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3) ILD caseload,
4) MDT practice,
5) IPF drug access,
6) non-IPF PF-ILD drug access, and
7) clinical trials.

Centre definitions

Subgroups of ILD-specialist centres and non-ILD-specialist centres were compared, where a specialist centre was defined by meeting the following criteria, defined by expert consensus:

- operates as a tertiary healthcare facility,
- receives patient referrals specifically for ILD diagnosis and management, and
- conducts MDT meetings for ILD case discussions.

World Bank definitions of country income status and geographical region were used.

Analysis

Kruskal–Wallis tests, chi-square tests and Fisher's exact ratio were used to determine significant independence among subgroups, as appropriate. Spearman rank correlations were applied. Analysis was conducted using R software. Respondents with missing data were excluded from the analysis, except for those with a small number of missing responses.

Results

Centre and respondent demographics

The majority of respondents (346 (95.3%)) were pulmonologists. 62.8% were male and 36.6% were female. Respondents also included rheumatologists (2.5%), internal medicine (0.8%) and radiologists (0.8%). Most respondents had been in medical practice for at least 11 years since their specialisation (57.6%).

Most centres were ILD-specialist centres (71.3%), of which 76.0% were academic centres, and 28.7% were non-ILD-specialist centres, of which 47.1% were academic ($p<0.0001$) (table 1). Centres were based in 64 countries (supplementary material E3). ILD-specialist centres tended to be in high-income countries (HICs) (86.5%) and upper middle-income countries (UMICs) (65.7%) ($p<0.0001$). Only 28.6% of responding ILD-specialist centres were based in lower middle-income countries (LMICs).

The highest number of responding centres were in Europe and Central Asia (38.3%), followed by Latin America and Caribbean (25.6%), East Asia and Pacific (16.8%), North America (7.2%), Middle East and North Africa (5.5%), South Asia (4.1%), and Africa (2.5%) ($p<0.0001$).

TABLE 1 Key features of participating centres

	All centres	ILD-specialist centres	Non-ILD-specialist centres
Centres	363	259 (71.3%)	104 (28.7%)
Country income level			
High	200 (55.1%)	173 (86.5%)	27 (13.5%)
Upper middle	105 (28.9%)	69 (65.7%)	36 (34.3%)
Lower middle	56 (15.4%)	16 (28.6%)	40 (71.4%)
Low	1 (0.3%)	1 (100%)	0 (0%)
Not classified	1 (0.3%)	0 (0%)	1 (100%)
Region			
Europe and Central Asia	139 (38.3%)	120 (86.3%)	19 (13.7%)
Latin America and Caribbean	93 (25.6%)	61 (65.6%)	32 (34.4%)
North America	26 (7.2%)	23 (88.5%)	3 (11.5%)
East Asia and Pacific	61 (16.8%)	29 (47.5%)	32 (52.5%)
South Asia	15 (4.1%)	7 (46.7%)	8 (53.3%)
Middle East and North Africa	20 (5.5%)	15 (75%)	5 (25%)
Africa	9 (2.5%)	4 (44.4%)	5 (55.6%)
Centre type			
Academic centre	276 (76%)	227 (82.2%)	49 (17.8%)
Nonacademic centre	87 (24%)	32 (36.8%)	55 (63.2%)

Data are presented as n respondents (% of respondent or total centres). χ^2 $p<0.0001$ between ILD-specialist and nonspecialist centres. ILD: interstitial lung disease.

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Referrals and caseload

At ILD-specialist centres, a significant percentage of ILD patient referrals were from pulmonologists and rheumatologists (figure 1), exceeding the percentage observed in non-ILD-specialist centres ($p<0.0001$). The highest percentage of referrals to non-ILD centres were self-referrals (patients independently seeking specialist care) or patients referred by nonphysician healthcare professionals (HCPs), which was higher than the proportion of patients self-referred to ILD-specialist centres ($p<0.0001$). A larger range of referrals to non-ILD centres were *via* primary care physicians (20%) compared to ILD-specialist centres ($p=0.04$).

ILD-specialist centres reported a significantly higher annual number of new ILD patients than non-ILD-specialist centres across all types of ILD ($p<0.0001$) (figure 2a). ILD-specialist centres reported a significantly higher annual number of new IPF patients (32 new patients·year^{-1}) and non-IPF PF-ILD (30 patients·year^{-1}) than non-ILD-specialist centres (five new IPF patients·year^{-1} and five PF-ILD patients·year^{-1}) ($p<0.0001$).

Centres reported that IPF and PF-ILDs were the most common types of ILD, each representing 30% of the total ILD caseload, respectively. The percentage of IPF cases managed was similar across all centre types ($p=0.19$) (figure 2b). However, the percentage of PF-ILD cases managed was significantly lower in non-ILD-specialist centres (20% of total ILD caseload) than ILD-specialist centres (30%) ($p=0.005$). Specialist centres also had a higher percentage of caseload for other ILD subtypes than non-ILD centres. This difference in percentage reflected a higher absolute caseload across all ILD subtypes in specialist centres compared to non-ILD centres ($p<0.0001$) (table 2).

The disease subtypes with the highest median total caseload (total number of patients managed per year) across all centres were IPF (40 total cases·year^{-1}), connective tissue disease associated with ILD (CTD-ILD) (30 cases·year^{-1}), idiopathic nonspecific interstitial pneumonia (20 cases·year^{-1}) and hypersensitivity pneumonitis (20 cases·year^{-1}).

Diagnostic practice

ILD-specialist centres tended to have a higher utilisation of diagnostic tests (median 12 tests) than non-ILD-specialist centres (nine tests) ($p<0.0001$) (figure 3). The number of tests received at a centre did not correlate with tests received prior to arrival at either specialist centres ($r=0.02$, $p=0.75$) or nonspecialist centres ($r=0.12$, $p=0.26$). The greater utilisation of diagnostic tests at specialist centres was reflected in the lower number of tests unavailable at centres in HICs (median 0 (interquartile range 1) tests unavailable at centre) compared to LMICs (4 (7)) and UMICs (2 (5)) (supplementary material E4, figure S1).

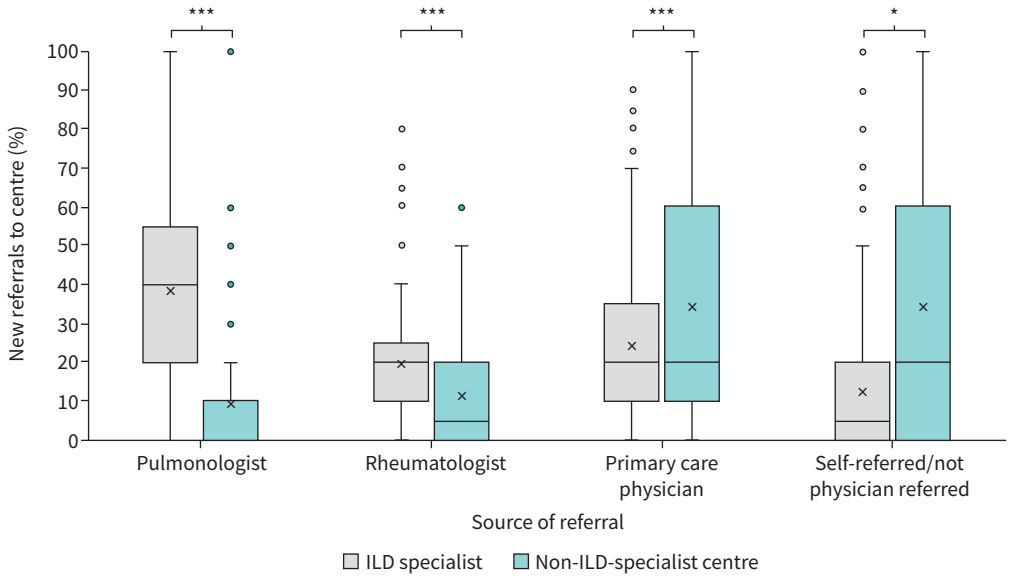

FIGURE 1 Source of referral of new interstitial lung disease (ILD) cases to centre (median/interquartile range). *: $p<0.05$. ***: $p<0.0001$.

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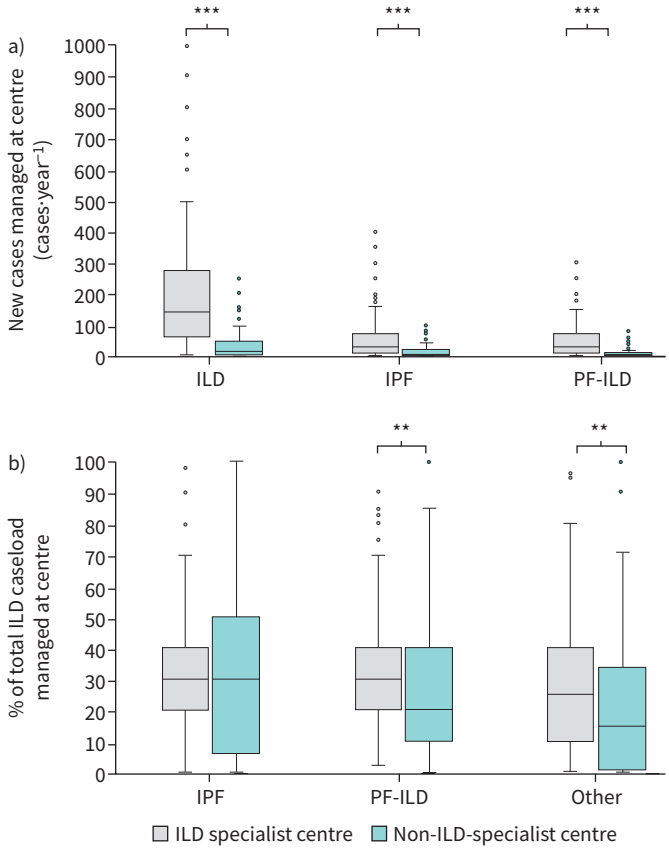

FIGURE 2 a) New interstitial lung disease (ILD) cases/referrals managed per year. b) Percentage of total ILD caseload managed (median/interquartile range). IPF: idiopathic pulmonary fibrosis; PF-ILD: progressive fibrosing interstitial lung disease. **: p<0.01. ***: p<0.0001.

New ILD referral caseload showed a moderate correlation with the number of diagnostic tests employed in patients at non-ILD centres (r=0.39, p=0.0002). However, caseload was not correlated with the number of diagnostic tests performed at ILD-specialist centres (r=−0.07, p=0.32). The most common tests received by the "majority of patients" at respondent's centres were spirometry, High-resolution computed tomography (HRCT) and chest x-ray (>90%). Non-ILD centres had a higher utilisation of chest x-rays than ILD centres (p=0.002).

Only 29 non-ILD-specialist centres reported holding MDT meetings to discuss ILD cases. Among ILD-specialist centres, 87.6% held MDT meetings dedicated specifically to ILD case discussions, while

TABLE 2 Total (new and follow up) interstitial lung disease (ILD) cases/referrals at the respondent's centre in an average year (cases·year^{-1})

	All centres	ILD-specialist centres	Non-ILD-specialist centres
Idiopathic pulmonary fibrosis	40 (90 (0–1500))	50 (96 (0–1500))	5 (38 (0–400))
Connective tissue disease associated with ILD	30 (62 (0–700))	50 (75 (1–700))	6 (18 (0–350))
Idiopathic nonspecific interstitial pneumonia	20 (45 (0–750))	25 (50 (0–750))	6 (18 (0–500))
Hypersensitivity pneumonitis	20 (45 (0–600))	30 (37 (0–600))	4 (9 (0–600))
Sarcoidosis	15 (48 (0–900))	25 (75 (0–900))	2 (10 (0–120))
Other idiopathic interstitial pneumonias	15 (35 (0–600))	20 (40 (0–600))	2 (10 (0–100))
Unclassifiable ILD	10 (27 (0–300))	20 (24 (0–300))	1 (8 (0–150))
Post-COVID-19 ILD	10 (21 (0–300))	15 (25 (0–300))	5 (13 (0–70))
Drug-induced ILD	5 (9 (0–200))	10 (15 (0–200))	1 (5 (0–30))

Median (interquartile range (min–max)), p<0.0001 for the Kruskal–Wallis test between centre type for each ILD subtype.

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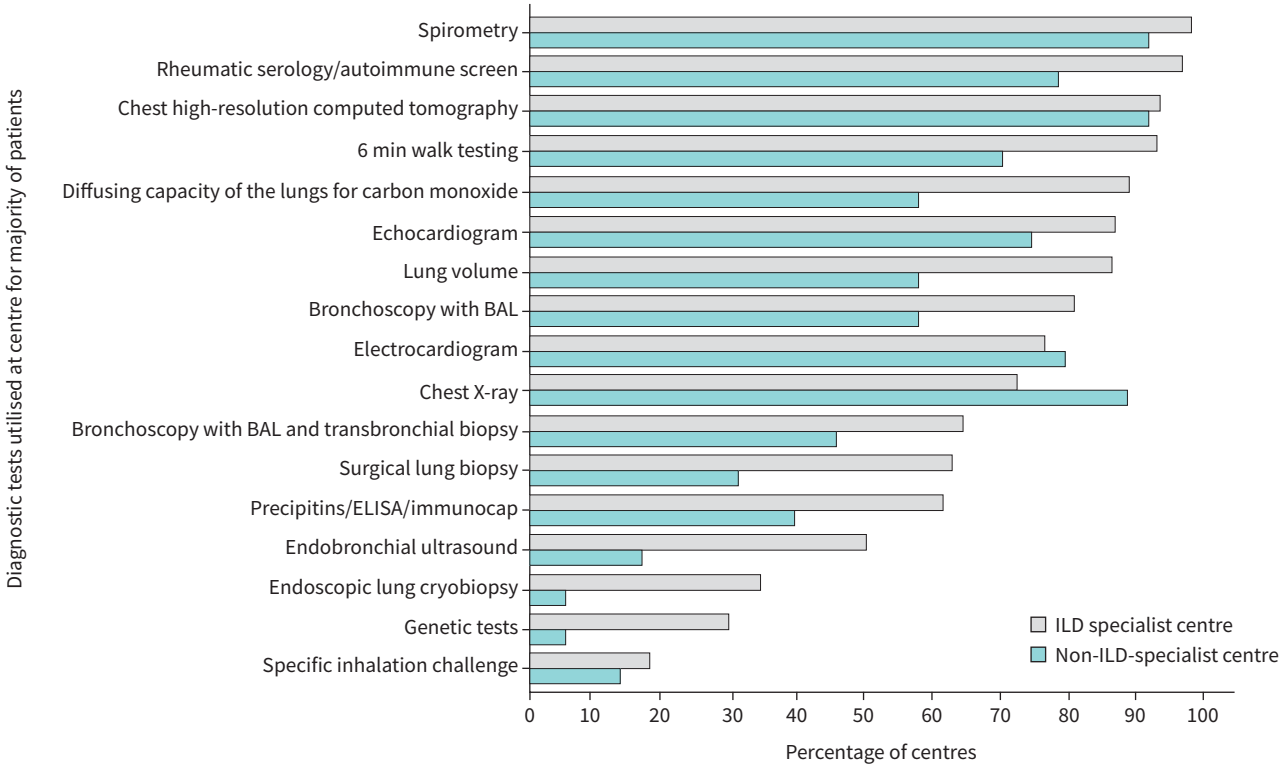

FIGURE 3 Diagnostic tests received by the majority of patients at respondent's centre. BAL: bronchoalveolar lavage.

the remaining 12.4% discussed ILD cases during general chest radiology meetings. In contrast, 62.1% of MDT meetings at non-ILD-specialist centres were dedicated ILD MDT meetings (p=0.001) (table 3).

In response to the COVID-19 pandemic, nearly 60% of ILD-specialist centres and under half of the non-ILD-specialist centres reported changes in their MDT format. Transitioning to virtual MDT (vMDT) meetings resulted in an increase in meeting frequency for only 29.8% of ILD centres and 44.8% of non-ILD centres. However, adopting vMDT meetings allowed HCPs from outside of their respective centres to participate in nearly 90% of centres. Furthermore, vMDT meetings contributed to increased regular participation in 59.6% of ILD-specialist centres and 72.4% of non-ILD centres.

TABLE 3 Multidisciplinary team (MDT) meeting characteristics

	All centres	ILD-specialist centres	Non-ILD-specialist centres	p-value
Dedicated ILD MDT meeting	229 (84.8%)	211 (87.6%)	18 (62.1%)	0.001
Change in format since pandemic	157 (57.9%)	143 (59.1%)	14 (48.3%)	0.34
Current format of MDT meeting				
Face-to-face	149 (41%)	138 (57%)	11 (37.9%)	NA
Teleconference	15 (4.1%)	12 (5%)	3 (10.3%)	NA
Videoconference	100 (27.5%)	85 (35.1%)	15 (51.7%)	NA
Multimedia messaging	12 (3.3%)	12 (5%)	0 (0.0%)	NA
Hybrid	115 (31.7%)	106 (43.8%)	9 (31.0%)	NA
Multiple formats	191 (52.6%)	174 (71.9%)	17 (58.6%)	NA
Change to vMDT increased meeting frequency	85 (31.4%)	72 (29.8%)	13 (44.8%)	0.13
Change to vMDT meeting to enable HCPs from outside centre to join	155 (89.6%)	140 (89.7%)	15 (88.2%)	0.51
vMDT meetings increased regular participation	164 (61%)	143 (59.6%)	21 (72.4%)	0.11

Data are presented as n respondents (% of respondent of total centres, of ILD-specialist centres or non-ILD-specialist centres). p-value = χ^2 between ILD-specialist and nonspecialist centres. HCPL healthcare professional; NA: not applicable; vMDT: virtual multidisciplinary team.

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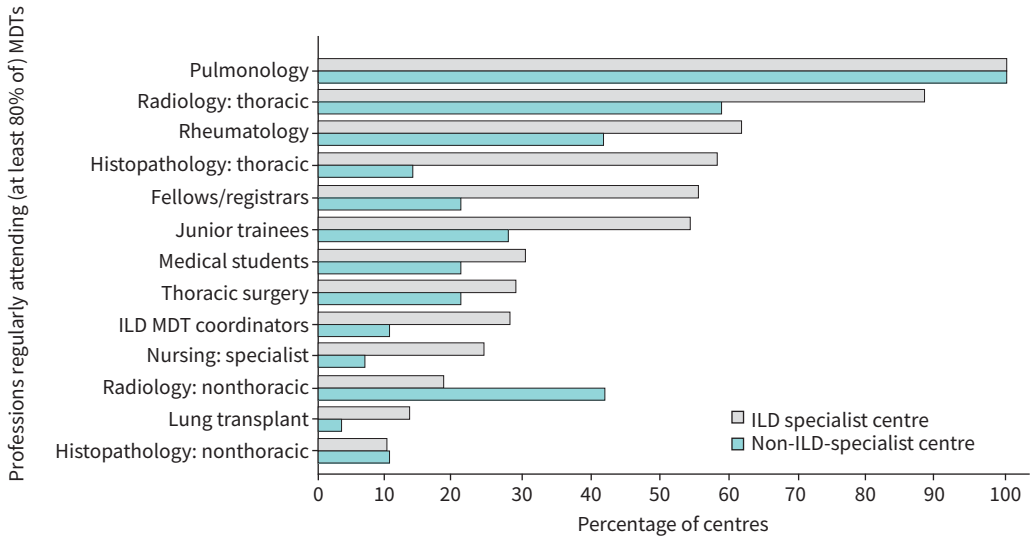

FIGURE 4 Professions regularly attending (at least 80% of) multidisciplinary team (MDT) meetings. ILD: interstitial lung disease.

Across all centres, 41% of MDT meetings used a face-to-face format, which was higher in ILD-specialist centres than in non-ILD-specialist centres. Many centres held MDT meetings using videoconferencing (27.5%). Many centres used hybrid (31.7%) or multiple formats for MDT meetings (selecting more than one of the provided MDT meeting formats) (52.6%), which was higher in specialist centres. 71.3% of centres reported an increase in new ILD cases since the start of the COVID-19 pandemic. This increase was not significantly different between centre type (p=0.54).

Specialist centres had a higher number of professions regularly (defined as attending at least 80% of meetings) attending meetings (median six professions) than nonspecialist centres (three professions) (p<0.0001) (figure 4). A higher percentage of MDT meetings in specialist centres included each listed profession regularly attending meetings than in non-ILD centres, with the exception of nonthoracic radiologists. Furthermore, specialist centres had notably better access to specialist professions, with a 43.9% difference in thoracic histopathologists and a 29.4% difference in thoracic radiologists in non-ILD centres.

Access to treatment/resources

There were disparities in the available resources (table 4). For treatment, a higher percentage of ILD-specialist centres had access to IPF and PF-ILD antifibrotic drugs compared to non-ILD-specialist centres (p<0.0001). A higher percentage of ILD centres had antifibrotics covered by government insurance/health service (76.7%) compared to non-ILD centres (38.5%) (p<0.0001). Access to clinical trials was also greater in ILD centres (72.9%) compared to non-ILD centres (21.4%) (p<0.0001).

These disparities were also evident through significant regional and income-based variations (supplementary material E4, tables S1–S5). Generally, HICs had better access to IPF and PF-ILD antifibrotics, clinical trials

TABLE 4 Access to resources by centre type

	All centres	ILD-specialist centres	Non-ILD-specialist centres	p-value
Access to IPF antifibrotic drugs	297 (82.3%)	235 (91.4%)	62 (59.6%)	<0.0001
Access to non-IPF PF-ILD antifibrotic drug	282 (78.3%)	225 (87.5%)	57 (55.3%)	<0.0001
Antifibrotics covered by government insurance/health service	237 (65.7%)	197 (76.7%)	40 (38.5%)	<0.0001
Access to clinical trials	210 (58.2%)	188 (72.9%)	22 (21.4%)	<0.0001

Data are presented as n respondents (% of respondent of total centres, of ILD-specialist centres or non-ILD-specialist centres). p-value = χ^2 between ILD-specialist and nonspecialist centres. IPF: idiopathic pulmonary fibrosis; PF-ILD: progressive fibrosing interstitial lung disease.

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and government or health service insurance coverage compared to UMICs and LMICs (Table S1) ($p<0.0001$). Regional patterns showed that Europe and Central Asia and North America had the most consistent access to resources (Tables S2–S5). Despite these regional differences, ILD-specialist centres provided more comprehensive access to treatments and resources overall compared to nonspecialist centres ($p<0.0001$).

Discussion

This cross-sectional study aimed to compare the ILD patient pathway from referral to diagnosis between ILD-specialist centres and non-ILD-specialist centres across referrals, caseload, diagnostic tools, MDT meeting practices and resource availability. The findings shed light on the role of specialist centres in delivering optimal care for ILD patients and highlight disparities between specialist and nonspecialist centres.

The study revealed notable differences in referral patterns between ILD-specialist centres and non-ILD-specialist centres. ILD-specialist centres primarily received referrals from pulmonologists, who likely have greater experience and expertise in diagnosing ILDs. In contrast, nonspecialist centres had a higher proportion of self-referrals and referrals from primary care physicians. Primary care physicians may not recognise early indicators of ILDs, leading to delays in appropriate referrals and suboptimal patient outcomes [4, 21]. These referral patterns suggest the importance of awareness and education among primary care providers and potential ILD patients, facilitating timely identification and referrals to specialist centres when necessary. While our study reported a lower average ILD caseload than previous research [20], the pattern aligned with earlier findings, with IPF and CTD-ILD being the most prevalent ILD subtypes referred to centres [22].

Specialist centres exhibited a considerably higher utilisation of key diagnostic tests, such as autoimmune screening, HRCT, spirometry and diffusing capacity of the lung for carbon monoxide (D_{LCO}), which are recommended by guidelines as foundational for MDT discussions [8] and therapeutic response monitoring [23]. Utilisation at specialist centres exceeded 90%, ensuring consistent testing practices. Our study revealed a substantial increase in the utilisation of these essential diagnostic tests compared to previous research [20]. Spirometry and HRCT utilisation rates doubled, while D_{LCO} utilisation increased by 10%. Test utilisation was notably lower in nonspecialist centres than specialist centres, falling below levels previously reported of higher utilisation across all tests [20]. Notably, the utilisation of D_{LCO} was greatly reduced in nonspecialist centres compared to previous findings [20].

Recent guidelines on IPF/PF-ILD suggest the acceptability of cryobiopsy as an alternative to surgical lung biopsy [24]. However, our study revealed lower utilisation rates of cryobiopsy, as well as bronchoalveolar lavage (BAL) and surgical lung biopsy (SLB), than previously identified [20]. This may be partially attributed to adaptations in the patient diagnostic pathway during the COVID-19 pandemic, recommending potential deferral of BAL and SLB for most patients [15]. It should be acknowledged that certain tests cannot be performed outside of specialist centres and so the patient pathway differs between specialist and nonspecialist centres.

Our study identified disparities in the utilisation of genetic testing between specialist and nonspecialist centres. Routine genetic testing, supported by pulmonologists and ILD patients [25], may allow earlier diagnosis, personalised treatment and management, and risk assessment for disease progression, contributing to improved patient care [26]. As the cost of genetic testing declines, it may be more widely available to patients [27]. Although it was more commonly utilised in specialist centres, it remained underutilised overall. The lower utilisation of genetic testing highlights an area for potential improvement, the need for greater investment in genetic testing resources and education.

In our study, a significant shift towards hybrid meeting formats was evident, with most centres transitioning to a mixed format for MDT meetings. Previously, 80% of MDT meetings were held face-to-face [20], now only 41% continue this format. Employing multiple formats aligns with the growing prevalence of vMDT meetings since the COVID-19 pandemic. Prior to the COVID-19 pandemic, only 8% of ILD clinicians reported utilising telemedicine [28]. This emphasises the importance of technology to access external clinical expertise, with nearly 90% of centres hosting vMDT meetings reporting the ability to include HCPs from outside their institution. This aligns with the consensus from a Delphi study which suggested that all centres should utilise telehealth to promote cross-centre collaboration [29]. This transition has resulted in increased regular participation and facilitated the inclusion of HCPs from external centres, consistent with findings in oncology MDT meetings during the COVID-19 pandemic [30, 31]. The transition to vMDT meetings introduces challenges regarding data security and clinical data coordination. By selecting vMDT meeting platforms compliant with the HIPAA (Health Insurance

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Portability and Accountability Act) that offer encryption for patient data, stringent access controls and enabling real-time access through dedicated patient data management platforms [32], decision-making and collaboration can be enhanced.

A higher proportion of specialist centres demonstrated adherence to guideline recommendations, ensuring the presence of pulmonologists, along with at least one radiologist, histopathologist and specialist trainees/fellows during MDT meetings [33], with a higher attendance of radiology and histopathology specialists [34]. In contrast, many non-ILD centres fell short of meeting these criteria and typically had a presence of nonspecialist radiologists and histopathologists during MDT meetings. This is consistent with prior studies that identified suboptimal attendance of core members to MDT meetings [35, 36].

Despite managing a comparatively high caseload of CTD-ILD cases, a significant number of centres, particularly non-ILD centres, lack regular participation of rheumatologists in MDT meetings, which is central to the accurate diagnosis of CTD-ILD [37]. This finding aligns with previous studies that have also reported the absence of routine involvement of rheumatologists in MDT discussions [38].

The percentage of centres with access to IPF antifibrotics was similar to that found by Richeldi *et al*. [20]. Indeed, the higher availability of IPF and PF-ILD antifibrotics in ILD-specialist centres, coupled with better coverage by government insurance/health services, demonstrates the better access to treatment options at specialist centres. Our study reveals that while ILD-specialist centres generally have better access to antifibrotics than nonspecialist centres, significant regional disparities remain. The lack of access was associated with the country's income status, with LMICs facing the greatest challenges, as well as previously identified regional variations [20]. Research has shown that a higher proportion of patients in specialist centres receive antifibrotic prescriptions compared to non-ILD-specialist centres [7]. One common barrier to accessing antifibrotics is reimbursement, often requiring prescriptions from ILD-specialist centres [39]. Centres in regions with limited access to critical therapies are likely to face challenges in providing optimal care. Additionally, diagnostic certainty is higher in ILD-specialist centres, providing an added advantage to patients at these centres [40]. Other studies have also reported limited access to clinical trials as a barrier to treatment [36].

This study utilised a global self-selecting survey, introducing potential response bias and may thus not fully represent all centres, potentially affecting generalisability of the findings. Moreover, variations in the interpretation and reporting of ILD caseloads, diagnostic practices and MDT meeting structures may have arisen from the inherent subjectivity and recall bias of respondents' perceptions. To mitigate this, when multiple respondents from the same centre participated, responses from the participant with the most extensive clinical experience were chosen. Regional differences in caseload and MDT meeting structures also contributed to some of the variation observed in responses. Unfortunately, this study had limited representation from low-income countries due to the self-selection process.

The survey distribution in late 2022 coincided with updates in diagnostic guidelines [24]. Some centres may have been in the process of adopting more contemporary diagnostic tools and methods based on the latest guidelines. However, such limitations are inherent to cross-sectional studies.

Future research could incorporate patient perspectives, evaluated in both centre types, to compare their experiences across different care pathways. These insights could help identify potential gaps in accessibility, providing a more comprehensive understanding of the effectiveness of ILD care across different healthcare settings. Furthermore, focusing on longitudinal studies to evaluate long-term outcomes and the effectiveness of ILD care pathways in different centre types on patient outcomes would provide insights for optimising ILD care.

Our study highlights the crucial role that specialist centres play in enhancing ILD diagnostic pathways and treatment options, benefiting from enhanced access to expertise, diagnostic tools and resources. However, observed variations between these two types of centres underscore the ongoing need for continuous evaluation of diagnostic strategies, resource allocation and multidisciplinary collaboration across all healthcare settings. We advocate for suspected ILD patients to be referred to specialist centres, wherever possible, to have the opportunity to receive a precise and timely diagnosis and the most suitable treatment and prognosis. Addressing the resource disparities between centre types and across different regions is imperative. Our study suggests that transitioning to virtual MDT meetings can partially address this issue by facilitating expertise exchange and collaboration between nonspecialist centres and external specialists. We recommend increased collaboration and communication between specialist and nonspecialist centres to enhance the quality of care provided to ILD patients. Through scrutinising various aspects of the diagnostic

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process, this study has identified potential gaps and opportunities for improvement in the delivery of care for ILD patients.

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