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Evaluation of Diagnostic Concordance Between Multidisciplinary Thoracic Board Decisions and Final Diagnoses: A Single-Center Retrospective Study

Multidisipliner Toraks Konseyi Kararları ile Nihai Tanılar Arasındaki Tanısal Uyumun Değerlendirilmesi: Tek Merkezli Retrospektif Bir Çalışma

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ABSTRACT

Aim: Multidisciplinary thoracic boards (MTB) improve diagnostic accuracy for complex lung diseases, yet robust data on real-world performance particularly concordance between preliminary and final diagnoses remain limited. This study quantitatively evaluated diagnostic performance, described patient and clinical characteristics, and identified factors associated with discordance.

Methods: We retrospectively analyzed 157 patients discussed in MTBs between January 2022 and December 2024. Excluding 24 patients lacking follow-up, the final cohort comprised 133 patients. Data included demographics, smoking history, comorbidities, imaging, board decisions, and final diagnoses. Diagnostic performance was evaluated using a 2×2 contingency table, ROC analysis, sensitivity, specificity, and McNemar's test.

Results: The cohort (mean age 62.4±11.6 years; 40.1% female) included never-smokers (30.6%). Comorbidities were present in 88.5%. Referrals originated mainly from pulmonology (77.7%). Preliminary board malignancy diagnosis was 71.4%. Common CT findings were solid nodules (42.7%) and ground-glass opacities (21.7%). Recommendations favored wedge biopsy (33.8%) and CT follow-up (33.1%). Final diagnoses included adenocarcinoma (12.8%), squamous cell carcinoma (9.0%), metastasis (10.5%), infection (15.8%), sarcoidosis (4.5%), and others (45.1%). Non-attenders (n=24) mostly received tissue sampling recommendations (75.0%). At the natural clinical threshold, preliminary assessment showed 93.1% sensitivity, 34.6% specificity, 28.4% PPV, and 94.7% NPV; ROC-optimal cutoff yielded 62% sensitivity and 62% specificity. McNemar's test showed a significant difference between paired preliminary and final malignancy classifications($p<0.001$).

Conclusion: Multidisciplinary thoracic board assessments demonstrated moderate yet statistically significant concordance with final diagnoses, featuring high sensitivity but limited specificity at the clinical threshold, underscoring the need for structured decision-support.

Key Words: Thoracic council, multidisciplinary approach, lung cancer, diagnosis

ÖZ

Amaç: Multidisipliner toraks konseyleri (MTK) karmaşık akciğer hastalıklarında tanısal doğruluğu artırır; ancak gerçek dünya performansına, özellikle ön ve kesin tanılar arasındaki uyuma dair güçlü veriler sınırlıdır. Bu çalışma, tanısal performansı nicel olarak değerlendirmiş, hasta özelliklerini tanımlamış ve uyumsuzlukla ilişkili faktörleri belirlemiştir.

Yöntem: Ocak 2022 - Aralık 2024 tarihleri arasında MTK'da tartışılan 157 hasta geriye dönük incelendi. Takibi olmayan 24 hasta hariç tutularak 133 hastadan oluşan nihai kohort oluşturuldu. Demografik veriler, sigara öyküsü, komorbiditeler, görüntüleme, konsey kararları ve kesin tanılar kaydedildi. Tanısal performans; 2×2 olasılık tablosu, ROC analizi, duyarlılık, özgüllük ve McNemar testiyle değerlendirildi.

Bulgular: Yaş ortalaması 62.4±11.6 yıl olan kohortun %40.1'i kadındı ve %30.6'sı hiç sigara içmemişti. Komorbidite oranı %88.5 idi. Başvurular en çok göğüs hastalıklarından (%77.7) yapıldı. Ön konsey malignite tanısı %71.4 oldu. Çoğunlukla CT bulguları solid nodül (%42.7) ve buzlu cam opasiteleriydi (%21.7). Öneriler wedge biyopsi (%33.8) ve CT takibi (%33.1) yönündeydi. Kesin tanılar; adenokarsinom (%12.8), skuamöz hücreli karsinom (%9.0), metastaz (%10.5), enfeksiyon (%15.8), sarkoidoz (%4.5) ve diğerleri (%45.1) olarak dağıldı. Takibe gelmeyen hastalara (%24) çoğunlukla doku örneklemesi önerilmişti (%75.0). Doğal klinik eşikte duyarlılık %93.1, özgüllük %34.6, PPV %28.4 ve NPV %94.7 iken; ROC-optimal kesme değerinde duyarlılık ve özgüllük %62 oldu. Eşleştirilmiş ön ve kesin tanı malignite sınıflandırmaları arasında anlamlı fark saptandı ($p<0.001$).

"Multidisipliner toraks konseyi değerlendirmeleri kesin tanı ile orta düzeyde fakat anlamlı uyum göstermiş; klinik eşikte yüksek duyarlılık ama sınırlı özgüllük sergileyerek yapılandırılmış karar destek sistemlerine duyulan ihtiyacı vurgulamıştır.

Anahtar Sözcükler: Toraks konseyi, multidisipliner yaklaşım, akciğer kanseri, tanı

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Introduction

Pulmonary diseases, particularly malignancies and conditions mimicking malignancy, often present with similar clinical and radiological findings. This overlap poses challenges in reaching an accurate diagnosis and necessitates multidisciplinary approaches. Today, multidisciplinary thoracic boards (MTB) enhance diagnostic accuracy and improve standards in patient management by integrating the knowledge and experience of various specialties. This multidisciplinary team comprises experts with diverse backgrounds, skills, and clinical experience, working collaboratively both in planned treatments and in establishing the most appropriate follow-up programs [1] .

In many lung cancer guidelines, multidisciplinary boards are recommended for evaluating patients' clinical characteristics, imaging findings, laboratory data, and risk factors as a whole [2]. Especially in cases with suspected malignancy, these meetings significantly contribute to selecting the correct diagnostic method, planning appropriate treatment strategies, and improving overall survival rates [3,4]. Furthermore, investigating the concordance between board decisions and definitive diagnoses is crucial for demonstrating the effectiveness of clinical decision-making processes.

The primary objective of this study was to evaluate the diagnostic concordance between preliminary diagnoses established during multidisciplinary thoracic board discussions and the final confirmed diagnoses. We deliberately restricted our analyses to diagnostic concordance and did not attempt to evaluate effectiveness relative to a control group, since the retrospective, single-arm design does not support causal inference. Secondary objectives included describing patient characteristics, radiological findings, board recommendations, and diagnostic procedures performed following board evaluation, and identifying factors associated with diagnostic discordance.

Method

This study was conducted through a retrospective analysis of patients discussed in the multidisciplinary thoracic board held at our hospital between January 2022 and December 2024. A total of 157 patients were included in the study. By reviewing patients' electronic medical records, imaging reports, and board meeting minutes, data were collected on demographic characteristics, smoking history, comorbidities, referring department, clinical and radiological findings, preliminary diagnoses, board decisions, and definitive diagnoses. Nodule characterization and follow-up were conducted in accordance with the Fleischner Society guidelines [5,6].

The multidisciplinary thoracic board convenes regularly on a weekly basis. Meetings are attended by specialists in pulmonology, thoracic surgery, medical oncology, and radiology. Each session follows a structured format in which patient cases are presented, relevant clinical data are reviewed, and radiological and pathological images are directly examined to support collective decision-making. Final recommendations are reached through consensus, integrating the perspectives of all participating disciplines.

Because no control group was available, the study was not designed to evaluate the superiority of multidisciplinary board discussions over standard clinical decision-making. Therefore, the findings should be interpreted as an assessment of diagnostic concordance rather than proof of clinical effectiveness.

For consistency throughout the manuscript, the term "definitive diagnosis" was used for the post-board, histopathology or follow-up-based final classification, while "preliminary diagnosis" referred to the board's documented pre-procedure assessment.

Inclusion Criteria

Inclusion criteria were defined as adult patients aged 18 years and older, who were discussed in the multidisciplinary thoracic board, had accessible basic clinical and radiological data prior to the board meeting, and had documented diagnostic or therapeutic decisions following the meeting.

Exclusion Criteria

Exclusion criteria included patients under the age of 18, cases with insufficient data in board records or patient files.

Although being lost to follow-up is now defined as an exclusion criterion, all 157 patients evaluated in MTBs were initially captured in the board registry. They are reported separately in the patient-flow diagram and excluded only from analyses requiring a definitive final diagnosis, in order to maintain consistency with the primary endpoint (concordance).

Ethical Considerations

The study protocol was reviewed and approved by the Akdeniz University Ethics Committee (Approval Date: 06.03.2025, Decision No: TBAEK-237). All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki.

Written informed consent was obtained from all patients for participation in the procedures and for the use of their clinical and imaging data for scientific and/or educational purposes.

Statistical Analysis: In this study, descriptive statistics for continuous variables were presented as percentages, frequencies, means, and standard deviations (X±SD). To compare relationships between categorical variables in board decisions, the Chi-square test with Fisher's correction was used. For evaluating the level of agreement, ROC analysis was employed along with specificity and sensitivity values. The primary endpoint was diagnostic concordance between the multidisciplinary thoracic board preliminary diagnosis and the final confirmed diagnosis. Diagnostic performance was assessed using receiver operating characteristic (ROC) analysis, sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV). A p-value of <0.05 was considered the critical threshold for statistical significance. To assess the difference between preliminary and definitive diagnosis rates, the McNemar test was applied. All data were analyzed using the SPSS 27.0 (Statistical Package for the Social Sciences) software.

Results

A total of 157 patients were discussed in the multidisciplinary thoracic board during the study period. Of these, 24 patients (15.3%) did not the analytical cohort (Figure 1). The study cohort had a mean age of 62.4±11.6 years and 59.9% were male attend follow-up visits after the board decision, and 133 patients (84.7%) with a confirmed final diagnosis constituted. Most patients (88.5%) had at least one comorbidity, with hypertension (40.8%) and diabetes mellitus (26.1%) being the most frequent. The majority of cases (77.7%) were referred from the department of pulmonology, followed by oncology (22.3%), as detailed in Table 1.

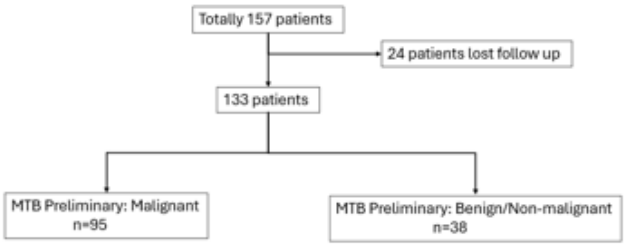


Figure 1. Study flow diagram

Table 1: General Characteristics of Patients

Characteristics		Data
Gender, n (%)	Female	63 (40.1)
	Male	94 (59.9)
Age, Mean ±SD, (Min.-Max.)		62.45±11.62 (22-101)
Smoking	Never smoked	48 (30.6)
	Current smoker	68 (43.3)
	Quit smoking	41 (26.1)
Comorbidity	Yes	139 (88.5)
	No	18 (11.5)
Diabetes	Yes	41 (26.1)
	No	116 (73.9)
Hypertension	Yes	64 (40.8)
	No	93 (59.2)
Cerebrovascular disease	Yes	6 (3.8)
	No	151 (96.2)
Referring unit	Pulmonology	122 (77.7)
	Oncology	35 (22.3)

Among the 133 patients with a definitive diagnosis, the board's preliminary classification was primary lung malignancy in 47% (n=63), metastatic disease in 19.9% (n=27) when considered together with the metastatic subcategorization, infection/ inflammation in 17.9% (n=24), and benign/other entities in the remaining patients. The most common specific preliminary diagnosis was

primary lung malignancy, followed by metastasis and infection.

Radiologically, solid lesions (42.7%) and ground-glass opacities (21.7%) were the most common CT findings. PET-CT demonstrated hypermetabolic activity in 54.8% of patients, while 17.8% had no PET-CT evaluation (Table 2).

Table 2: Clinical and Diagnostic Features

CT findings	Solid Nodule	67(42.7)
	Ground Glass Nodule	34(21.7)
	Pleural Effusion	2(1.3)
	Mediastinal LAP	22(14.0)
	Consolidation	32(20.4)
Lesion Location	Right upper lobe	53 (33.8)
	Right middle lobe	13 (8.3)
	Right lower lobe	25 (15.9)
	Left upper lobe	34 (21.7)
	Left lower lobe	27 (17.2)
PET	Hypermetabolic	86(54.8)
	Hypometabolic	43(27.4)
	No PET	28(17.8)
Board decision	Bronchoscopy	27(17.2)
	Mediastinoscopy	2(1.3)
	Wedge Biopsy	53(33.8)
	CT Follow-up	52(33.1)
	Neoadjuvant-Surgery	2(1.3)
	Curative Surgery	0(0.0)
	DefinitiveRT-CTx	6(3.8)
	Transthorasic Biopsy	4(2.5)
	Other	11(7.0)

CT:computed tomography; LAP:lymphadenopathy; PET:Positron Emission Tomography; RT:Radiotherapy; CTx: chemotherapy

Following the diagnostic procedures, the final diagnoses were as follows: small cell lung cancer in 0.6%, lung adenocarcinoma in 10.8%, squamous cell carcinoma in 7.6%, infection in 13.4%, metastasis in 8.9%, diffuse parenchymal lung disease in 1.3% and sarcoidosis in 3.8%. The remaining 45.1% (n = 60) comprised a heterogeneous "other diagnoses" category, which was further sub-classified as organizing pneumonia/non-specific interstitial changes (18.3%), reactive lymphadenopathy/non-malignant lymphadenopathy (15.0%), post-treatment/post-surgical changes (15.0%), atypical adenomatous hyperplasia/benign tumor (11.7%), COPD / asthma-related imaging findings (10.0%), other granulomatous (10.0%) and miscellaneous/ not further classifiable (20.0%).

Of the 24 patients who did not attend follow-up visits, 18 (75.0%) had been recommended for tissue sampling or surgical biopsy, 4 (16.7%) for additional imaging/follow-up, and 2 (8.3%) for other interventions. These patients were retained in descriptive analyses of demographic and imaging characteristics but excluded from concordance and diagnostic performance analyses.

A direct diagnostic impact of the multidisciplinary thoracic board was observed when preliminary and final diagnoses were compared. The 2×2 contingency table summarizing board preliminary classification against the final diagnosis is presented. Diagnostic performance was assessed as follows: a 2×2 contingency table comparing the board's preliminary classification (malignant vs. benign/non-malignant) with the final confirmed classification was constructed, and true-positive, false-positive, true-negative, and false-negative counts were derived; sensitivity, specificity, positive predictive value, and negative predictive value were calculated both at the board's natural clinical decision threshold and at the ROC-optimal cutoff; ROC analysis was performed with the area under the curve reported with a 95% confidence interval; and McNemar's test (with continuity correction where appropriate) was used to test for a statistically significant difference between paired preliminary and final malignancy classifications (Table 3). At the ROC-optimal cutoff, both sensitivity and specificity were 62%, reflecting a balanced but moderate diagnostic performance. McNemar's test with continuity correction, based on 70 discordant pairs, yielded a χ^2 value of 60.36 ($p < 0.001$), confirming a statistically significant difference between preliminary board classifications and final diagnoses. These findings underscore the tendency of the multidisciplinary thoracic board to overestimate malignancy at its natural clinical threshold, while also highlighting the diagnostic refinement achieved through subsequent histopathological confirmation.

In 66.0% (n = 68) of patients initially considered malignant by the board, the final diagnosis was benign or non-malignant, demonstrating a clear

tendency toward overestimation of malignancy at the preliminary board stage. This reflects the high-sensitivity, low-specificity natural threshold of the board's clinical decision rule and is consistent with the safety-first approach typical of multidisciplinary oncology case discussion. Conversely, in 6.9% (n = 2) of malignant cases, the initial board classification was non-malignant, reflecting the added diagnostic value of subsequent histopathological examination and follow-up. The high NPV (94.6%) indicates that patients designated "non-malignant" by the board were very rarely subsequently diagnosed with cancer supporting the safety of the conservative pathway for the non-malignant group.

Table 3: Concordance Between Malignancy Levels in Diagnoses

	Final Diagnosis		
	Malignant	Benign/Non-Malignant	Total
MTB Preliminary:Malignant	TP=27	FP=68	95
MTB Preliminary:Benign/Non-Malignant	FN=2	TN=36	38
Total	29	104	133
Diagnostic Performance at the Board's Natural Clinical Threshold			
• Sensitivity: 93.1% • Specificity: 34.6% • Positive Predictive Value (PPV): 28.4% • Negative Predictive Value (NPV): 94.7%			

TP (True Positive), FP (False Positive), TN (True Negative), FN (False Negative), PPV (Positive Predictive Value), NPV (Negative Predictive Value), MTB (Multidisciplinary thoracic boards)

Discussion

In this study, the contribution of multidisciplinary thoracic boards to clinical practice was retrospectively evaluated. Our findings demonstrate a statistically significant but moderate level of diagnostic concordance between multidisciplinary thoracic board assessments and final diagnoses. Several factors plausibly contributed to the moderate overall concordance (AUC = 0.63) observed. First, the natural clinical threshold of the multidisciplinary board is calibrated towards high sensitivity and avoidance of missed malignancies, which inherently produces many false-positive preliminary classifications (n = 68 of 95 in our cohort). Second, a substantial fraction of pulmonary nodules discussed at boards are radiologically indeterminate, and in the absence of advanced molecular or AI-assisted decision-support tools, the board must rely on Fleischner-style morphology-based risk assessment. Third, the heterogeneity of the "other diagnoses" category which comprised organizing pneumonia, reactive lymphadenopathy, atypical adenomatous hyperplasia, COPD related changes, and autoimmune conditions represents clinical entities that are well known to mimic malignancy both radiologically and clinically, contributing to discordance. These findings suggest that multidisciplinary discussions may contribute to diagnostic decision making; however, the present study design does not allow causal conclusions regarding their effectiveness. The importance of multidisciplinary thoracic boards extends beyond individual clinical decisions. Gomes et al. emphasized that multidisciplinary cancer conferences (MCCs) improve the quality of decision-making by integrating diverse expertise and promoting evidence-based practices [7]. They further highlighted that structured MCCs contribute to positive patient outcomes, enhance communication among specialists, and facilitate continuous quality improvement through the use of validated assessment tools and targeted interventions. These findings support our observation that multidisciplinary discussions provide a systematic framework for managing complex thoracic cases and optimizing patient care.

One of the most common reasons for referring patients to the thoracic board is the presence of pulmonary nodules. When certain risk factors are present, the likelihood of malignancy in pulmonary nodules increases. These factors include nodule size, smoking frequency, nodule shape, growth rate, and location. When such risk factors exist, evaluation is relatively straightforward. In particular, the Fleischner guidelines serve as a useful reference in this context [5,6] . However, in some cases, decision-making is not always easy. In our study, a significant portion of patients were referred to the board due to pulmonary nodules. Of these, 33.8% underwent surgical biopsy and 17% underwent bronchoscopic biopsy. In a study conducted in the United States, follow-up imaging was recommended in 43% of cases referred to a multidisciplinary nodule board, diagnostic procedures in 36%, and malignancy

was detected in 65% of those who underwent diagnostic procedures [8]. Similarly, in a study by Liu et al., multidisciplinary team discussions were observed to increase the positive predictive value for malignancy in the evaluation of small solitary pulmonary nodules (≤2 cm) [9]. This finding suggests that, especially in resource-limited settings, boards contribute to early diagnosis and appropriate referral while reducing unnecessary invasive procedures. These findings are consistent with the results of our study.

Flaherty et al. demonstrated that multidisciplinary discussions improve diagnostic reliability in interstitial lung diseases [10]. Particularly in differentiating between UIP and NSIP, diagnoses based solely on radiological or pathological findings may be insufficient, and the multidisciplinary board is emphasized as the gold standard in diagnosis. Furthermore, Ryerson et al. reported that multidisciplinary board decisions are strongly associated with long-term prognosis [11]. Although our study on interstitial lung diseases did not evaluate prognosis, we did have patients who required parenchymal biopsy for diagnostic purposes.

In our study, it was observed that the most frequently referring department to the thoracic board was pulmonology. This finding is consistent with the literature. For instance, Walsh et al. demonstrated that pulmonologists are the leading discipline guiding the process in interstitial lung disease centers [12]. However, the contributions of oncology, radiology, and thoracic surgery are critically important, especially in the diagnosis and treatment planning of malignant cases.

Osarogiagbon et al. described multidisciplinary thoracic oncology programs as essential vehicles for quality improvement and emphasized the need to establish meaningful benchmarks to evaluate their success [13]. The authors proposed that effective multidisciplinary programs should incorporate stakeholder perspectives, standardized processes, and measurable outcomes to ensure sustainability and continuous improvement. These recommendations align with the present study, in which the multidisciplinary board served as an organized platform for collaborative decision-making and coordinated patient management.

Our findings also show that a significant portion of decisions made in multidisciplinary boards lead to changes in clinical management. Particularly noteworthy is the proportion of cases whose preliminary diagnosis differed from the final diagnosis after board evaluation. The data from this study clearly reveal the impact of multidisciplinary board assessments on diagnostic and therapeutic approaches. Among the 29 patients ultimately diagnosed with malignancy, 93.1% (n=27) had a preliminary diagnosis of malignancy, while 6.9% (n=2) did not (p=0.01). Following advanced investigations and histopathological examination, only two patients' diagnoses changed. The consistency between the initial primary diagnosis, board evaluation, and final diagnosis once again underscores the importance of the multidisciplinary approach.

Patients in this group who were initially suspected of malignancy but ultimately diagnosed with non-malignant conditions were spared unnecessary and potentially toxic oncological treatments. Instead, they received appropriate therapies targeting the actual underlying pathology, such as infections or benign diseases. This finding aligns with the study by Walsh et al., which reported that approximately one-third of cases presented to the board had their diagnoses revised [14] . This highlights that the multidisciplinary approach not only confirms diagnoses but also prevents incorrect or incomplete clinical guidance.

Similarly, Kreidieh and Tfayli reported that multidisciplinary thoracic tumor boards resulted in modifications of treatment plans in 45.2% of patients and diagnostic discussions in approximately one-third of cases [15]. Furthermore, 87.2% of the recommendations made during tumor board meetings were successfully implemented in clinical practice. The authors suggested that the value of multidisciplinary meetings should not only be assessed by changes in management but also by their ability to establish consensus-driven upfront management strategies. Our findings are consistent with this perspective, demonstrating that thoracic board discussions substantially influence both diagnostic pathways and therapeutic decision-making.

Additionally, in the 30 cases with a confirmed diagnosis of malignancy, treatment plans were personalized and optimized based on the specific histological subtypes (small cell carcinoma, adenocarcinoma, squamous cell carcinoma) and staging information. This approach enabled more accurate and effective treatment decisions not only for patients ultimately diagnosed with non-malignant conditions but also for those with confirmed malignancies, thereby benefiting the entire patient population.

In the study by Gaudioso et al. multidisciplinary thoracic board discussions significantly improved median overall survival in patients with stage III/IV lung cancer (36.9 vs. 19.3 months; $p < 0.001$) and increased guideline adherence from 80% to 94% [16] . Moreover, treatment plans were altered in 41% of cases. Although our study did not assess survival outcomes, we observed changes in both diagnostic and therapeutic approaches among our patients.

Recent evidence also suggests that technological innovations may further improve the effectiveness of multidisciplinary meetings. Ibekwe et al. demonstrated that the implementation of a tumor board-specific information technology platform significantly enhanced the quality of case presentations and discussions during thoracic multidisciplinary conferences [17]. Although improvements in guideline adherence and treatment implementation were not observed, the authors concluded that technology can optimize information exchange and support more comprehensive clinical deliberations. These findings underscore the potential role of digital tools in strengthening the quality and efficiency of thoracic board activities.

Limitations

Our study has several limitations. First, due to its retrospective, single-arm design, causal inference regarding board effectiveness is not possible; no comparators (e.g., standard clinical decision-making without board evaluation) were available. Second, 24 patients (15.3%) did not attend follow-up visits after the board decision and were excluded from concordance analyses, which may introduce selection bias; however, this pre-specified exclusion was necessary to maintain a valid primary endpoint. Third, as a single-center study, the generalizability of the results is limited by institutional case-mix and referral patterns.

Conclusion

Multidisciplinary thoracic board assessments demonstrated statistically significant but moderate concordance with final diagnoses. Although these findings support the potential value of multidisciplinary discussion in complex thoracic cases, the absence of a control group precludes conclusions regarding effectiveness. Prospective controlled studies are needed to further define the impact of multidisciplinary boards on diagnostic accuracy and patient outcomes.

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