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Systematic review

Diagnostic accuracy of family physicians in identifying high-risk dermatologic conditions requiring emergency referral: a systematic review

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Abstract

Background: Family physicians evaluate skin disorders associated with diagnostic delay, systemic deterioration, tissue destruction, or delayed cancer treatment. These presentations include suspected malignancy, severe drug reactions, and invasive infection, although their referral pathways differ, this review evaluated diagnostic and referral performance in these categories. **Methods:** Original studies published through 31 Jan 2026 were reviewed using predefined criteria. Patient-based investigations were separated from studies using standardized photographs or clinical vignettes, while cancer pathways were analyzed independently from same-day dermatologic emergencies. **Results:** Ten studies evaluated diagnostic classification, referral, excision decisions, or image-based recognition. Melanoma sensitivity in general practitioners was 29% in one comparative study, whereas another reported 66.7% sensitivity and 92.0% specificity for recognizing malignant lesions. Following training, dermoscopy increased referral sensitivity from 54.1% to 79.2% without reducing specificity. Sequential dermoscopy reduced excision or referral of suspicious lesions by 56.4%, whereas other diagnostic aids produced inconsistent effects. In an urgent-disease vignette study, family physicians recognized Stevens-Johnson syndrome in 71.4% and pemphigus vulgaris in 28.6% of responses. **Conclusion:** Diagnostic performance varied according to disease spectrum, clinical setting, physician experience, assessment method, and outcome definition. Training-supported dermoscopy improved selected cancer-triage outcomes, although benefits were not reproduced across all diagnostic technologies.

Keywords: Diagnostic accuracy; dermatologic emergencies; family physicians; general practice; melanoma.

Introduction

Dermatologic disorders constitute a major component of general practice because primary-care clinicians provide the initial assessment, determine the level of urgency, and decide whether management requires reassurance, treatment, biopsy, specialist review, or immediate hospital evaluation. This gatekeeping function becomes important when visually similar lesions represent different prognoses, since delayed escalation and indiscriminate referral carry clinical and service consequences. Diagnostic accuracy in family medicine extends beyond naming a condition and includes recognizing risk, selection of appropriate pathway, and avoidance of false reassurance when definitive verification is required (1).

Acute high-risk dermatoses form a clinically diverse group in which timely escalation depends on recognition of systemic toxicity, rapidly progressive tissue injury, mucosal involvement, severe pain, or extensive epidermal detachment. Stevens-Johnson syndrome and toxic epidermal necrolysis demand identification of the clinical pattern and suspected medication exposure, followed by urgent multidisciplinary care because deterioration extends beyond the skin (2). Necrotizing soft-tissue infection presents a different diagnostic challenge, since early cutaneous findings appear nonspecific even though suspicion of aggressive infection requires immediate surgical assessment (3).

Suspected melanoma and keratinocyte cancers follow an expedited diagnostic pathway in which delayed recognition risks more advanced disease and more extensive treatment, although suspected cancer does not automatically constitute an emergency-department referral (4). Earlier research comparing dermatologists with primary-care physicians found considerable variation in melanoma sensitivity and distinguished accurate diagnostic naming from the broader decision to biopsy or refer a suspicious lesion. This distinction is clinically important because an incorrect provisional label still permits appropriate management when the physician recognizes malignancy risk and arranges definitive histopathological assessment (5).

A Cochrane diagnostic review reported that visual-inspection performance differed according to whether assessment occurred in person or through selected images (6). A separate review of dermoscopy in primary care found that diagnostic performance was affected by training,

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implementation, clinical setting, and the threshold used for referral or excision (7). This separation was necessary because an accurate disease label, an appropriate cancer-referral decision, and recognition of an unstable dermatologic emergency involve different thresholds and consequences for patients (5-7). The present review evaluated the accuracy of family physicians in identifying high-risk dermatologic conditions, distinguished diagnosis from referral performance, separated patient-based studies from image-based assessments.

Methods

This systematic review was designed in accordance with PRISMA 2020 and the diagnostic-test-accuracy extension of PRISMA. PubMed, Scopus, Web of Science Core Collection, and the Cochrane Library were searched from database inception through 31 Jan 2026, and the reference lists of eligible reports and relevant reviews were examined for additional publications. The search combined controlled vocabulary and free-text terms describing family physicians, general practitioners, primary care, dermatologic disease, skin malignancy, severe cutaneous reactions, diagnostic accuracy, recognition, triage, and referral.

Studies were eligible when they assessed family physicians, family medicine residents, general practitioners, or primary-care physicians evaluating a dermatologic presentation with potentially serious consequences from delayed diagnosis. Reference standards comprised dermatologist assessment, histopathology, hospital diagnosis, multidisciplinary expert consensus, surgery, or adequate clinical follow-up; standardized images and vignettes were eligible only when the correct diagnosis had been established in advance. Eligible outcomes included sensitivity, specificity, predictive values, diagnostic agreement, missed diagnosis, appropriate referral, under-referral, over-referral, and sufficient information to reconstruct a diagnostic 2 × 2 table. Studies limited to knowledge, confidence, or self-reported competence without an objectively defined diagnosis were excluded, as were case reports, reviews, editorials, routine minor dermatoses, and mixed-professional investigations lacking extractable primary-care physician results.

Two authors independently screened titles and abstracts, examined eligible full texts, and resolved disagreements through discussion and consensus. The same authors independently extracted the study setting, design, physician group, patient or lesion sample, target condition, index assessment, reference standard, diagnostic threshold, and reported accuracy or referral outcomes using a standardised form. Patient-based studies, image-based experiments, and vignette assessments were classified separately, while same-day dermatologic emergencies were distinguished from expedited suspected-cancer referrals.

Risk of bias and applicability were evaluated by two authors using the four QUADAS-2 domains covering patient selection, index testing, reference standards, and participant flow or timing. Sensitivity, specificity, predictive values, diagnostic agreement, appropriate referral, missed diagnoses, and excision yield were retained according to the definitions used by each study. Where several reports described overlapping data, the most complete dataset was retained, and supplementary reports contributed only unique outcomes absent from the principal publication. Statistical pooling was not performed because the included investigations differed in target conditions, clinical thresholds, verification procedures, outcome definitions, and units of analysis; consequently, the findings were organized through structured narrative synthesis.

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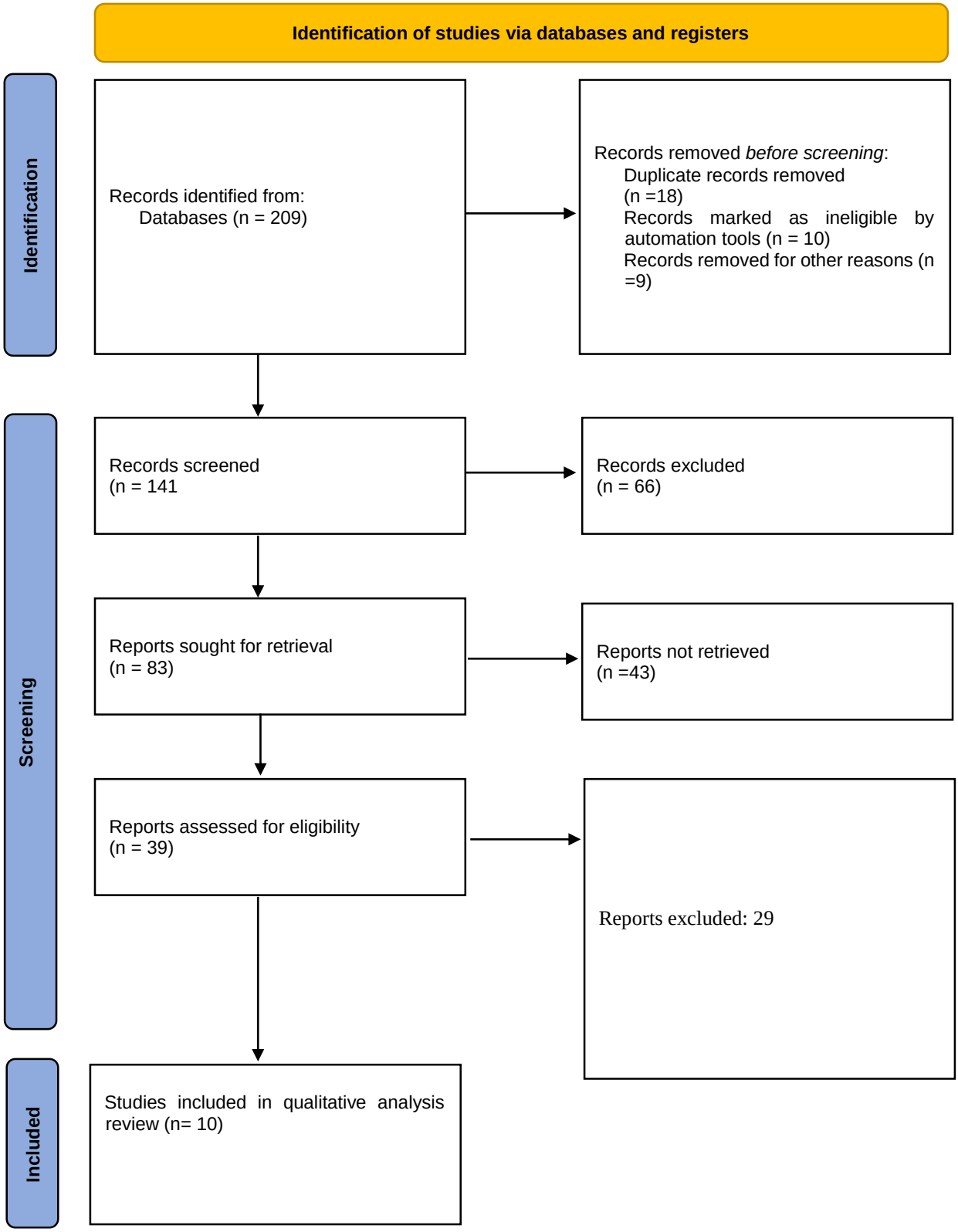


Figure 1: PRISMA flow chart

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Results

Ten articles met the eligibility criteria, of which eight investigated patients or lesions encountered within clinical pathways and two assessed physician performance using selected images or predefined clinical vignettes. Most patient-based data concerned suspected skin cancer, whereas only one study supplied separately extractable family-physician results for acute high-risk dermatoses. Heterogeneity was present in target conditions, index assessments, verification methods, and outcomes, precluding an interpretable pooled estimate. The applicability concerns arose from selected excision samples, controlled image sets, and indirect referral outcomes.

Youl et al. compared 104 mainstream general practitioners with 50 physicians working in primary-care skin cancer clinics and found comparable sensitivity for any skin cancer, at 91% and 94%, respectively (8). In a histology-linked analysis of minor surgical procedures, Pockney et al. reported lesion-level sensitivity of 66.7%, specificity of 92.0%, positive predictive value of 40.0%, and negative predictive value of 97.2% for general-practitioner recognition of malignancy (9). These results indicate that apparently strong performance for broad malignancy recognition does not imply equally accurate classification of individual tumour types (8,9).

The randomized study by Argenziano et al. included 73 trained primary-care physicians who evaluated 2,522 patients, with referral sensitivity rising from 54.1% under unaided examination to 79.2% with dermoscopy, while specificity remained essentially unchanged at 71.3% and 71.8% (10). Menzies et al. subsequently assessed 374 suspicious pigmented lesions managed by 63 primary-care physicians and reported that dermoscopy with optional sequential digital monitoring reduced excision or referral by 56.4%, while 97.6% of malignant pigmented lesions received appropriate management (11). These studies associated structured dermoscopy training with improved discrimination between lesions requiring escalation and benign lesions suitable for observation (10,11).

Practice organization and diagnostic technology produced less consistent findings across other investigations (12-15). Rosendahl et al. analyzed 21,900 excised lesions containing 2,367 melanomas and reported a melanoma number needed to treat of 17.0 among generalist practitioners, compared with 8.5 among physicians practising exclusively in skin cancer medicine (12). MoleMate did not improve appropriate referral in Walter et al., while Koelink et al. found correct diagnoses in 50.5% of dermoscopy-group lesions and 40.5% of control lesions, and English et al. found no improvement in the adjusted benign-to-melanoma excision ratio after introducing a diagnostic aid (13-15).

In the selected-image experiment by Westerhoff et al., training increased melanoma sensitivity with surface microscopy from 57.8% to 75.9%, although the controlled photographic format differed from an unselected consultation (16). Aljohani et al. reported that the 28 family physicians within a mixed-specialty vignette study recognised cellulitis in 92.9%, Stevens-Johnson syndrome in 71.4%, staphylococcal scalded skin syndrome in 64.3%, leukocytoclastic vasculitis in 39.0%, and pemphigus vulgaris in 28.6% of responses (17). Because these scenarios assessed diagnostic recognition rather than actual transfers, they did not establish sensitivity for same-day emergency referral in routine family practice (17).

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Table 1. Characteristics and applicability of the included original studies

Study	Setting and design	Sample	Index assessment and reference standard	Main applicability concern
Youl et al. (8)	Australia; prospective comparison	104 mainstream GPs, 50 skin cancer clinic doctors; 28,755 encounters	Clinical diagnosis versus histopathology	Verification concentrated on sampled lesions
Pockney et al. (9)	United Kingdom; observational trial analysis	82 GPs; 491 lesions with histology	Malignancy judgement versus histopathology	Selected minor-surgery population
Argenziano et al. (10)	Spain/Italy; randomized study	73 physicians; 2,522 patients	Unaided examination versus dermoscopy; expert assessment/histology	Assessment followed one-day training
Menzies et al. (11)	Australia; sequential intervention	63 physicians; 374 lesions	Naked-eye management followed by dermoscopy and digital monitoring	No concurrent untreated group
Rosendahl et al. (12)	Australia; prospective audit	21,900 excisions; 2,367 melanomas	Prospective suspicion versus histopathology	Excision yield did not measure sensitivity
Walter et al. (13)	United Kingdom; randomized trial	1,297 participants; 1,580 lesions	Best practice with or without MoleMate; expert assessment	Referral appropriateness was the endpoint
Koelink et al. (14)	Netherlands; cluster-randomized trial	48 practices; 416 lesions	Naked-eye assessment versus dermoscopy; final diagnosis	Accuracy estimate was imprecise
English et al. (15)	Australia; practice-randomized trial	468 GPs; 223 practices	Diagnostic aid versus usual care; excision histology	Unexcised lesions lacked verification
Westerhoff et al. (16)	Australia; randomized image study	74 GPs; 100 lesions	Clinical and surface-microscopy images; histopathology	Selected images limited clinical applicability
Aljohani et al. (17)	Saudi Arabia; vignette survey	161 physicians, including 28 family physicians	Predefined illustrated scenarios	Typical vignettes did not measure referral

Table 2. Principal diagnostic and referral findings

Study	Main result	Interpretation
Youl et al. (8)	Any-cancer sensitivity: 91% for mainstream GPs and 94% for clinic doctors; melanoma: 29% and 60%	Broad cancer recognition exceeded melanoma-specific sensitivity

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Study	Main result	Interpretation
Pockney et al. (9)	Sensitivity 66.7%; specificity 92.0%; PPV 40.0%; NPV 97.2%; κ = 0.45	Accuracy reflected a histology-linked minor-surgery sample
Argenziano et al. (10)	Referral sensitivity increased from 54.1% to 79.2%; specificity remained 71.3% and 71.8%	Training-supported dermoscopy improved sensitivity without lowering specificity
Menzies et al. (11)	Excision/referral decreased 56.4%; 97.6% of malignant lesions received correct management	Benign-lesion discrimination improved while malignant-lesion management remained high
Rosendahl et al. (12)	Melanoma NNT: 17.0 in generalist, 9.4 in special-interest, and 8.5 in exclusive skin cancer practice	Practice concentration correlated with excision yield
Walter et al. (13)	Appropriate referrals: 56.8% with MoleMate and 64.5% with best practice alone	MoleMate did not improve referral appropriateness
Koelink et al. (14)	Correct diagnoses: 50.5% with dermoscopy and 40.5% in controls; OR 1.51, 95% CI 0.96-2.37	The difference was statistically imprecise
English et al. (15)	Adjusted benign-to-melanoma ratio: 1.02, 95% CI 0.68-1.51	The diagnostic aid did not improve excision efficiency
Westerhoff et al. (16)	Image-based melanoma sensitivity increased from 57.8% to 75.9% after training	Education improved controlled test performance
Aljohani et al. (17)	Family physicians: cellulitis 92.9%, SJS 71.4%, SSSS 64.3%, vasculitis 39.0%, pemphigus 28.6%	Recognition varied and did not measure emergency referral

Discussion

This review identified marked variation in family physicians' performance, with the magnitude and clinical meaning of reported accuracy depending on whether investigators measured a precise diagnostic label, broad recognition of malignancy, selection for referral or biopsy, or the yield of excised lesions. A recent meta-analysis found that lesion type, physician experience, and examination method substantially influenced skin-cancer accuracy, reinforcing the need to interpret estimates within their original clinical and methodological context (18). A single summary estimate spanning cancer, severe drug reactions, invasive infection, clinical consultations, photographs, and vignettes would obscure rather than clarify the available findings.

The strongest comparative result involved trained dermoscopy use, which increased referral sensitivity by approximately 25 percentage points in the Argenziano trial without a meaningful loss of specificity (10). The sequential intervention evaluated by Menzies et al. also reduced unnecessary excision or referral while retaining appropriate management for nearly all malignant lesions, suggesting that targeted technology is most useful when embedded within structured education and an explicit management pathway (11). MoleMate and the diagnostic aid evaluated by English et al. failed to improve their principal referral or excision outcomes, indicating that

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additional information alone does not ensure better clinical decisions (13,15).

Physician experience and practice concentration also appeared relevant, since melanoma excision yield improved progressively from generalist practice to exclusive skin cancer practice, even after consideration of dermoscopy use (12). This pattern supports the interpretation that repeated clinical exposure, case selection, and developed visual expertise contribute to performance alongside the instrument itself (12,18). The image-based improvement reported after surface-microscopy training remains educationally relevant, although predetermined lesion sets omit history, palpation, evolving symptoms, competing diagnoses, and follow-up decisions that shape real primary-care assessment (6,16).

The data concerning acute dermatologic emergencies was substantially narrower than the cancer literature, consisting principally of separate subgroup results from one vignette investigation (17). Recognition differed sharply between conditions, with relatively high scores for cellulitis and substantially lower scores for pemphigus vulgaris and leukocytoclastic vasculitis, which identifies specific educational gaps without measuring actual emergency transfer, stabilisation, or subsequent patient outcome (17). Acute escalation remains a condition-specific clinical decision guided by features such as mucosal injury, epidermal detachment, rapid progression, severe pain, and systemic toxicity rather than by extrapolation from melanoma studies (2,3,17).

Interpretation requires attention to selective verification, because investigations restricted to biopsied or excised lesions omit high-risk conditions that were neither recognised nor sampled, thereby inflating reassurance regarding negative assessments (6,9). Transparent reporting under PRISMA 2020 and PRISMA-DTA requires explicit description of study selection, index-test thresholds, target conditions, and reference standards, while QUADAS-2 highlights the associated risks arising from patient selection and incomplete verification (19-21). Future studies reported according to STARD need consecutive primary-care recruitment, predefined referral thresholds, verification of initially negative assessments through histology or adequate follow-up, and separate reporting of diagnostic accuracy, referral appropriateness, treatment delay, and clinical outcomes for cancer and same-day emergencies across diverse health systems and levels of dermatology access worldwide.

Conclusion

Family physicians' diagnostic performance varied substantially according to the target condition, clinical setting, physician experience, examination method, and outcome definition. Training-supported dermoscopy improved referral sensitivity and reduced unnecessary procedures in selected cancer studies, whereas other diagnostic technologies produced inconsistent benefits. Data concerning acute dermatologic emergencies remained limited to vignette-based recognition, without direct measurement of same-day referral accuracy or patient outcomes. Cancer pathways and immediate dermatologic emergencies therefore require separate evaluation. Future clinical studies require consecutive recruitment, verified follow-up of negative assessments, explicit referral thresholds, and condition-specific reporting of missed diagnoses, appropriate escalation, treatment delay, and subsequent clinical outcomes across settings.

Abbreviations

CI, confidence interval; GP, general practitioner; NNT, number needed to treat, used in the included literature as an excision-yield measure; NPV, negative predictive value; OR, odds ratio; PCP, primary-care physician; PPV, positive predictive

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value; PRISMA, Preferred Reporting Items for Systematic Reviews and Meta-Analyses; PRISMA-DTA, PRISMA for Diagnostic Test Accuracy; QUADAS-2, Quality Assessment of Diagnostic Accuracy Studies 2; SJS, Stevens-Johnson syndrome; SSSS, staphylococcal scalded skin syndrome; STARD, Standards for Reporting Diagnostic Accuracy Studies; TEN, toxic epidermal necrolysis.

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