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Dermoscopy in General Practice: A Retrospective Study of Skin Lesion Assessment, Diagnostic Yield, and Two-Week-Wait (2WW) Referrals

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Abstract

Introduction: Dermoscopy is a non-invasive diagnostic tool allowing for the visualisation of skin lesions with greater clarity than the naked eye. If widely adopted in primary care, it can potentially enhance the diagnostic yield of suspicious skin lesions by general practitioners (GPs), leading to a more effective 2WW (two-week-wait) referral pathway.

Objectives: This study aims to assess the effectiveness of dermoscopy in identifying suspicious skin lesions and its impact on the 2WW pathway with regard to referral outcomes and diagnostic yield within primary care.

Method: This was a retrospective observational study within a general practice surgery in Eltham Medical Practice, London, UK. A total of 4,658 patients had their skin lesions assessed by a single GP using a dermoscope within a mole clinic between 1 January 2020 and 31 December 2024. There were 575 2WW referrals, with data collected from EMIS Health.

Results: Over 60 months (01/01/2020 to 31/12/2024), 4,658 patients underwent dermoscopic assessment, resulting in 575 (12.3%) 2WW referrals. Within referrals, 275 (47.8%) were diagnosed with cancerous or precancerous lesions: 11 cases (1.9%) of melanoma, 54 cases (9.4%) of squamous cell carcinoma (SCC), and 144 cases (25.0%) of basal cell carcinoma (BCC). In 2023, the diagnostic yield with dermoscopy was 6.7% (1/15) for melanoma, 51.2% (21/41) for SCC, and 91.6% (22/24) for BCC.

Conclusion: Incorporating regular dermoscopy use within general practice, coupled with adequate training, could improve identification of suspicious skin lesions by GPs, resulting in a greater proportion of appropriate referrals to secondary care. This may reduce the burden of the 2WW skin cancer pathway on secondary care whilst improving patient outcomes; further comparative studies are necessary to determine these benefits.

Categories: Family/General Practice, Oncology, Dermatology
Keywords: 2ww referrals, dermatology, dermoscopy, diagnostic accuracy, skin cancer

Introduction

Skin cancer is a major public health concern in the UK, as incidence rates continue to rise each year [1]. The principal categories of skin cancer are non-melanoma skin cancers (basal cell carcinoma and squamous cell carcinoma) and melanomas, the most aggressive subtype clinically [2]. Since the early 1990s, melanoma cases have more than doubled in the UK, as projections suggest an estimate of 26,500 new melanoma cases annually by 2038-2040 [1].

Early diagnosis and treatment are crucial, as they can also significantly reduce costs associated with advanced-stage treatment and hospital admission, as well as improve patient outcomes [3]. Skin cancer management often involves a multidisciplinary approach including dermatology, oncology, surgery and primary care services, which further exacerbates the financial burden [4]. In 2008, the cost of skin cancer to the National Health Service (NHS) was around £106 million per year, with the cost being around £2560-£2607 per case of melanoma, and the projected cost to the NHS in 2020 was over £180 million annually [5]. According to data collected from Northern Ireland in 2021/2022, the current cost of treating a malignant melanoma case has risen to £31,000, which is tenfold larger than previous estimates [4]. Melanoma cases are expected to increase by 28% by 2040, necessitating an estimated additional £3.8 million for treatment [4].

The role of general practice in skin cancer detection

As the first point of contact for patients, general practitioners (GPs) are essential for the early detection of

skin malignancies [6]. They are responsible for identifying suspicious skin lesions and assessing the need for a specialist referral for further investigation [6]. A full-time GP is estimated to diagnose one person with melanoma every three to five years [7]. Current NHS guidelines require GPs to conduct thorough clinical assessments, including a robust medical history, examining the lesion under good lighting (with or without magnification), assessing lymph nodes and using the weighted seven-point checklist to evaluate major and minor characteristics of the lesion [8]. These steps establish the need for a referral. If melanoma is suspected, an urgent two-week-wait (2WW) referral through the suspected cancer pathway is made, ensuring an appointment within two weeks [8].

Current uses of dermoscopy

Dermoscopy is a non-invasive diagnostic tool that allows for more detailed visualisation of skin lesions than the naked eye, potentially improving detection of skin cancers [9]. Despite research suggesting that dermoscopy is effective, its adoption by general practitioners remains limited [10]. Research suggests that GPs do not use dermoscopy consistently; it has been reported to be used in only 8.4% of consultations involving suspicious skin lesions [10]. Research into reasons behind why GPs are not using dermoscopy illustrates two main influences: cost of equipment and the need for relevant training [11].

General practice

A GP partner at a UK General Practice has implemented dermoscopy use within a mole clinic to help assess suspicious skin lesions and determine whether an urgent referral to a specialist is required. The clinic demonstrated a high diagnostic yield among 2WW referrals, with a greater proportion of referrals resulting in confirmed cancerous and precancerous diagnoses when compared to previous studies.

From January 2020 to December 2024, a total of 4,658 patients attended the mole clinic over a span of 60 months. Of these, 12.3% (575) were referred using the 2WW referral pathway following dermoscopic assessment. A total of 275 patients were subsequently diagnosed with skin cancer or a precancerous lesion, accounting for 47.8% of 2WW referrals. The subtypes of skin cancer diagnosed include melanoma, squamous cell carcinoma, and basal cell carcinoma. The precancerous lesions included Bowen's disease, also known as squamous cell carcinoma in situ.

Objectives

The study aimed to determine the detection rate of cancerous and precancerous lesions with the use of dermoscopy by identifying the proportion of 2WW referrals resulting in a biopsy diagnosis over a five-year period. In addition, this study aimed to evaluate the accuracy of clinical suspicion achieved with dermoscopy with regard to specific skin cancers (melanoma, basal cell carcinoma, and squamous cell carcinoma) over a single year of 2WW referrals.

We sought to contextualise the diagnostic yield following dermoscopic assessment in general practice by comparing our findings to studies looking at primary care 2WW skin cancer referrals, as well as the diagnostic accuracy of skin lesions achieved by general practitioners with the naked eye.

This paper was presented as an abstract at the British Journal of General Practice Conference 2026.

Materials And Methods

Study design

This retrospective service evaluation study aimed to evaluate the effectiveness of dermoscopy in diagnostic yield and referral outcomes regarding skin cancers within primary care. This study was conducted at Eltham Medical Practice in London, UK, from January 2020 to December 2024. A total of 4,658 patients were assessed within the practice mole clinic across a 60-month period by a single GP trained in dermoscopy. With regard to patients with multiple visits, only their initial presentation was included; this was to reduce any duplicate assessments of the same skin lesion. Patients with suspicious skin lesions were referred through the NHS 2WW skin cancer referral pathway for further investigations in secondary care.

Mole clinic

The mole clinic, established by a GP partner, is a specialised service exclusively for assessment of suspicious skin lesions. Patients expressing concern regarding a skin lesion at a routine appointment or through reception would subsequently be booked into this clinic for further assessment. The mole clinic offers in-clinic cryotherapy treatment and can refer patients on to a minor surgery list for benign skin lesion excision depending on the type of lesion. All suspected cancerous lesions were referred to specialists in secondary care under the 2WW pathway per the GP's clinical judgement.

Dermoscopic assessment

The GP used a dermoscope as the primary tool for skin lesion assessment within this clinic. The GP also took

dermoscopic images of suspicious skin lesions and uploaded them to electronic patient records. This GP's training for dermoscopy use includes attending a 12-week "Introduction to Dermoscopy" programme held by the University of Cardiff in 2013. This course teaches qualified doctors how to assess skin lesions using a dermatoscope, including topics such as assessment of lesions with a dermatoscope, global and local features, pattern analysis of melanocytic and non-melanocytic lesions, and a standardized approach to dermoscopic assessment.

The dermoscope used was the DermLite DL5 (DermLite LLC, San Juan Capistrano, CA, USA). The device had specifications that included 32 mm, 25 LEDS, 10x magnification, an in-built magnetic ruler for measuring lesions, and compatibility with smartphones via the MagnetiConnect clamp adapter.

Referral process and diagnosis

Patients with lesions that appeared suspicious under dermoscopic examination were referred using the 2WW referral pathway. The referral criteria were based on the findings of the dermoscopic assessment and clinical judgement, following the National Institute for Health and Care Excellence (NICE) guidelines for suspected skin cancer [4]. The primary outcome measures were the proportion of referred patients diagnosed with cancerous or precancerous lesions within 2WW referrals. Diagnoses were confirmed following biopsy and histopathological examination after excision of the lesion.

A secondary outcome was the histological confirmation rate for each respective skin cancer subtype, determined by comparing the GP's recorded suspected diagnosis with the histopathological findings, which would be the positive predictive value. This was collected across a single year in 2023, due to the fact that this year had the most complete data with regard to referral information. The GP recorded their diagnostic impression of the skin lesion on the 2WW document sent to secondary care; this was compared to the biopsy diagnosis of the lesion.

Data collection

Data on lesion characteristics, referral outcomes, and subsequent diagnoses were collected from electronic patient records. Referral data and suspected diagnoses were extracted from the 2WW referral form; histopathological confirmation of skin lesions was determined in secondary care and collected from clinic letters.

Comparative analysis

Statistical analysis was performed using GraphPad Prism (10.1.0, GraphPad Software Inc., USA). Chi-squared tests were used to compare the proportions of diagnosed skin cancers within referrals between our study and similar studies in current literature [12,13]. Z tests were used to compare positive predictive values for melanoma, squamous cell carcinoma and basal cell carcinoma between our study and a control arm in current literature [13]. A p-value less than 0.05 was considered statistically significant.

Statement of confidentiality

This was a service evaluation study; therefore, formal ethical approval was not sought, and this study was approved internally by the practice. All data were anonymised prior to analysis, with no patient-identifiable information collected, ensuring confidentiality throughout.

Results

There were 4,658 patients who underwent dermoscopic assessment over 60 months between 01/01/2020 and 31/12/2024. There were 575 (12.3%) 2WW referrals made, of which 275 (47.8%) patients were confirmed to have cancerous and precancerous lesions.

Within 575 2WW referrals, there were 209 (36.3%) patients with cancerous lesions (superficial + malignant melanoma, squamous cell carcinoma, basal cell carcinoma). There were 66 (11.5%) patients with precancerous lesions (SCC in situ). There were 11 (1.9%) cases of melanoma diagnosed from 2WW referrals, as well as 54 (9.4%) cases of SCC and 144 (25.0%) cases of BCC, as shown in Table *1*.

Type of skin malignancy	2WW referral confirmed diagnoses with dermoscopy (%)	2WW referrals, Queen's Hospital study (Haile-Redai et al. [12])	Naked-eye assessment (Koelink et al. [13])
Melanoma	11/575 (1.9%)	0/83 (0.0%)	2/206 (1.0%)
Squamous cell carcinoma	54/575 (9.4%)	3/83 (3.6%)	0/206 (0.0%)
Basal cell carcinoma	144/575 (25.0%)	8/83 (9.6%)	26/206 (12.6%)

TABLE 1: Rates of melanoma, SCC, and BCC diagnoses made across studies

The second column is our study in which dermoscopy was used. The proportion of each diagnosis type from 2WW referrals reported by Haile-Redai et al. [12] in a study at a UK hospital receiving 2WW referrals from GPs, expressed in the third column of the table. Diagnosis rates of skin malignancies from a study evaluating naked-eye diagnostic accuracy of Dutch general practitioners examining skin lesions, reported by Koelink et al. [13], are expressed in the fourth column of the table.

SCC: squamous cell carcinoma, BCC: basal cell carcinoma, 2WW: two-week wait, GP: general practitioner

Overall pick-up rate of common skin malignancies

Melanoma, SCC, and BCC diagnoses within 2WW referrals in this study were combined within our study, as were cases of each malignancy in a study conducted at Queen's Hospital [12]. We conducted a chi-squared test to compare our combined proportion of these three malignancies to the proportion observed in the Queen's Hospital study [12]. Our study's combined proportion of these three skin malignancies (36.3%) within 2WW referrals was significantly higher than the proportion (13.3%) observed in the Queen's Hospital study [12] ($P < 0.0001$, χ^2 (1) = 17.4).

Individual diagnosis rates of skin malignancies

As shown in Table *2*, the proportion of 2WW referrals that resulted in a melanoma diagnosis was greater within our study compared to the 2WW referrals of the Queen's Hospital study [12]; however, this comparison did not yield significance ($Z = 1.3$, $p = 0.204$). There was also a greater proportion of confirmed SCC diagnoses in comparison to the Queen's Hospital study [12]; this comparison tended toward significance ($Z = 1.8$, $p = 0.080$). The proportion of confirmed BCC diagnoses was significantly greater within our study incorporating dermoscopic assessment relative to the proportion seen within 2WW referrals reported by Haile-Redai et al. [12] ($Z = 3.1$, $p \leqslant 0.01$).

Type of skin malignancy	2WW referral confirmed diagnoses with dermoscopy (%)	2WW referrals, Queen's Hospital study (Haile-Redai et al. [12]) (%)	Z-statistic	P-value
Melanoma	11/575 (1.9%)	0/83 (0.0%)	1.3	0.204
Squamous cell carcinoma	54/575 (9.4%)	3/83 (3.6%)	1.8	0.080
Basal cell carcinoma	144/575 (25.0%)	8/83 (9.6%)	3.1	<0.01

TABLE 2: Comparison of confirmed diagnoses of malignancies within skin 2WW referrals

A two-proportion Z-test was used to compare pick-up rates of the three most common skin malignancies (melanoma, SCC, and BCC) within 2WW referrals in our study (using dermoscopy) and in a UK hospital receiving 2WW referrals from GPs, as reported by Haile-Redai et al. [12]. These diagnoses were confirmed through biopsy of excised lesions.

SCC: squamous cell carcinoma, BCC: basal cell carcinoma, 2WW: two-week wait

Accuracy of clinical suspicion with dermoscopy

Using a two-proportion Z-test, we compared the respective histological confirmation rates of suspected skin malignancies within our study across a single year (2023), using dermoscopy, to those in a control arm reported by Koelink et al. [13], relying on naked-eye examination of skin lesions. This comparison was used to assess the rate at which the GP correctly suspected the specific subtype of skin cancer, as confirmed by

subsequent histopathological examination.

As shown in Table 3, the accuracy of clinical suspicion for melanoma in our study (6.7%) was lower than that rate observed by Koelink et al. using naked-eye examination (Z = -1.1, p = 0.265) [13]. When using dermoscopy in our study, the accuracy for SCCs (51.2%) was significantly higher than the 0% rate reported by Koelink et al. through naked-eye examination [13] (Z = 2.2, p = 0.03). There was a greater concordance between clinical suspicion and histopathology for BCCs observed with dermoscopic assessment in our study (91.6%) relative to naked-eye examination (83.9%) reported by Koelink et al. [13]; however, this comparison was not significant (Z = 0.9, p = 0.39)

Type of skin malignancy	Accuracy of clinical suspicion with dermoscopy	Naked-eye diagnostic accuracy (Koelink et al. [13])	Z-statistic	P-value
Melanoma	1/15 (6.7%)	2/9 (22.2%)	-1.1	0.265
Squamous cell carcinoma	21/41 (51.2%)	0/5 (0.0%)	2.2	0.03*
Basal cell carcinoma	22/24 (91.6%)	26/31 (83.9%)	0.9	0.39

TABLE 3: Comparison of diagnostic accuracy between dermoscopic examination vs. naked-eye examination

The accuracy of clinical suspicion was determined by dividing the number of biopsy-confirmed diagnoses by the number of correctly suspected cases, which was calculated for each skin malignancy type. 2WW referrals for skin lesions assessed in 2023, containing adequate data on both suspected malignancy type and subsequent biopsy outcome, were analysed to evaluate diagnostic accuracy (column 2). Diagnostic accuracy with naked-eye examination (column 3) is reported by Koelink et al. [13], where GPs diagnosed skin lesions using photos from a database. A two-proportion Z-statistic was used to compare the respective diagnostic accuracies between our dermoscopic assessment and the naked-eye assessment reported by Koelink et al.

2WW: two-week wait, GP: general practitioner

Discussion

This retrospective analysis reports the diagnostic outcomes of 2WW skin cancer referrals over a five-year period. We aimed to contextualise these findings within the wider literature to explore the diagnostic benefit of dermoscopic assessment with regard to skin cancer detection within primary care. While the use of dermoscopy in secondary care is well established, within primary care, its incorporation remains obscure as GPs are mostly dependent on the sole naked-eye examination of suspicious skin lesions. This discussion highlights how dermoscopy can potentially optimise referral pathways. Moreover, this study's findings are evaluated alongside national data regarding 2WW referrals, to assess if dermoscopy can meaningfully reduce inappropriate urgent referrals that could reduce the strain on secondary care dermatology services.

Comparison to existing literature

Within our study, a trained GP using a dermoscope achieved a cancerous lesion pick-up rate of 36% (209/575) within 2WW referrals, which was confirmed through biopsy of excised lesions. This rate is higher than the rate (10-19%) typically reported within primary care [14,15].

Our study produced a melanoma diagnosis rate of 1.9% (11/575) within referrals, similar to the rate (2.1%) observed in a study with a large sample of 4,399 referrals to a rapid access pigmented lesion clinic at a UK hospital reported by Pacifico et al. [16]. However, our rate of melanoma diagnoses was lower than the 8-12% reported by other UK hospitals evaluating 2WW referrals for skin lesions [15,17]. The diagnosis rate for SCC within 2WW referrals in our study was 9.4%% (54/575), comparable to the 9.8% observed in a study at a North East England hospital [17], with a similar sample size of 460 2WW referrals; however, our study, which incorporated dermoscopy, illustrated a greater accuracy for clinical suspicion for SCCs.

It is worth noting that hospital-based studies reporting rates of melanoma or SCC diagnoses involved larger service populations and were conducted at centres receiving 2WW referrals. Conversely, our study reflects referrals originating from a single general practice, which may account for lower rates of diagnoses. There is also a potential issue of under-referral, likely due to reduced skill to recognise suspicious lesions, which could be attributed to the fact that most of these assessments were most likely conducted using the naked eye solely.

A specific study conducted at the Queen's Hospital evaluated the diagnostic accuracy of 2WW referrals for skin lesions that were received from primary care [12]. When combining the three most common skin malignancies (melanoma, SCC, and BCC), our study had a significantly greater proportion of confirmed

diagnoses (36%) within 2WW referrals than the proportion (13%) reported by Haile-Redai et al. [12] ($p < 0.0001$). Regarding specific malignancies, our study produced an increased proportion of confirmed diagnoses within 2WW referrals for SCCs ($p = 0.080$) and melanoma ($p = 0.204$) than the respective rates observed by Haile-Redai et al. [12]. The diagnosis rate of BCC within 2WW referrals in our study was 25% (144/575), which was significantly higher than the 2.4% reported by Haile-Redai et al. [12] ($p \leqslant 0.01$). Our study illustrated an increased pick-up rate of cancerous lesions within 2WW referrals relative to the Queen's Hospital study despite the latter having a significantly greater service population of 750,000 [12] compared to the 26,000 served by Eltham Medical Practice. It is important to consider that potential variation in demographic characteristics between the study populations in this comparison may limit the validity of these findings.

However, on a national level, the British Association of Dermatologists reports that out of 500,00 annual referrals for suspected skin cancer through the 2WW pathway [18], only 6% of referrals account for SCC and melanoma diagnoses. The pick-up rate (11.3%) of SCC and melanoma within 2WW referrals in our study using dermoscopy was almost double this figure. Our study illustrated that dermoscopic assessment identified a greater proportion of cancerous skin lesions within 2WW referrals than seen in referrals produced by primary care across the UK [12,18]. The extent to which dermoscopy was used within studies in the wider literature is unclear, but the general low usage of dermoscopy among UK GPs [19] suggests that these skin lesions were most likely assessed with the naked eye only.

A cluster randomised trial involving Dutch GPs evaluated the impact of dermoscopy on the diagnostic accuracy of skin lesions [13]. Within this study, the control arm used naked-eye examination while the intervention arm involved dermoscopic assessment [13]. Although we did not evaluate diagnostic accuracy directly, we quantified accuracy of clinical suspicion based on the GP's suspected diagnosis in comparison to histopathological confirmation for each respective subtype of skin cancer. Over a year of 2WW referrals, our study demonstrated greater accuracy of clinical suspicion using dermoscopy for SCC ($p = 0.03$) and BCC ($p = 0.39$) compared to naked-eye examination rates reported by Koelink et al. [13]. Our melanoma accuracy was lower than the rate observed in the control group reported by Koelink et al. [13]. Our dermoscopic accuracy for SCC (51.2%) was similar to the dermoscopy rate (50%) reported by Koelink et al. and higher than the naked-eye rate (0%) [13]. Our dermoscopic accuracy for BCC suspicion was 91.6%, which was greater than both the dermoscopy and naked-eye rates reported by Koelink et al. [13].

Limitations

This study involved 4,658 participants, resulting in 575 2WW referrals across five years, providing a large sample size that is comparable to previous studies examining 2WW referrals for skin cancers. However, this was a service evaluation study and therefore did not employ a control arm consisting of sole naked-eye assessments of skin lesions. The lack of a control arm within the study itself restricts the ability to directly compare the greater diagnostic characteristics of dermoscopy compared to naked-eye inspection. Recruiting a control arm consisting of a population with a similar demographic and presentation of skin lesions would have strengthened the comparison and further validated the findings.

Non-referred patients were not followed up for skin cancer diagnosis, as this is a retrospective evaluation of a clinical service that relies on finite resources, which introduces the possibility of false negatives. Furthermore, the assessment of accuracy of clinical suspicion of individual skin malignancies was restricted to 2023, due to varying completeness of data on referral forms. The small sample for this outcome measure restricts the comparability and generalisability of this specific analysis. This was also a single centre study involving a single GP, whereas the recruitment of multiple practices with GPs trained in dermoscopy would have increased the wider applicability of the study's findings.

Implications for practice

The benefits of dermoscopy for detecting malignant skin lesions have previously been demonstrated within secondary care [20], which we aimed to reflect within a general practice setting. Our findings highlighted a higher proportion of cancerous and precancerous diagnoses among 2WW referrals, compared to figures reported in current literature. With regard to histological confirmation rates for specific suspected skin cancers, there was increased accuracy demonstrated using dermoscopy relative to naked-eye examination reported in previous studies. Although the absence of an internal control arm limited direct comparison of the diagnostic benefit of the dermoscope, this study strengthens the case for its use by an adequately trained GP for the assessment of suspicious skin lesions. Incorporating dermoscopy use with sufficient training may enhance a GP's diagnostic aptitude for suspicious skin lesions, leading to a more efficient 2WW pathway. A streamlined 2WW pathway could improve patient care and satisfaction by potentially reducing time taken for specialist assessment, reducing the burden of skin cancer on primary and secondary care.

Nonetheless, a UK survey showed only 17% of GPs without a special interest in dermatology implement dermoscopy, and 20% of those with an interest had not refreshed their training in over 5 years [19]. This highlights the need to integrate dermoscopy use in primary care and to provide accessible training programmes for GPs, which warrants further research.

Conclusions

This retrospective study looked at 2WW referrals following a dermoscopic assessment of suspicious skin lesions by a trained GP, highlighting a high diagnostic yield for cancerous and precancerous lesions. In addition, this study identified higher histological confirmation rates for specific suspected skin cancer subtypes than reported in previous studies. These findings highlight the potential diagnostic value of dermoscopy in primary care; however, its diagnostic comparison is limited due to the lack of an internal control arm accounting for population characteristics and operator variability. Therefore, further comparative studies should be conducted to explore the impact of dermoscopy on diagnostic value, referral pathways, and services regarding skin cancer.

Additional Information

Author Contributions

All authors have reviewed the final version to be published and agreed to be accountable for all aspects of the work.

Concept and design: Utharsan Sivakumar, Glenes Armstrong Baafour Awuah, Mayooran Siva

Acquisition, analysis, or interpretation of data: Utharsan Sivakumar, Mayooran Siva

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Critical review of the manuscript for important intellectual content: Utharsan Sivakumar, Mayooran Siva

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Disclosures

Human subjects: Informed consent for treatment and open access publication was obtained or waived by all participants in this study. **Animal subjects:** All authors have confirmed that this study did not involve animal subjects or tissue. **Conflicts of interest:** In compliance with the ICMJE uniform disclosure form, all authors declare the following: **Payment/services info:** Imperial College University funded the presentation of an abstract of this work at the British Journal of General Practice Conference 2026. **Financial relationships:** All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work. **Other relationships:** One of the co-authors (Dr. M S) is a current GP partner at the practice at which the study was conducted.

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