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# Diagnostic Reliability in Teledermatology: A Systematic Review and a Meta-Analysis

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#### Abstract

<u>Objectives:</u> To compare TD and F2F agreement in primary diagnoses of dermatological conditions.

Design: Systematic review and Meta-Analysis

Methods: MEDLINE, Embase, Cochrane Library (Wiley), CINAHL, and medRxiv were searched between January 2010 and May 2022. Observational studies and randomized clinical trials that reported percentage agreement or kappa concordance for primary diagnoses between TD and F2F physicians were included. Titles, abstracts, and full-text articles were screened in duplicate. From 6,945 citations, 44 articles were included. A random-effects meta-analysis was conducted to estimate pooled estimates. The QUADAS-2 tool and the Cochrane RoB2 tool were used to evaluate the risk of bias. Primary outcome measures were mean percentage and kappa concordance for assessing diagnostic matches between TDs and F2F. Secondary outcome measures included agreement between TDs, F2F dermatologists, and TD and histopathology results.

<u>Results:</u> 44 studies were extracted and reviewed. The pooled agreement rate was 68.9%, and kappa concordance was 0.67. When both F2F and TD consults were conducted by dermatologists, the overall diagnostic agreement was significantly higher at 71%, compared to 44% for non-specialists. Kappa concordance was 0.69 for TD vs specialist, and 0.52 for non-specialists. Higher diagnostic agreements were also noted with image acquisition training, and the use of digital photography. Agreement rate was 76.4% between TDs, 82.4% between F2F physicians, and 55.7% between TD and histopathology.

<u>Conclusions and Relevance:</u> TD can be an attractive option particularly in resource poor settings. Future efforts should be placed on incorporating image acquisition training and access to high quality imaging technologies.

Registration number: 10.17605/OSF.IO/FJDVG

**Keywords:** teledermatology, dermatology consultations, store-and-forward, telemedicine, remote consultation, dermatology hospitalists

# **Article Summary:**

# Strengths and limitations of this study:

- This is the most comprehensive systematic review and meta-analysis of the topic to date without language restrictions applied.
- Inclusion criteria was broad, permitting the inclusion of all types of dermatological diseases, imaging technologies, in person physician specializations (GPs, hospitalists, and dermatologists), and presence or absence of image acquisition training.
- Article search was limited to 2010 and later due to the recent incorporation of smartphones in teledermatology practices.
- Due to considerable heterogeneity between studies, meta-analysis and synthesis of predictors for accurate diagnoses remotely was limited even after subgrouping.

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#### Introduction

With the emergence of COVID-19, the introduction of virtual consults in healthcare settings, especially dermatology, has been expanded to allow many patients the opportunity for equitable access to care when in-person appointments pose a challenge and risk to patients.<sup>1</sup> Different modalities were introduced to support Teledermatology (TD). This involves the remote sharing of patient data, which includes synchronous video-streaming TD, and asynchronous sharing of still images- via emails, or text messages, or store-and-forward TD (SFTD).

Although both synchronous and asynchronous approaches have been shown to be cost effective, SFTD is particularly popular as it requires fewer resources and less coordination than synchronous TD.<sup>2, 3</sup> With the advent of higher resolution smartphone cameras, relatively minimal training is required to correctly capture data for remote dermatologists; multiple SFTD studies opted to provide no training in image capture and still found value in TD.<sup>4, 5</sup>

There is valid concern over the reliability of TD given the significant variability in diagnostic accuracy predicted across pre-pandemic research.<sup>6</sup> This is expected given the lack of standardization across studies and the potential for confounds across TD methodologies and applications, e.g., level of training or skin lesion type. This variability in approach may benefit from an increased demand, which could provide greater impetus to optimize and standardize TD.

To our knowledge, this is the first and most inclusive meta-analysis (MA) that compares dermatology TD consults to face-to-face (F2F) that looked at all relevant studies without overly exclusive inclusion criteria. The primary objective of this study was to compare the reliability of

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TD diagnoses to F2F consults, as determined by Cohen's kappa interrater agreement and total agreement rates. TD can assume important roles as a routine complement to primary care and an alternate route to the typical in-person referrals. Consequently, we wanted to determine agreement for TD and all F2F consults, TD and F2F primary care consults, and finally TD and F2F dermatologist consults, which would arguably best capture the limitations introduced by the change in medium from F2F to TD.

Additional subset analyses were performed to control for potential confounds (e.g., inflammatory vs. malignant, staff training for image acquisition, teledermoscopy, and smartphone vs digital cameras) introduced by the heterogenous methodology. The secondary objectives sought to determine the agreement rate within TD diagnoses and within F2F consults to provide an idea of each medium's consistency, and for the agreement rate between TD and histopathology, provides the best estimate of accuracy.

#### Methods

#### Protocol Registration

This study was performed in accordance with the Preferred Reporting Items for Systematic review and Meta-Analysis Protocols (PRISMA-P) 2015 guidelines.<sup>7</sup> The protocol for this review was registered on Open Science Framework (<u>https://osf.io/fidvg</u>).

# Search Strategy

A comprehensive search of major bibliographic databases, MEDLINE, Embase, Cochrane Library (Wiley), CINAHL, and medRxiv was performed in August 2021, and MEDLINE was searched again between August 2021 and May 2022 to screen any new articles published after our protocol was registered. The search strategy was developed by a medical librarian at Queen's University (Kingston, ON).

No restrictions were placed on language or status of the publications. Search results were limited to studies published between January 2010 and May 2022 due to the novelty of incorporating smartphones in teledermatology remote consultations.<sup>8</sup> The International Prospective Register of Systematic Reviews (PROSPERO) and OSF were searched up to May 2022 for relevant ongoing systematic reviews using the terms 'telemedicine', 'teledermatology', 'dermatology', 'diagnostic accuracy', and 'diagnostic concordance'. Reference lists of included studies were screened to identify additional studies not identified in the search.

Studies evaluating the diagnostic reliability of TD that reported on patients with dermatological conditions who were evaluated by a clinician using SFTD (asynchronous) or live video-based (synchronous) telemedicine systems were included. It was required that all articles compared the tele- to a F2F diagnosis conducted by a physician. Inclusion and exclusion criteria are summarized in **eTable 1**, available in the supplementary appendix.

#### Data Selection & Extraction

Following the removal of duplicated citations, the titles and abstracts were screened. Following this step, a full text assessment was conducted. At both stages, screening was performed independently by two reviewers [AB and NB]. Any disagreements were resolved through consensus by two reviewers and when necessary, through discussion with a third reviewer [JLRG].

A data collection form was created on the *Covidence* website and piloted by two reviewers [AB, NB]. Three additional reviewers assisted with data extraction [JLRG, MB, MM]. Two reviewers were assigned to each paper. One reviewer extracted all characteristics of the included literature, and the second reviewer validated the characteristics for accuracy. Any disagreements were resolved by consensus. In the supplementary appendix, **eTable 2** summarizes the information extracted from full-text articles.

#### Data Synthesis

This MA assessed the effectiveness of SFTD technologies and live video conferencing in diagnosing skin conditions. Outcomes regarding complete diagnostic percentage agreement rates

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and Cohen's kappa concordance were assessed separately, with some studies being part of both analyses if they reported both variables. The patient, intervention type, lesion, and geographic characteristics were summarized qualitatively. Please see supplementary appendix and **eTable 3** for more details on data synthesis and nomenclature for each study grouping.

# Risk of Bias

Three reviewers [AB, NB, MB] completed the risk of bias assessment; all studies were independently reviewed. Version 2 of the Cochrane risk-of-bias tool for randomized trials (RoB 2) was used to assess the risk of bias in three randomized trials.<sup>9-11</sup> RoB 2 is structured into a fixed set of domains of bias, focusing on different aspects of trial design, conduct, and reporting.<sup>12</sup> The Quality Assessment of Diagnostic Assessment of Diagnostic Accuracy (2<sup>nd</sup> Edition, QUADAS-2) was used to assess risk of bias. Uncertain risk of bias was assigned to studies with insufficient information except for studies that were likely to be biased due to missing data. In the latter case, high risk of bias was assigned.

#### Search Strategy, and Data Analysis

Please see supplementary appendix for additional information on search strategy and interpretation of kappa values.

#### Patient and Public Involvement

Patients or the public were not involved in the design, or conduct, or reporting, or dissemination plans of our research.

#### **Results**

 6,945 studies were screened for eligibility of which 44 were included in this study. Of these, 40 studies reported diagnostic agreement rates<sup>4, 5, 9-11, 13-47</sup> and 21 studies reported kappa concordance. <sup>5, 9, 13, 14, 19, 22, 25, 28-33, 35-37, 48-52</sup> Further details are provided in the PRISMA diagram in **Figure 1**. Full list of excluded studies can be found in the supplementary appendix, **eTable 4**.

# Study and patient characteristics

**Table 1** summarizes study characteristics for the 44 papers that were included. Forty-one (93%) of the included studies were observational, of which 31 (76%) were prospective, nine (22%) were retrospective. One (2%) study was ambispective. Three studies were randomized controlled trials and one study was a quasi-randomized trial. Thirteen studies (30%) were from the United States of America (USA), where one study looked at patients living in Botswana who were evaluated by TDs based in the USA. Thirteen (30%) from Europe, eleven (25%) from South America, and seven (16%) from other countries. There were ten primary studies published after January 2020 where a pre and post pandemic analysis was performed.

**Table 2** summarizes participant characteristics. Studies selected for the review included a total of 52,075 patients (Range: 26 to 24,210 patients). Some patients had multiple lesions and the total number of lesions included in the study was 57,222 (Range: 26 to 27,519 lesions). Thirty-seven (83%) of papers examined less than 500 skin lesions.

The mean age reported in 27 (61%) studies was  $54.78 \pm 15.69$  years (Range: 0 to 100 years old). Thirty-four (77%) studies reported participant gender, with a mean of 57% females (Range: 3.2%)

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to 74%). Only 13 (29%) of studies reported information on Fitzpatrick skin types, ethnicity, or race. The dermatoses included in this study were grouped as "all types of skin lesions", "skin cancers only", and inflammatory or benign skin conditions. Twenty-seven studies (62%) included in this analysis were inclusive to all types of dermatoses, 13 (29%) studies looked specifically at suspicious lesions, and three (6.8%) studies excluded skin cancers completely. Results on the diagnostic reliability between TDs and F2F (specialist and non-specialists combined) and diagnostic agreement between TDs, F2F dermatologists, and TD vs Histopathology are included in the supplementary appendix.

Diagnostic reliability of TD when compared to F2F (specialist and non-specialists) evaluation Agreement was assessed by measuring the complete agreement of primary diagnoses between TD and F2F physicians (both specialist and non-specialists) by analyzing diagnostic agreement rates (percentage) and concordance (Cohen's kappa coefficient). The overall diagnostic agreement rate and concordance were 68.9% (CI 64.4% to 73.1%), and 0.67 (CI 0.60 to 0.74). See **eFigure 1** and the supplementary appendix for further details.

# Diagnostic agreement between TD and TD, F2F and F2F, and TD and Histopathology

Diagnostic agreement rates were also compared within rater groups, as well as between TD and histopathology, when values were available. Diagnostic agreement rate between TDs, F2F dermatologists, and TD vs histopathology were: 76.4% (CI 69% to 82.5%), 82.4% (CI 76.7% to 87.0%), and 55.7% (CI 53% to 58.4%). See **eFigure 2** and the supplementary appendix for further details.

#### Sub-group analyses

# Diagnostic reliability of TD when compared to the current gold standard (F2F evaluation by a dermatologist) vs non-specialist

Thirty-five studies reported diagnostic agreement rates.<sup>4, 5, 9-11, 13-20, 22, 25-33, 35-46</sup> **Figure 2A** shows that the percentage agreement between TD and F2F dermatologists ranged from 38% to 98%, with 44 out of 64 comparisons having percentage agreement above 60% and seven studies having over 90% agreement. The diagnostic agreement rate between TD and F2F dermatologist was 70.96% (CI 69.8% to 72.1%) while the diagnostic agreement rate between TD and F2F of non-specialists was 44.1% (CI 39.9% to 48.4%). When non-specialists were compared to dermatologists for F2F vs. TD the agreement rate was significantly lower among non-specialists (p < 0.001, heterogeneity:  $I^2 = 98\%$ ). The percent agreement ranged from 13.9% to 71.7%, with six out of eight having concordance values below 50%, <sup>20, 21, 23, 24, 30, 32, 34, 47</sup>

Thirteen studies with 28 unique comparisons made between TD and F2F dermatologists that reported concordance values.<sup>9, 13, 14, 19, 22, 28, 31-33, 37, 42, 49, 51</sup> When kappa concordance values were compared, **Figure 2B** shows diagnostic agreement between TD and F2F dermatologists had a mean of 0.69 (CI 0.60 to 0.75) and it ranged between 0.213 (CI 0.20 to 0.23) to 0.96 (CI 0.92 to 0.98). When comparing TDs to non-specialists, the mean concordance value for diagnostic agreement from four studies had a mean of 0.52 (CI 0.25 to 0.71).<sup>30, 32, 48, 50</sup> When non-specialists were compared to dermatologists for F2F vs. TD, diagnostic concordance was significantly lower among non-specialists (p = 0.031, heterogeneity:  $I^2 = 100\%$ ).

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# Diagnostic reliability of TD vs F2F by training involved and type of technology used related to image acquisition

Twenty studies with 37 unique comparisons that compared TDs with F2F physicians stated explicitly that training was provided to those in charge of image acquisition shown in **Figure 3**.<sup>9-11, 14-16, 19, 20, 23, 26, 29, 32, 35-41, 43, 44</sup> The mean agreement rate shown in **Figure 3A** was higher at 75.9% (CI 74.4% to 77.27%) compared to no training provided 62.1% (CI 60.5% to 63.7%), and this difference was statistically significant (p = 0.033, heterogeneity: I^2 = 98%). Concordance values in **Figure 3B** were also higher between TD and F2F when training was provided, with a mean 0.77 (CI 0.66-0.84), and 0.60 (CI 0.49-0.69) without training. This difference was statistically significant (p = 0.01, I^2=98%).

#### Other sub-group analyses

Statistically significant trends related to diagnostic agreement by image capturing technologies (**eFigure 5**) were also identified. No statistically significant patterns could be identified with the use of teledermoscopy, lesion type, grouping studies as pre- or post-pandemic, or risk of bias. Please see supplementary appendix for further details.

#### Quality assessment

The results of quality assessment for risk of bias and applicability in individual studies are displayed in the supplementary appendix and **eTable 5**.

#### **Discussion:**

 This study constitutes the largest systematic review and MA on TD to our knowledge, including 44 studies across four languages.

We noted an overall agreement rate of 68.9% and overall concordance of kappa = 0.67 between TDs and F2F physicians. Through sub-group analyses, we found that the agreement was significantly higher for studies that compared TD to in-person assessments by dermatologists compared to non-specialists (difference of 26.86%, p <0.001). The lower concordance when F2F non-specialists are used suggests that lowered reference test accuracy reduces agreement rates: and for the purposes of clinical practice, it implies a greater need for TD to supplement primary over specialist care.

We noted greater agreement rates (p = 0.033) between in-person and remote care when standardized training on image acquisition was incorporated into clinical workflow – suggesting a benefit to training primary care providers supporting TD.<sup>24, 53, 54</sup> Digital photography was also associated with more frequent agreement rates between TD and F2F physicians (p = 0.029). Although the exact reason for this trend is less clear, this could be attributed to better image resolution and more experienced staff taking clinical images in a standardized manner for virtual consultations.

Pathological assessment of skin lesions is the cornerstone of skin cancer diagnosis. This MA found a 55.7% (CI 53.0% to 58.4%) agreement rate between TD and histopathology. This low agreement rate reflects all skin biopsies, and specific diagnostic accuracy rates could not be calculated by

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lesion type due to the small number of studies that reported this value. Through sub-group analyses, we were able to compare cancerous and non-cancerous lesions; slightly higher concordance was seen with skin cancers compared to studies that also included non-suspicious lesions like dermatitis and psoriasis. However, data was too heterogeneous for any significant conclusions. We also looked at the use of teledermoscopy, another technique that could help improve diagnostic accuracy of TD for suspicious lesions, but no significant trends could be identified. These findings reflected the results of a 2016 systematic review on TD.<sup>6</sup>

Many teledermoscopy studies grouped statistics from lesions analyzed with and without dermoscopy, preventing the assessment of the dermatoscope's incremental contributions without the influence of potentially less accurate, dermatoscope-free analysis. Supporting this explanation, the three teledermoscopy studies that focused on cancer lesions demonstrated greater concordance rates than the teledermoscopy studies targeting broader lesions. One study identified agreement rates between TD and F2F dermatology of 92.3% (24/26) and between TD and histopathology of 66.7% (17/26), both above our identified median.<sup>45</sup> Another study found an agreement rate of 90% (37/41) when targeting pigmented lesions, although the rate may have been inflated due to recall bias introduced by having the same dermatologist perform TD and F2F consults.<sup>16</sup> Finally, one study diagnosed keratotic lesions in sun-exposed areas, finding a high agreement rate of 92% (915/1000).<sup>37</sup> However, this study also risked bias from its experimental design, which excluded lesions with poor image quality. This fails to recapitulate the complexities of practical TD, which must contend with potentially difficult image acquisition.

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The 68.9% (CI 64.4% to 73.05%) combined agreement rate between TD and F2F is lower than the agreement rates outlined in a recent review.<sup>55</sup> This suggests our greater sample size introduces more studies with poor agreement, which may better reflect the reality of adopting TD at a larger scale and signal risk from a lack of standardization.<sup>54,55</sup> Our date cut-off of 2010 means our dataset has little overlap with existing reviews, and more heavily features new relevant technologies like smartphone apps for image acquisition.<sup>6, 56</sup> The most recent MA<sup>56</sup> on TD limited its dataset to studies with multiple TD and F2F consults, and variably choosing to filter low-frequency diagnoses from certain studies.<sup>46</sup> Our results had greater heterogeneity compared to this MA, drawing attention to a key issue in the literature: unless results are heavily filtered – introducing bias, omitting most research, and weakening statistical power, the data is too heterogenous for effective metanalytic inferences. However, messy and heterogeneous data likely reflects real-world evidence and clinical practices.

A possible source of heterogeneity in our analysis could be due to lack of stratification by study design given the minute number of randomized controlled trials available for analysis. However, filtering biased studies did not improve the suitability of our data for our proposed random-effects MA model. Our review also risked publication bias by not actively seeking out unpublished materials in conference proceedings. This likely reflects the nature of clinical work, highlighting the variability across different providers and settings and reinforcing the need to develop a standardized framework for employing and assessing TD.

Current trends suggest that TD will continue to expand, there have been many recent studies examining its accuracy without the design considerations necessary to allow comparisons beyond

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siloed investigations.<sup>1</sup> The implementation of evidence-informed processes is critical to the success of TD services, and the accurate assessment of TD will be required to assess which contexts it should be employed in, e.g., suspected malignancy vs. erythema.

The factors targeted by our sub analysis are undoubtedly important to standardize with best practices requiring the inclusion of primary care provider training in image acquisition, explicitly outlined conditions where dermatoscope attachments are required, and standardized reporting with a lesion's anatomical site, size, distribution, morphology, and colour. Additional guidelines for data reporting could be designed with a mind to future research goals, e.g., the inclusion of Fitzpatrick grading to identify gaps in medical care. Finally, both clinical and research guidelines must address privacy concerns, as the integration of EMR and the sharing of patient images or videos presents potential vulnerabilities.

#### **Conclusion:**

This MA indicates that diagnostic agreement between remote and in person dermatologists is acceptable in select conditions (i.e., when training for image acquisition is provided and technologies for high-quality images are used). Telemedicine adoption rates are accelerating globally, and TD must be considered for enhanced accessibility, flexibility, reduced costs, and safer environments it can provide patients.

The results of this MA represent significant evidence to indicate the suitability of TD for remote care, particularly as a complement to primary care, where it can serve as an intermediate step before F2F specialist consultations. Furthermore, the categorisation of diagnostic concordance highlights important factors to further improve diagnostic accuracy. Additionally, it highlights the lack of standardization in TD studies, calling for greater structure in clinical practice and conducting primary research.

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#### Author Contributions:

JLRG is the guarantor of the review and supervised study design. JLRG also contributed to data analysis and provided statistical expertise. AB and NB oversaw study design, data collection, data analysis, and original draft preparation. AB designed the search strategy with the guidance

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of the medical librarian, AKP. AB, NB, MB, MM participated in the abstract and full text screen, data extraction, and risk of bias assessment. RDJF, AL, and SCW contributed to draft review and editing. All authors read, provided feedback and approved the final manuscript.

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# **Competing interests:**

JLRG, RDJF, AL are employees, and SCW is a co-founder, medical chief officer, and shareholder of Swift Medical. No funding bodies have any role in study design, data collection and analysis, decision to publish, or preparation of the manuscript. All other authors declare no conflict of interest.

#### Data availability statement:

Data are available in a public, open access repository. All data relevant to the study are included in the article, uploaded as supplementary information, or deposited on Open Science Framework: <a href="https://osf.io/fjdvg">https://osf.io/fjdvg</a>. Data are available under the terms of the Creative Commons Zero "No rights reserved" data waiver (CC0 1.0 Public domain dedication). Our systematic review produced a large amount of information, and the arising database is available for future collaboration on additional analyses. Please contact the corresponding author with any inquiries.

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# **Figure Legends**

# Figure 1. PRISMA Flow diagram of study selection.

**Figure 2. Forest plot representing F2F and TD primary diagnostic agreement by specialization status of the F2F physician.** Studies were sorted into two groups, a) F2F diagnosis completed by a board-certified dermatologist; b) F2F diagnosis completed by a non-specialist (e.g., general practitioner). (A) Forest plot representing percentage agreement and 95% C.I. for overall concordance across 40 studies with a total of 72 unique number of comparisons, N of events and total included participants. (B) Forest plot representing kappa concordance and 95% C.I. for overall concordance across 21 studies with a total of 45 unique number of comparisons, N of total included participants.

# Figure 3. Forest plot representing F2F and TD primary diagnostic agreement by whether imaging acquisition training was indicated by the study.

Forest plot representing F2F and TD primary diagnostic agreement when image acquisition training is involved. Studies were sorted into two groups, a) Did not conduct or did not report training personnel on image acquisition; b) Stated that person in charge of image acquisition was trained. (A) Forest plot representing percentage agreement and 95% C.I. for overall concordance across 39 studies with a total of 71 unique number of comparisons, N of events and total included participants. (B) Forest plot representing kappa concordance and 95% C.I. for overall concordance across 21 studies with a total of 45 unique number of comparisons, N of total included participants.

# Tables

			TD vs Derm		
Source	Study design	Country of publ., Study reported funding (Y/N)	Intervention Assessment of diagnostic agreement between	Outcomes Comparing complete primary diagnostic agreement between F2F and TD (and between Histo and TD if applicable)	Quality rating
		Stanc	lard of reference: F2F		
Azfar, et al, 2014	Prospective Cohort Study	Botswana , N	TD and F2F dermatologists via smartphone images	Diagnostic agreement rate (TD1 46.6%, TD2 56.8%, TD3 48.6%) concordance (TD1 0.41, TD2 0.51, TD3 0.43), N=136	Low
Barcaui, et al, 2018	Prospective Cohort Study	Brazil, N	TD and F2F consult by the same dermatologist via digital photography and dermoscopy images stored in WhatsApp	Diagnostic agreement rate (90%, N=41)	High
Batalla, 2015	Retrospective Cohort Study	Spain, N	TD and F2F dermatologists by via clinical images	Diagnostic agreement rate (55%, N=65)	Moderat e
Borve, et al, 2012	Prospective Cohort Study	Sweden, Y	TD and F2F consults by the same dermatologist via smartphone images stored in Tele-Dermis	Diagnostic agreement rate (78%, N=40)	High
Gatica, et al, 2015	Prospective Cohort Study	Chile, N	TD and F2F dermatologists via clinical images taken by digital photography	Diagnostic agreement rate (82%, N=125)	Moderat e
Gerhardt, et al, 2021	Observational study	USA, Y	TD and F2F dermatologists via clinical images	Diagnostic agreement rate (75.3%, N=809)	High
Keller, et al, 2020	Prospective Cohort Study	USA, Y	TD and F2F dermatologists or hospitalists on clinical images taken by smartphones and tablets	Derm vs TD: Diagnostic agreement rate (52.5%), concordance (0.45)	Low
Marchell, et al., 2017	Quasi RCT	USA, Y	TD and F2F dermatologists via digital photography, compressed and uncompressed video	SFTD: Diagnostic agreement rate (76%, N=213); uncompressed video (76%, N=101), compressed video (72%, N=112)	Low
Muir, et al,	Prospective	Australia,	TD and F2F	Derm vs TD:	High

Carter, et al, 2017	Prospective and retrospective	USA, Y	TD and F2F dermatologists, as well as F2F PCP via	Derm vs TD: Diagnostic agreement rate	High	lesions
Zanini, 2013	Prospective Cohort Study	Brazil, N	TD and F2F dermatologists via clinical images taken by digital photography	Diagnostic agreement rate (76.3%, N=100)	Moderat e	
Vano- Galvan, et al, 2010	Retrospective , Cross- sectional study	Spain, N	TD and F2F dermatologists via clinical images taken by digital photography for case conferences	Diagnostic agreement rate (69.05%, N=2000)	High	
Saleh, et al, 2017	Prospective Cohort Study	Egypt, Y	TD and F2F dermatologists via clinical images taken by digital photography stored in Dropbox	Diagnostic agreement rate (81.3%), concordance (0.46- 0.52), N=600	Low	
Rubegni, et al, 2011	Prospective Cohort Study	Italy, N	TD and F2F dermatologists via digital photography and dermoscopy images stored in Dermo-image.	Diagnostic agreement rate (87.7%), concordance (0.863), N=130	Low	
Romero, et al, 2010	Randomized Controlled Trial	Spain, Y	TD and F2F consults by the same dermatologist via digital photography and videoconferences via DERMARED software	Diagnostic agreement rate (85%, N=368)	Moderat e	
Romero Aguilera, et al, 2014	Prospective Cohort Study	Spain, Y	TD and F2F dermatologists via clinical images taken by digital photography stored in DERMARED. A small portion of patients were seen by the same Derm for F2F and TD consult.	Diagnostic agreement rate (77.8%, N=170)	Moderat e	
Ribas, et al, 2010	Prospective Study	Brazil, Y	TD and F2F dermatologists via digital photography	Diagnostic agreement rate (81.5%) concordance (0.8), N=174	High	
Okita, et al, 2016	Prospective Cohort Study	Brazil, N	TD and F2F dermatologists via smartphone images	Diagnostic agreement rate (54%, N=100)	High	
Nami, et al, 2015	Prospective Cohort Study	Italy and Austria, Y	TD and F2F dermatologists via smartphone images stored in MugDerma	Diagnostic agreement rate (91.05%), concordance (0.906), N=391	High	
	Cohort Study	N	emergency derms and non-specialists via clinical images taken by digital photography	Diagnostic agreement rate (98%), concordance (0.93)		

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	cohort study		clinical images stored using Epic EHR software	(38%)	
Lamel, et al, 2012	Prospective Cohort Study	USA, N	TD and F2F dermatologists via smartphone images stored in ClickDerm	Diagnostic agreement rate (62%), concordance (0.6) N=107	Moderat e
Vestergaard , et al, 2020	Prospective Cohort Study	Denmark, N	TD and F2F dermatologists via smartphone and dermoscopy images using FotoFinder Systems	F2F: Diagnostic agreement rate (TD1 62%, TD2 60.2%), concordance (TD1 0.58, TD2 0.57), N=600 Histo: Diagnostic agreement rate (TD1 58.2%, TD2 53.6%), N=292	High
Warshaw, et al, 2015	Prospective, Cross- sectional study	USA, N	TD and F2F dermatologists via digital photography and dermoscopy images	Diagnostic agreement rate and concordance* A1 (75.70%, 0.56), N=753 A2 (75.30%, 0.56), N=752 A3 (80.10%, 0.62), N=684 B1 (52.80%, 0.44), N=651 B2 (53.40%, 0.45), N=652 B3 (60.00%, 0.52), N=595 C1 (51.50%, 0.38), N=583 C2 (50.20%, 0.38), N=579 D1 (45.70%, 0.32), N=1,034 D2 (50.10%, 0.37), N=1,020	Moderat
Zink, et al, 2017, Sept	Prospective Cohort Study	Germany, Y	TD and F2F dermatologists via smartphone and dermoscopy images using Handyfotos	F2F: Diagnostic agreement rate (92.3%) Histo: Diagnostic agreement rate (66.7%), N=26	Low
Giavina- Bianchi, et al, 2020 Oct	Retrospective Cohort Study	Brazil, N	TD and F2F dermatologists via smartphone images	Diagnostic agreement rate (78%) concordance (0.743), N=739	High
	Star	dards of ref	erence: F2F and Histop	athology	

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Rios-Yuil, 2011	Randomized Controlled Trial	Panama	TD and F2F dermatologists via clinical images taken by digital photography for case conferences	F2F: Diagnostic agreement rate (83.3%), concordance (0.652) Histo: Diagnostic agreement rate (66.7%) N=30	Moderat e	Skin cancer and other dermatoses
Zink, et al, 2017, July	Prospective Cohort Study	Germany, Y	TD and F2F dermatologists via smartphone images stored in the KLARA app	F2F: Diagnostic agreement rate (58.9%, N=195) Histo: Diagnostic agreement rate (55.6%, N=195)	High	and other oses
Giavina- Bianchi, et al, 2020 Nov	Retrospective Cohort Study	Brazil, N	TD and F2F dermatologists via smartphone images	F2F: Diagnostic agreement rate (61%), concordance (0.213), N=803 Histo: Diagnostic agreement rate (54%), concordance (0.087), N=289	High	
Senel, et al, 2013	Prospective Cohort Study, Repeated measures	Turkey, N	TD and F2F dermatologists via digital photography and dermoscopy images	Without dermoscopy: Concordance (TD1 0.77, TD2 0.75), N=150 With dermoscopy: Concordance (TD1 0.85, TD2: 0.86), N=150	High	0 0
Sola- Ortigosa, et al, 2020	Prospective Cohort Study	Spain, N	TD and F2F consults by the same dermatologist via dermoscopy and clinical images taken by digital photography and tablets	Without dermoscopy F2F: Diagnostic agreement rate (TD1 82.1%, TD2 83.2%, TD3 81.3%), concordance (TD1 0.87, TD2 0.83, TD3 0.89) Histo: Diagnostic agreement rate (TD1 87.5%, TD2 83.5%, TD3 88.4%), N=1000 With dermoscopy F2F: Diagnostic agreement rate (TD1 91.5%, TD2 90.2%, TD3 89.9%), concordance (TD1 0.91, TD2 0.90, TD3 0.89) Histo: Diagnostic agreement rate (TD1 91.5%, TD2 91.2%, TD3 90.3%), N=1000	High	Skin cancer lesions only

Tan, et al, 2010	Prospective Cohort Study, Repeated measures	New Zealand, Y	TD and F2F consults by the same dermatologist via digital photography	F2F: Diagnostic agreement rate (73.7%, N=681), accuracy (Sn, Sp, PPV)**	High	
		Standards of	of reference: Histopatho	,		
Borve, et al, 2013	Prospective Cohort Study	Sweden, Y	TD and F2F consults by the same dermatologist via smartphone and dermoscopy images stored in iDoc 24 app	F2F: Diagnostic agreement rate (TD1 55%, TD2 57%), concordance (TD1 0.47, TD2 0.48), accuracy (TD1 51%, TD2 61%) Histo: Concordance (TD1 0.51, TD2 0.51), N=69	High	
Clarke, et al, 2021	Prospective Cohort Study	USA, Y	TD and F2F dermatologists via clinical images taken by digital photography stored in Research Electronic Data Capture	F2F: Diagnostic agreement rate (66.6%), concordance (0.6), N=308 Histo: Diagnostic agreement rate (65%), N=62	High	
Goulart- Silveira et al, 2019	Prospective Cohort Study	Brazil, N	TD and F2F dermatologists via smartphone images acquired and stored via Telederma app	F2F: Concordance (0.958), accuracy (Sn, Sp, PPV, NPV) Histo: Concordance (0.556), N=39	High	
	S	tandards of	f reference: No clear sta	ndard		
Altieri, et al, 2017	Prospective Cohort Study	USA, Y	TD and F2F dermatologists via clinical images taken by digital photography	Diagnostic agreement rate (TD1 58.1%, N=160; TD2 53.3%, N=152; TD3 52.6%, N=152), concordance (TD1 0.51, N=160; TD2 0.51, N=152; TD3 0.57, N=152)	Low	
Barbieri, et al, 2014	Prospective Cohort Study	USA, N	TD and F2F dermatologists via smartphone images using the AccessDerm smartphone platform	Diagnostic agreement rate (TD1 64%, TD2 56%), N=50	Moderat e	
Gabel, et al, 2021	Prospective Cohort Study	USA Y	TD and F2F dermatologists via clinical images taken by digital photography and tablets	Diagnostic agreement rate (66.7%), concordance (0.33), N=41	High	
Tran, et al, 2011	Prospective Cohort Study	Egypt, Y	TD and F2F dermatologists via smartphone images stored in ClickDoc	Diagnostic agreement rate (75%, N=30)	High	

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Carter, et al, 2017	Prospective and retrospective cohort study	USA, Y	TD and F2F dermatologists, as well as F2F PCP via clinical images stored using Epic EHR software	Derm vs TD: Diagnostic agreement rate (38%)	High
A2 (non-biopsid A3 (non-biopsid B1 (biopsied pi B2 (biopsied pi B3 (biopsied pi C1 (non-biopsid C2 (non-biopsid D1 (biopsied no D2 (biopsied no	sied pigmented lesi ed pigmented lesi ed pigmented lesi gmented lesions, N gmented lesions, N gmented lesions, N ed non-pigmented ed non-pigmented lesi on-pigmented lesi on-pigmented lesic d light dermoscopy	ons, Macro+P Ons, Macro+P Macro) Macro+PLD) Macro+PLD) Iesions, Macro Iesions, Macro) Ons, Macro+P	LD) LD) ro) cro+PLD)		
				Outcomes Comparing	
Source	Study design	Country of publ., Study reported funding (Y/N)	Intervention Assessment of diagnostic agreement between	complete primary diagnostic agreement between <b>F2F and</b> <b>TD</b> (and between Histo and TD if applicable)	Quality rating
Costello, et al, 2019	Prospective Cross- sectional study	USA, Y	TD and F2F PCP via smartphone and dermoscopy images using the Photo Exam app	Diagnostic agreement rate (31.6%, N=37)	High
Duong, et al, 2014	Observational study	France, Y	TD and F2F emergency physicians via smartphone images and videoconferences	Videoconference: diagnostic agreement rate (68.7%, N=83) SFTD: diagnostic agreement rate (30.9%, N=110)	High
Gonzalez- Coloma, et al, 2019	Prospective, Cross- sectional study	Chile, N	TD and F2F PCP via clinical images	Diagnostic concordance (0.50, N=326)	High
Keller, et al, 2020	Prospective Cohort Study	USA, Y	TD and F2F dermatologists or hospitalists on clinical images taken by smartphones and tablets	ED vs TD: Diagnostic agreement rate (45.3%), concordance (0.4), N=53	Low
Muir, et al, 2011	Prospective Cohort Study	Australia , N	TD and F2F emergency physicians via clinical images taken by digital photography	ED vs TD: Diagnostic agreement rate (72%),	High

				concordance (0.42), N=60		
Carter, et al, 2017	Prospective and retrospective cohort study	USA, Y	TD and F2F dermatologists, as well as F2F PCP via clinical images stored using Epic EHR software	PCP vs TD: Diagnostic agreement rate (14%), N=79	High	Skin cancer lesions only
Jones, et al, 2021 Piccoli, et al, 2015	Retrospective Cohort Study Retrospective Cross- sectional study	New Zealand, Y Brazil, Y	TD and F2F PCP via digital photography and dermoscopy images TD and F2F PCP via digital photography and dermoscopy images	PCP vs TD (SSC Matched*) Diagnostic concordance (0.69, N=184), accuracy	Moderate	
Chen, et al, 2010	Retrospective Cohort Study	USA, Y	TD and F2F PCP via clinical images stored in Second Opinion Software	Diagnostic agreement rate (48%, N=405)	High	Skin lesions other than malionancies
Patro, et al 2015	Prospective Cohort Study	India, Y	TD and F2F PCP via digital photography	Diagnostic agreement rate (56%, N=206)	High	lesions er than mancies

\*A1 (non-biopsied pigmented lesions, Macro

A2 (non-biopsied pigmented lesions, Macro+PLD)

A3 (non-biopsied pigmented lesions, Macro+PLD)

B1 (biopsied pigmented lesions, Macro)

B2 (biopsied pigmented lesions, Macro+PLD)

B3 (biopsied pigmented lesions, Macro+PLD)

C1 (non-biopsied non-pigmented lesions, Macro)

C2 (non-biopsied non-pigmented lesions,, Macro+PLD)

D1 (biopsied non-pigmented lesions, Macro)

D2 (biopsied non-pigmented lesions, Macro+PLD)

PLD = polarized light dermoscopy

\*Suspected Skin Cancer Pathway matched for age, sex, and ethnicity.

**Table 1. Study characteristics for all included studies. (A)** Studies that compared TD with F2F dermatologists. **(B)** Studies that compared TD with F2F non-specialists. Studies are in alphabetical order and are grouped according to lesion type reported.

Source	Patient demographics	Special inclusions, and exclusions				
	Country where patients resided, number of patients included, percentage by gender/sex, age, number of lesions included					
Skin cancer, and other common dermatological lesions						
Altieri, et al, 2017	USA, 232 p., sex N/A, age: 18+, 232 l.	Inclusion: Adults				
1	Botswana, 76 p., 57% female, 43% male,					

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Barbieri, et al, 2014	USA, 50 p., 64% female, 36% male, mean age: 55.2, 50 l.	Inclusion: Adults
Barcaui, et al, 2018	Brazil, 31 p., 71% female, 29% male, mean age: 56.5, 41 l.	Inclusion: Adults with pigmented lesions only
Batalla, 2015	Spain, 183 p., 66% female, 34% male, mean age: 9, 65 l.	Inclusion: Pediatric patients
Borve, et al, 2012	Sweden, 40 p., 57.5% female, 42.5% male, mean age: 49, 40 l.	Inclusion: Adults
Costello, et al, 2019	USA, 37 p., 65% female, 35% male, mean age: 47.9, 37 l.	Inclusion: Adults who were under or uninsured
Duong, et al, 2014	France, 111 p. SFTD, 83 p. videoconference, sex N/A, age: 18+, 110 I. SFTD, 68 I. videoconference	Inclusion: Adults presenting to emergency department
Gabel, et al, 2021	USA, 41 p. sex N/A, age N/A, 41 l.	N/A
Gatica, et al, 2015	Chile, 125 p., 57.6% female, 42.4% male, mean age: 37.7, 125 l.	
Gerhardt, et al, 2021	USA, 809 p., sex N/A, age N/A, 809 l.	Inclusion: Veteran population; Exclusion: Patients whose lesions resolved early
Gonzalez- Coloma, et al, 2019	Chile, 326 p., 59% female, 41% male, mean age: 35.8, 326 l.	N/A
Keller, et al, 2020	USA, 100 p., 43.2% female, 56.8% male, age N/A,100 I.	N/A
Marchell, et al, 2017	USA, 216 p., sex N/A, age N/A, 216 I.	N/A
Muir, et al, 2011	Australia, 60 p. where F2F was an ED physician, 50 p. where F2F was a derm, 65% female, 35% male, mean age: 47, 60 and 50 l.	Inclusion: Adults; Exclusion: Lesions caused by accident or trauma
Nami, et al, 2015	Italy and Austria, 391 p., 52.2% female, 47.8% male, mean age: 54, 391 l.	Exclusion: Pigmented skin lesions
Okita, et al, 2016	Brazil, 100 p., sex N/A, age N/A, 100 l.	N/A
Ribas, et al, 2010	Brazil, 174 p., 53.4% female, 46.6% male, mean age: 34.7, 174 l.	
Rios-Yuil, 2011	Panama, 30 p., 63.3% female, 36.7% male, age range for 30% of patients: 50- 59, 30 l.	
Romero Aguilera, et al, 2014	Spain, 457 p., 56% female, 44% male, mean age: 36, 170 l.	
Romero, et al, 2010	Spain, 158 p. SFTD with videoconference, 170 p. SFTD only, 56% female, 44% male, mean age: 36, 510 l.	
Rubegni, et al, 2011	Italy, 130 p., 53.9% female, 46.1% male, mean age: 80.6, 130 l.	Inclusion: Geriatric patients
Saleh, et al, 2017	Egypt, 600 p., 50.7% female, 49.3% male, age: 38% >20, 17.3% >10-20, 31.7% 2- 10, 13% <2; 600 l.	N/A
Tran, et al, 2011	Egypt, 30 p., sex N/A, all ages, 30 l.	N/A

Vano-Galvan, et al, 2010	Spain, 100 p. (50 from derm outpatient clinic, 50 from the ED), sex N/A, age N/A, 100 l.	N/A
Zanini, 2013	Brazil, 100 p., sex N/A, age N/A, 100 l.	
Zink, et al, 2017, July	Germany, 195 p., 20.5% female, 79.5% male, age range: 1-89 years, 195 l.	
	Skin cancer lesions only	У
Borve, et al, 2013	Sweden, 62 p., 38.7% female, 60.3% male, mean age: 64, 69 l.	Inclusion: Adults whose lesions could be biopsied
Carter, et al, 2017	USA, 79 patients, 74% female, 26% male, mean age: 47, 79 l.	Inclusion: Adults with mild-to- moderate cases; Exclusion: Patients with melanocytic lesions or emergencies
Clarke, et al, 2021	USA, 206 p., 49.5% female, 50.5% male, mean age: 56.9, 308 l.	Inclusion: Adults with a lesion of concern reported by anyone (e.g., patient, family, referring GP) except dermatologist
Giavina- Bianchi, et al, 2020 Nov	Brazil, 17, 233 p., 71.4% female, 28.6% male, age N/A, 803 l.	Exclusions: Mild/complex cases, diagnoses without ICD10 code, and only looked at the 10 most frequent neoplasms
Goulart- Silveira et al, 2019	Brazil, 39 p., 69% female, 31% male, mean age: 68, 39 l.	Inclusion: Adults; Exclusion: Patients with bad quality images
Jones, et al, 2021	New Zealand, 481p., 64% female, 36% male, age range: 0-90+, 528 l.	Inclusion: Adults and children with suspected skin cancers.
Lamel, et al, 2012	USA, 86 p., 58.1% female, 41.9% male, mean age: 45.2, 107 l.	N/A
Piccoli, et al, 2015	Brazil, 184 p., 73.4% female, 26.6% male, mean age: 54.7, 184 l.	Exclusions: Patients with poorly take images, patients under concurrent treatment
Senel, et al, 2013	Turkey, 150 p., 49% female, 51% male, mean age: 55, 150 l.	Inclusion: Adults with non-melanocy lesions only
Tan, et al, 2010	New Zealand, 200 p., 63% female, 37% male, age range: 11-94, 491 l.	N/A
Vestergaard, et al, 2020	Denmark, 519 p., 57% female, 42% male, mean age: 55, 600 l.	Inclusion: Adults
Warshaw, et al, 2015	USA, 2,152 p., 3.2% female, 96.8% male, mean age: 68, 3021 l.	Inclusion: Adults
Zink, et al, 2017, Sept	Germany, 26 p., sex N/A, age N/A, 26 l.	
Sola-Ortigosa, et al, 2020	Spain, 636 p., 43.2% female, 56.8% male, mean age: 72.8, 1000 l.	Inclusion: Adults with keratotic skin lesions only; Exclusion: Patients with poorly taken images
	Skin lesions other than skin ne	oplasms
Chen, et al, 2010	USA, 405 p., 50.6% female, 49.4% male, mean age: 5.9, 405 l.	Inclusion: 12 or younger; Exclusion: Lesions caused by an accident or trauma

Giavina- Bianchi, et al, 2020 Oct	Brazil, 24,210 p., 70% female, 30% male, age N/A, 739 l.	Exclusions: Mild/complex cases, diagnoses without ICD10 code, and only looked at the 20 most frequent inflammatory dermatoses
Patro, et al 2015	India, 206 p., 58.7% female, 41.3% male, age range: 1+, 206 l.	Exclusions: Pregnant women and patients with concurrent diseases

**Table 2. patient characteristics for all 44 included studies.** Studies in alphabetical order and are grouped according to lesion type reported. Last column describes special inclusion and exclusion criteria that could impact quality of the studies included. NA or N/A: Not available, I.: lesion, SFTD: Store And Forward Technology, GP: General practitioner.

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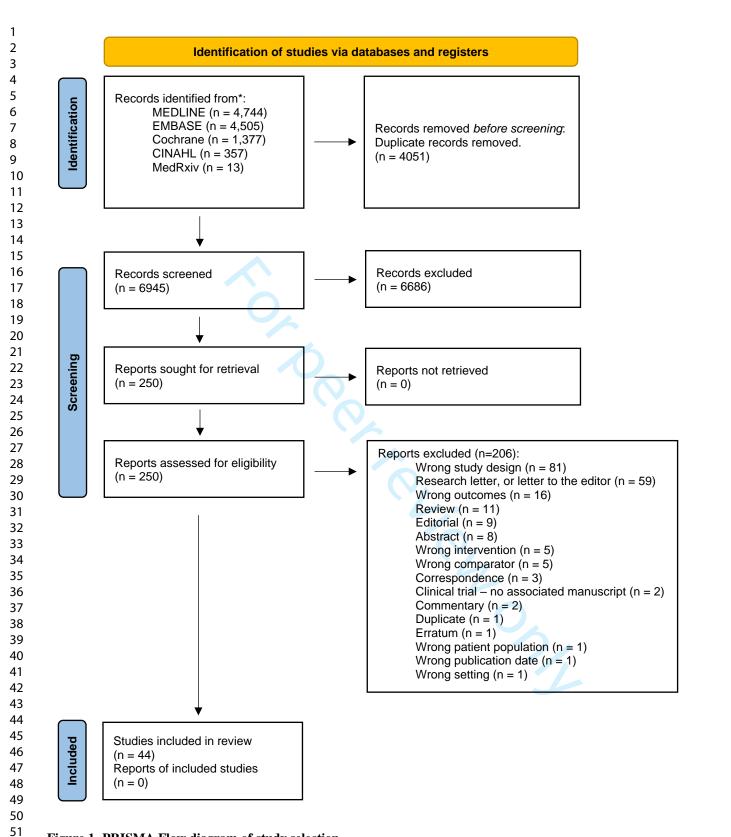


Figure 1. PRISMA Flow diagram of study selection.

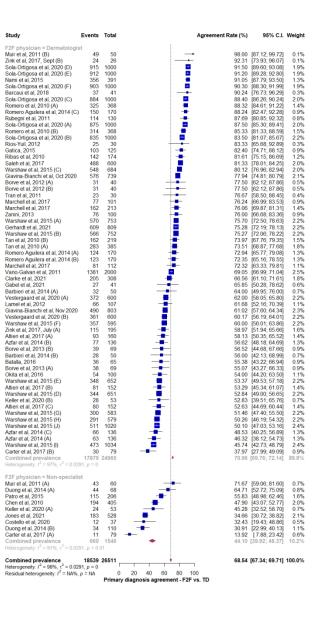


Figure 2. Forest plot representing F2F and TD primary diagnostic agreement by specialization status of the F2F physician. Studies were sorted into two groups, a) F2F diagnosis completed by a board-certified dermatologist; b) F2F diagnosis completed by a non-specialist (e.g., general practitioner). (A) Forest plot representing percentage agreement and 95% C.I. for overall concordance across 40 studies with a total of 72 unique number of comparisons, N of events and total included participants.

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8	Study Total Kappa 95% C.I. Weight
9	F2F physician = Dermatologist
10	Goulart-Silveira, et al, 2019 39 0.96 [0.92; 0.98] 2.0% Muir et al, 2011 (B) 60 0.93 [0.89; 0.96] 2.1%
11	Sola-Ortigosa et al, 2020 (D) 636 🛛 🚺 0.91 [0.90; 0.92] 2.3%
12	Nami et al, 2015 391 • 0.91 [0.89; 0.92] 2.3% Sola-Ortigosa et al, 2020 (E) 636 • 0.90 [0.88; 0.91] 2.3%
13	Sola-Ortigosa et al, 2020 (C) 636
14	Sola-Ortigosa et al, 2020 (A) 636 • 0.87 [0.85; 0.89] 2.3%
15	Rubegni et al, 2011 130 0.86 [0.81; 0.90] 2.2% Senel, et al, 2013 (D) 150 0.86 [0.81; 0.90] 2.2%
16	Senel, et al, 2013 (C) 150 📃 0.85 [0.80; 0.89] 2.2%
17	Sola-Ortigosa et al, 2020 (B) 636 0.83 [0.80; 0.85] 2.3% Ribas et al, 2010 174 0.80 [0.74; 0.85] 2.2%
18	Senel, et al, 2013 (A) 150 0.77 [0.70; 0.83] 2.2% Senel, et al, 2013 (B) 150 0.75 [0.67; 0.81] 2.2%
19	Giavina-Bianchi et al, Oct 2020 24210 0.74 [0.74; 0.75] 2.3%
20	Rios-Yuil, 2012 30 - 0.65 [0.38; 0.82] 1.9% Warshaw et al, 2015 (C) 2152 0.62 [0.59; 0.65] 2.3%
20	Clarke et al, 2021 206 - 0.60 [0.50; 0.68] 2.2%
22	Lamel et al, 2012 86 - 0.60 [0.44; 0.72] 2.2% Altieri et al, 2017 (C) 232 - 0.57 [0.48; 0.65] 2.3%
22	Warshaw et al, 2015 (A) 2152 0.56 [0.53; 0.59] 2.3% Warshaw et al, 2015 (B) 2152 0.56 [0.53; 0.59] 2.3%
23	Saleh et al, 2017 600 600 0.52 [ 0.46; 0.58] 2.3%
	Warshaw et al, 2015 (F) 2152 - 0.52 [0.49; 0.55] 2.3% Altieri et al, 2017 (A) 232 - 0.51 [0.41; 0.60] 2.3%
25	Altieri et al, 2017 (B) 232 – 0.51 [0.41; 0.60] 2.3%
26	Azfar et al, 2014 (B) 76 0.51 [0.32; 0.66] 2.1% Borve et al, 2013 (B) 62 0.48 [0.26; 0.65] 2.1%
27	Borve et al, 2013 (A) 62 0.47 [0.25; 0.64] 2.1% Keller et al, 2020 (B) 100 0.45 [0.28; 0.59] 2.2%
28	Warshaw et al, 2015 (E) 2152 0.45 [0.42; 0.48] 2.3%
29	Warshaw et al, 2015 (D) 2152 - 0.44 [0.41; 0.47] 2.3% Azfar et al, 2014 (C) 76 - 0.43 [0.23; 0.60] 2.1%
30	Azfar et al, 2014 (A) 76 0.41 [0.20; 0.58] 2.1%
31	Warshaw et al, 2015 (G) 2152 - 0.38 [0.34; 0.42] 2.3% Warshaw et al, 2015 (H) 2152 - 0.38 [0.34; 0.42] 2.3%
32	Warshaw et al, 2015 (J) 2152 0.37 [0.33; 0.41] 2.3% Gabel et al, 2021 41 0.33 [0.02; 0.58] 2.0%
33	Warshaw et al, 2015 (I) 2152 🔤 0.32 [0.28; 0.36] 2.3%
34	Giavina-Bianchi et al, Nov 2020 17233 0.21 [0.20; 0.23] 2.3% Random effects model 70284 0.69 [0.60; 0.75] 91.2%
35	Heterogeneity: $J^2 = 100\%$ , $\tau^2 = 0.1863$ , $p = 0$
36	F2F physician = Non-specialist
37	Piccoli, et al, 2014 184 0.69 [0.61; 0.76] 2.2% Gonzalez-Coloma, 2019 326 0.50 [0.41; 0.58] 2.3%
38	Muir et al, 2011 (Å) 60 0.42 [0.19; 0.61] 2.1%
39	Keller et al, 2020 (A)         100         0.40         [0.22; 0.55]         2.2%           Random effects model         670         0.52         [0.26; 0.71]         8.8%
40	Heterogeneity: $I^2 = 82\%$ , $\tau^2 = 0.0314$ , $p < 0.01$
41	Random effects model 70954 0.67 [0.60; 0.74] 100.0%
42	Heterogeneity: $J^2 = 100\%$ , $\tau^2 = 0.1771$ , $p = b$
43	Primary diagnosis agreement - F2F vs. TD
44	
45	Figure 2. Forest plot representing F2F and TD primary diagnostic agreement by specialization status of the
46	F2F physician. Studies were sorted into two groups, a) F2F diagnosis completed by a board-certified
47	dermatologist; b) F2F diagnosis completed by a non-specialist (e.g., general practitioner). (B) Forest plot
48	representing kappa concordance and 95% C.I. for overall concordance across 21 studies with a total of 45
49	unique number of comparisons, N of total included participants.
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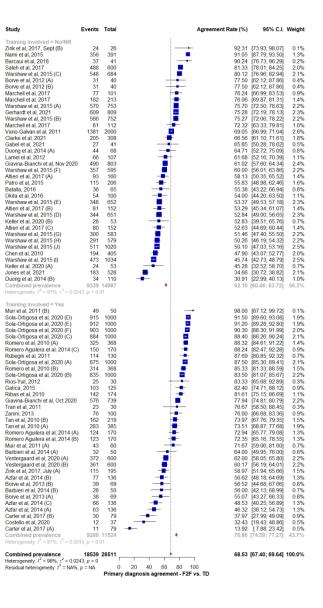


Figure 3. Forest plot representing F2F and TD primary diagnostic agreement by whether imaging acquisition training was indicated by the study.

Forest plot representing F2F and TD primary diagnostic agreement when image acquisition training is involved. Studies were sorted into two groups, a) Did not conduct or did not report training personnel on image acquisition; b) Stated that person in charge of image acquisition was trained. (A) Forest plot representing percentage agreement and 95% C.I. for overall concordance across 39 studies with a total of 71 unique number of comparisons, N of events and total included participants.

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Study	Total		Kappa	95% C.I.	Weight
Training involved = No/Not Me Goulart-Silveira, et al, 2019 Nami et al, 2015 Senel, et al, 2013 (D) Senel, et al, 2013 (C) Senel, et al, 2013 (C) Senel, et al, 2013 (A) Senel, et al, 2013 (A) Warshaw et al, 2015 (C) Clarke et al, 2021 Altieri et al, 2017 (C) Warshaw et al, 2015 (B) Saleh et al, 2017 (C) Altieri et al, 2017 (A) Altieri et al, 2015 (B) Gonzalez-Coloma, 2019 Keller et al, 2020 (B) Warshaw et al, 2015 (C) Warshaw et al, 2015 (D) Warshaw et al, 2015 (D) Warshaw et al, 2015 (D) Gabel et al, 2021 Warshaw et al, 2015 (D) Gavina-Bianchi et al, N02 v2020	antioned     39       391     150       150     150       150     2152       206     -       232     -       232     -       252     2152       2152     -       232     -       232     -       232     -       232     -       232     -       232     -       232     -       232     -       232     -       232     -       2152     -       217233     -		$\begin{array}{c} 0.96 \\ 0.91 \\ 0.85 \\ 0.77 \\ 0.75 \\ 0.62 \\ 0.60 \\ 0.60 \\ 0.60 \\ 0.67 \\ 0.56 \\ 0.56 \\ 0.56 \\ 0.56 \\ 0.52 \\ 0.51 \\ 0.51 \\ 0.51 \\ 0.51 \\ 0.51 \\ 0.51 \\ 0.51 \\ 0.51 \\ 0.53 \\ 0.53 \\ 0.53 \\ 0.33 \\ 0.33 \\ 0.32 \\ 0.21 \\ 0.$	0.92; 0.98] 0.88; 0.92] 0.81; 0.90] 0.80; 0.89] 0.77; 0.83] 0.67; 0.81] 0.59; 0.65] 0.44; 0.72] 0.48; 0.65] 0.49; 0.55] 0.49; 0.55] 0.49; 0.55] 0.49; 0.55] 0.41; 0.60] 0.41; 0.60] 0.41; 0.60] 0.41; 0.60] 0.41; 0.60] 0.41; 0.60] 0.42; 0.48] 0.41; 0.60] 0.41; 0.60] 0.42; 0.45] 0.42; 0.42] 0.34; 0.42] 0.34; 0.42] 0.34; 0.42] 0.34; 0.42] 0.34; 0.42] 0.28; 0.36] 0.20; 0.23] 0.29; 0.29]	2 0% 2 3% 2 2% 2 2% 2 2% 2 2% 2 3% 2 3%
Piccoli, et al, 2014 Rios-Yuil, 2012 Azfar et al, 2014 (B) Borve et al, 2013 (B) Borve et al, 2013 (A) Azfar et al, 2014 (C) Muir et al, 2011 (A) Azfar et al, 2014 (A)	$\begin{array}{c} 60\\ 636\\ 636\\ 636\\ 636\\ 636\\ 130\\ 636\\ 174\\ 24210\\ 184\\ 30\\ 76\\ -\\ 62\\ -\\ 76\\ 62\\ -\\ 76\\ 62\\ -\\ 76\\ -\\ 29016\\ 48, p < 0.01 \end{array}$		0.91 [ 0.90 [ 0.89 [ 0.87 ] 0.87 [ 0.87 ] 0.87 [ 0.83 [ 0.83 [ 0.83 ] 0.83 [ 0.83 [ 0.83 ] 0.84 [ 0.74 ] 0.65 [ 0.51 ] 0.48 [ 0.47 ] 0.43 [ 0.42 ] 0.42 [ 0.41 ]	0.89; 0.96] 0.90; 0.92] 0.88; 0.91] 0.87; 0.91] 0.87; 0.91] 0.85; 0.89] 0.84; 0.90] 0.80; 0.85] 0.74; 0.75] 0.61; 0.74; 0.75] 0.61; 0.74; 0.75] 0.26; 0.65] 0.25; 0.64] 0.23; 0.66] 0.23; 0.61] 0.20; 0.58] 0.26; 0.84]	2.1% 2.3% 2.3% 2.3% 2.2% 2.2% 2.2% 2.3% 2.2% 2.3% 2.2% 2.3% 2.2% 2.1% 2.1% 2.1% 2.1% 2.1% 2.1% 2.1
<b>Random effects model</b> Heterogeneity: $I^2 = 100\%$ , $\tau^2 = 0.17$	<b>70954</b>	- <b>†</b>	0.67 [	0.60; 0.74]	100.0%
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unique number of comparisons, N of total included participants. 264x343mm (96 x 96 DPI)

representing kappa concordance and 95% C.I. for overall concordance across 21 studies with a total of 45

# **Supplementary Online Content** 3 4 5

Title: Diagnostic Reliability in Teledermatology: A Systematic Review and Meta-Analysis

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## Supplementary eMethods

## **Search Strategy**

The search strategy was written for Ovid Medline and translated using each database's syntax, controlled vocabulary, and search fields. MeSH terms, Emtree terms, and free text words were used for TD and skin conditions such as melanoma and related synonyms. To identify additional articles not captured through the aforementioned search, a manual search was conducted via reference search of the included studies.

All database records were downloaded to EndNote X9 (Clarivate) and uploaded to web-based software for deduplication, screening, and full-text evaluation (Covidence; Veritas Health Innovation). We contacted three study authors to gain access to their published work.<sup>1-3</sup> The search strategy is available below.

#### **Ovid MEDLINE Search**

Ovid MEDLINE(R), Ovid MEDLINE(R) Daily and Epub Ahead of Print, In-Process & Other Non-Indexed Citations <1946 to 2022 May 02>

- 1. e consult\*.mp. 2. econsult\*.mp. 3. electronic consult\*.mp. 4. e health.mp. 5. ehealth.mp. 6. e visit\*.mp. 7.
- evisit\*.mp. 8. home video visit\*.mp. 9. internet/ or internet-based intervention/ 10. internet.mp. 11. offsite care.mp.
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  - diagnos\*.mp. 22. telehealth.mp. 23. tele health.mp. 24. telemedicine/ 25. telemedicine.mp. 26. tele medicine.mp. 27.
  - telemonitor\*.mp. 28. tele monitor\*.mp. 29. Telepathology/ 30. telepatholog\*.mp. 31. tele patholog\*.mp. 32.
- telepractice\*.mp. 33. tele practice\*.mp. 34. Therapy, Computer-Assisted/ 35. video consult\*.mp. 36.
  - videoconsult\*.mp. 37. virtual care.mp. 38. web based.mp. 39. Telepathology/ 40. or/1-39 41. Dermatology/ 42. dermatolog\*.mp. 43. dermatopatholog\*.mp. 44. exp Skin Diseases/di [Diagnosis] 45. exp Skin Neoplasms/ 46.
    - skin.mp. 47. exp Skin Abnormalities/ 48. burns/ or burns, chemical/ or burns, electric/ or sunburn/ 49. burn\*.mp. 50.
    - wound healing/ or cicatrix/ 51. wound\*.mp. 52. or/41-51, 53. 40 and 52, 54. teledermatolog\*.mp. 55. tele dermatolog\*.mp. 56. 54 or 55, 57. 53 or 56, 58. limit 57 to dt=20100101-20220402
      - Eligibility Criteria
    - Inclusion and exclusion criteria are summarized in eTable 1.
    - Data Selection and Extraction
    - Information extracted from full-text articles is summarized in eTable 2.
- Data Analysis: Cohen's kappa Interpretations
  - Cohen's kappa values for diagnostic concordance between TD and F2F physicians were interpreted based on the following criteria.<sup>4</sup> Values between 0-.20 indicate no agreement, .21-.39 minimal agreement, .40-.59 weak agreement, .60-.79 moderate agreement, .80-.90 strong agreement, and above .90 almost perfect agreement.
    - Data Synthesis

Agreement rates and Cohen's kappa concordances for unique study groupings were treated as individual and independent values. A letter was assigned to each unique study grouping as explained in eTable 3. Confounding factors including technology type, year of publication, and training of study raters was controlled using meta-regression. Proportions meta-analysis looked at weighted averages and 95% confidence intervals were reported. A random-effects model as proposed by DerSimonian and Laird was chosen as the primary method to estimate all pooled estimates.<sup>5</sup> Heterogeneity was assessed by calculating I<sup>2</sup>. Possible sources of heterogeneity were sought through sub-group analysis. This included different skin conditions, specialization of the F2F physician, whether staff were trained on image acquisition, the technology used for image acquisition, the use of teledermoscopy, studies poster pre-or post-pandemic, and risk of bias.

#### 99 Supplementary eResults

#### 101 Diagnostic reliability of TD when compared to F2F (specialist and non-specialists) evaluation

102 Of the 40 studies that reported diagnostic agreement rates there were 72 unique comparisons made between F2F and 103  $TD.^{6.45}$  eFigure 1A shows that the mean percentage agreement of 68.9% (CI 64.4%-73.1%) ranged from 14% to 104 98%, where 35/72 had percentage agreement above 70% and 7 studies had over 90% agreement. The studies were 105 heterogeneous (I^2=98%, p <0).

# 106 107 Of the 21 studies that reported concordance values, there were 45 unique comparisons made.<sup>6, 7, 12, 15, 18, 21-26, 29, 30, 33 108 <sup>35, 46-50</sup> eFigure 1B shows that the mean diagnostic concordance of 0.67 (CI 0.60 to 0.74) ranged from 0.213 (CI 0.20) </sup>

to 0.23) to 0.96 (CI 0.92 to 0.98), with 21 studies (47%) having moderate agreement (k=0.6 and above), and 13

110 (29%) studies having strong agreement. The studies were heterogeneous (I^2=100%, p <0.001). 111

#### 112 Diagnostic agreement between TD and TD, F2F and F2F, and TD and Histopathology

Of the ten studies that reported diagnostic agreement rates between TDs, there were 17 unique comparisons made between F2F and TD. **eFigure 2A** shows that the mean percentage agreement of 76.4% (CI 69% to 82.5%) ranged from 37% to 91.5%, with 10/17 having percentage agreement above 70% and two studies having over 90% agreement. The studies were heterogeneous (I^2=97%, p <0.001).

From four studies that reported diagnostic agreement rates between F2F dermatologists there were 6 unique
comparisons. eFigure 2B shows that the mean percentage agreement 82.4% (CI 76.7%-87.0%) ranged from 75.5%
to 91%. The studies were heterogeneous (I^2=68%, p <0.001).</li>

Five studies compared TDs to histopathology data, and there were six unique comparisons. **eFigure 2C** shows that the mean percentage agreement of 55.7% (CI 53% to 58.4%) ranged from 53.8% to 65.4%. The mean agreement rate between histopathology and TD was 55.7% (CI 53.0 to 58.4). The studies were homogeneous (I^2=0%, p = 0.49).

#### Subgroup analyses

#### Diagnostic reliability of TD vs F2F by the inclusion of teledermoscopy in both TD and F2F assessments Overall, twelve studies with 22 unique comparisons used teledermoscopy for diagnosing suspicious lesions.<sup>9, 12, 16, 30,</sup> <sup>33, 35, 39, 40, 43, 45</sup> eFigure 3A shows that with teledermoscopy, the mean diagnostic agreement rates was 69.1% (CI 66.8% to 71.4%), and this percentage ranged between from 31.6% to 92.3%. Without the use of teledermsocopy, the mean agreement rate was 68.3% (CI 66.8% to 69.8%). The means were not significantly different between the two groups and the studies were heterogeneous ( $I^2=97\%$ , p<0.001). eFigure 3B shows concordance values of seven studies that adapted teledermoscopy had a mean of 0.71 (CI 0.58 to 0.80).<sup>12, 30, 33, 35, 40, 48, 49</sup> Without teledermsocopy, the mean was 0.65 (CI 0.54 to 0.74). This difference was not statistically significant, and the studies were heterogeneous (I^2=100%, p<0.001).

139 Diagnostic reliability of TD vs F2F by the inclusion of lesion category

140 Twenty-six studies with 39 unique comparisons reporting percentage agreement rates that were inclusive to all 141 lesion types as shown in e**Figure 4A.** <sup>6-11, 16-20, 23, 25-27, 29-34, 37, 38, 41, 42, 44</sup> The mean percentage agreement was 69.9% 142 (CI 67.9% to 71.7%) and ranged from 30.9% to 98%, with the majority (26/39) having percentage agreement above 143 60% and 4 studies having over 90%. Eleven studies only looked at suspicious lesions <sup>12, 13, 15, 21, 24, 35, 36, 39, 40, 43, 45</sup>, and 144 the mean percentage agreement was 68.1% (CI 66.3% to 69.8%). Three studies excluded skin cancers <sup>14, 22, 28</sup> and the 145 mean percentage agreement was 62.2% (CI 56.2% to 67.8%). No statistical significance could be identified between 146 the three lesion groups and the studies were heterogeneous (I^2=98%, p<0.001).</p>

Concordance values for studies inclusive to all lesions seen in eFigure 4B were reported in ten studies with a mean of 0.62 (CI 0.48 to 0.74).<sup>6, 7, 18, 23, 25, 26, 29, 30, 33, 34</sup> Six studies that looked at cancerous skin lesions only reported a mean of 0.70 (CI 0.59 to 0.78).<sup>12, 15, 21, 24, 35, 40</sup> Only one study that looked at all lesions except cancerous ones reported a concordance value.<sup>22</sup> No statistical significance could be identified between the three lesion groups and the studies were heterogeneous ( $I^2=100\%$ , p<0.001). 

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#### 155 Diagnostic reliability of TD vs F2F by type of technology used related to image acquisition

- Approximately half of the studies with 41 unique comparisons that compared TDs with F2F physicians used digital cameras for image acquisition. Eighteen studies comparing F2F and TD agreement rates with 26 unique
- 158 comparisons reported the use of smartphones and tablets for image acquisition. **eFigure 5A** shows that the mean
- 7 159 percentage agreement rate was 71.7% (CI 70.3% to 73.1%) for digital cameras compared to 59.8% (CI 57.2% to
- 8 160 62.3%) for smartphones or tablets. The higher agreement rate with digital photography was statistically significant
- 9 161 (p = 0.029, heterogeneity:  $I^2 = 98\%$ ).

- 162 Concordance values for digital photography were reported for twelve studies with a mean of 0.70 (CI 0.61 to 0.76)
- 11 163 shown in **eFigure 5B**. Concordance values for smartphone or tablet technologies were reported for eight studies
- 12 164 with a mean of 0.62 (CI 0.38 to 0.78). The higher concordance with digital photography was statistically significant 13 165  $(p = 0.003, heterogeneity: I^2=100\%)$

#### 167 Diagnostic reliability of TD vs F2F by pre- and post-pandemic timelines.

168 When comparing TDs to all F2F physician, the average agreement rate was 65.5% (CI 64.0-66.9) for pre-pandemic 169 studies, and 75.3% (CI 73.4% to 77.2%) for studies published after January 2020. When the percentage agreements 170 were compared between the two groups, they were not statistically significant (p = 0.421) and also heterogeneous 171 (I^2=98%, p<0.001). eTable not included.

### 174 Risk of bias and quality assessment

The results of quality assessment for risk of bias and applicability in individual studies are displayed in. eTable 4.
Five (11.4%) of the studies had low risk of bias, 11 (25%) had moderate risk, and 28 (63.6%) had high-risk of bias.

There were no systematic differences between the results of studies that attempted to reduce risk of bias, compared with those with higher risk of bias. The mean diagnostic agreement rate between F2F and TD was 66.4% (CI 62.4% to 70.1%) for low risk, and 69.1% (CI 67.6% to 70.6%) for high risk (p = 0.932). When the percentage agreements were compared between groups, they were heterogeneous (I^ 2=98%, p<0.001). eTable not included.</p>

	A	Study Muir et al, 2011 (B) Zink et al, 2017, Sept (B) Sola-Ortigosa et al, 2020 (D) Sola-Ortigosa et al, 2020 (E) Nami et al, 2015 Sola-Ortigosa et al, 2020 (F) Barcaui et al, 2018 Sola-Ortigosa et al, 2020 (C) Romero et al, 2010 (A) Romero Aguilera et al, 2014 (C) Rubegni et al, 2011 Sola-Ortigosa et al, 2020 (A) Romero et al, 2010 (B) Sola-Ortigosa et al, 2020 (B) Rios-Yuil, 2012 Gatica, 2015 Ribas et al, 2017 Warshaw et al, 2015 (C) Giavina-Bianchi et al, Oct 2020 Borve et al, 2012 (B) Tran et al, 2011 Marchell et al, 2017 Marchell et al, 2017 Marcha et al, 2017 Marchell et al, 2015 (A)	Events           49           24           915           912           356           903           37           884           325           150           114           875           314           835           25           103           142           488           548           576           311           23           77           162	Total           50           26           1000           391           1000           41           1000           368           1000           30           125           174           600           684           739           40           30		92.31 91.50 91.20 91.20 90.30 90.24 88.40 88.32 88.24 87.69 87.50 85.33 83.50 83.33 83.50 83.33 82.40 81.61 81.33 80.12 77.94 77.50 77.50	$\begin{array}{l} [87.12; 99.72]\\ [73.93; 98.07]\\ [89.60; 93.08]\\ [89.28; 92.80]\\ [87.79; 93.50]\\ [86.30; 91.99]\\ [76.73; 96.29]\\ [86.26; 90.24]\\ [84.61; 91.22]\\ [82.47; 92.28]\\ [80.85; 92.32]\\ [85.30; 89.41]\\ [81.33; 88.59]\\ [81.07; 85.67]\\ [65.68; 92.89]\\ [74.71; 88.12]\\ [75.15; 86.69]\\ [78.01; 84.25]\\ [76.96; 82.94]\\ [74.81; 80.79]\\ [62.12; 87.86] \end{array}$	$ \begin{array}{c} 0.6.6\\ 0.8.8\\ 1.5.\\ 1.5.\\ 1.4.\\ 1.5.\\ 1.4.\\ 1.5.\\ 1.4.\\ 1.4.\\ 1.4.\\ 1.5.\\ 1.1.\\ 1.4.\\ 1.5.\\ 1.1.\\ 1.4.\\ 1.5.\\ 1.5.\\ 1.5.\\ 1.2.\\ 1.$
	A	Zink et al, 2017, Sept (B) Sola-Ortigosa et al, 2020 (D) Sola-Ortigosa et al, 2020 (D) Sola-Ortigosa et al, 2020 (E) Nami et al, 2015 Sola-Ortigosa et al, 2020 (F) Barcaui et al, 2018 Sola-Ortigosa et al, 2020 (C) Romero et al, 2010 (A) Romero et al, 2011 (C) Rubegni et al, 2011 Sola-Ortigosa et al, 2020 (A) Romero et al, 2010 (B) Sola-Ortigosa et al, 2020 (B) Rios-Yuil, 2012 Gatica, 2015 Ribas et al, 2010 Saleh et al, 2017 Warshaw et al, 2015 (C) Giavina-Bianchi et al, Oct2020 Borve et al, 2012 (A) Borve et al, 2012 (A) Borve et al, 2011 Marchell et al, 2017 Zanini, 2013	24 915 912 356 903 37 884 325 150 114 875 25 103 142 488 576 31 31 23 77	$\begin{array}{c} 26 \\ 1000 \\ 1000 \\ 391 \\ 1000 \\ 41 \\ 1000 \\ 368 \\ 170 \\ 130 \\ 1000 \\ 368 \\ 1000 \\ 30 \\ 125 \\ 174 \\ 600 \\ 684 \\ 739 \\ 40 \\ 40 \end{array}$		92.31 91.50 91.20 91.20 90.30 90.24 88.40 88.32 88.24 87.69 87.50 85.33 83.50 83.33 83.50 83.33 82.40 81.61 81.33 80.12 77.94 77.50 77.50	$\begin{array}{c} [73.93, 98.07] \\ [89.60, 93.08] \\ [89.28, 92.80] \\ [87.79, 93.50] \\ [88.30, 91.99] \\ [76.73, 96.29] \\ [86.26, 90.24] \\ [84.61, 91.22] \\ [82.47, 92.28] \\ [80.85, 92.32] \\ [85.30, 89.41] \\ [81.33, 88.59] \\ [81.07, 85.67] \\ [65.68, 92.89] \\ [74.71, 88.12] \\ [75.15, 86.69] \\ [78.01, 84.25] \\ [76.06, 82.94] \\ [74.80, 78.67] \\ [74.80, 78.67] \\ [74.80, 78.67] \\ [74.80, 78.67] \\ [74.80, 78.67] \\ [74.80, 78.78] \\ [74.80, 78.78] \\ [74.80, 78.78] \\ [74.80, 78.78] \\ [74.80, 78.78] \\ [74.80, 78.78] \\ [74.80, 78.78] \\ [74.81, 80.79] \\ [62.12, 87.86] \\ \end{array}$	$ \begin{vmatrix} 0.8\\ 1.5\\ 1.5\\ 1.5\\ 1.5\\ 1.4\\ 1.5\\ 1.5\\ 1.5\\ 1.4\\ 1.5\\ 1.4\\ 1.4\\ 1.4\\ 1.5\\ 1.5\\ 1.5\\ 1.5\\ 1.5\\ 1.5\\ 1.2\\ 1.2\\ 1.2\\ 1.2\\ 1.2\\ 1.2\\ 1.2\\ 1.2$
	A	Sola-Ortigosa et al, 2020 (D) Sola-Ortigosa et al, 2020 (E) Nami et al, 2015 Sola-Ortigosa et al, 2020 (F) Barcaui et al, 2018 Sola-Ortigosa et al, 2020 (C) Romero et al, 2010 (A) Romero Aguilera et al, 2020 (C) Rubegni et al, 2011 (A) Romero et al, 2010 (A) Romero et al, 2010 (B) Sola-Ortigosa et al, 2020 (B) Rios-Yuil, 2012 Gatica, 2015 Ribas et al, 2017 Warshaw et al, 2015 (C) Giavina-Bianchi et al, Oct2020 Borve et al, 2012 (A) Borve et al, 2012 (B) Tran et al, 2017 Marchell et al, 2017 Zanini, 2013	915 912 356 903 37 884 325 150 114 875 314 835 25 103 142 488 576 31 31 23 77	1000 1000 391 1000 41 1000 368 170 130 1000 368 1000 300 125 174 600 684 739 40 40		91.50 91.20 91.05 90.30 90.24 88.40 88.32 88.24 87.69 87.50 85.33 83.350 83.33 83.40 81.61 81.33 80.12 77.94 77.50	[89.60, 93.08]           [89.60, 93.08]           [87.79, 93.50]           [83.30, 91.99]           [76.73, 96.29]           [86.26, 90.24]           [84.61, 91.22]           [82.47, 92.28]           [80.85, 92.32]           [85.30, 89.41]           [81.33, 88.59]           [81.77, 85.67]           [65.68, 92.89]           [74.71, 88.12]           [75.15, 86.69]           [76.04, 82.94]           [74.81, 80.79]           [62.12, 87.86]	$ \begin{vmatrix} 1.5\\ 1.5\\ 1.5\\ 1.5\\ 1.5\\ 1.5\\ 1.5\\ 1.5\\$
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		Nami et al, 2015 Sola-Ortigosa et al, 2020 (F) Barcaui et al, 2018 Sola-Ortigosa et al, 2020 (C) Romero et al, 2010 (A) Romero Aguilera et al, 2014 (C) Rubegni et al, 2011 Sola-Ortigosa et al, 2020 (A) Romero et al, 2010 (B) Sola-Ortigosa et al, 2020 (B) Rios-Yuii, 2012 Gatica, 2015 Ribas et al, 2010 Saleh et al, 2017 Warshaw et al, 2015 (C) Giavina-Bianchi et al, Oct 2020 Borve et al, 2012 (A) Borve et al, 2012 (A) Borve et al, 2011 Marchell et al, 2017 Zanini, 2013	356 903 37 884 325 150 114 875 314 835 25 103 142 488 8548 576 31 31 23 77	391 1000 41 1000 368 170 130 1000 368 1000 30 125 174 600 684 739 40 40		91.05 90.30 90.24 88.40 88.32 88.24 87.50 85.33 83.50 83.33 82.40 81.61 81.33 80.12 77.94 77.50 77.50	$\begin{bmatrix} 87.79, 93.50 \\ 88.30, 91.99 \\ 76.73, 96.29 \\ 86.26, 90.24 \\ 84.61, 91.22 \\ 82.47, 92.28 \\ 80.85, 92.32 \\ 85.30, 89.41 \\ 81.33, 88.59 \\ [81.07, 85.67 ] \\ [85.68, 92.89 \\ [74.71, 88.12 ] \\ [75.15, 86.69 \\ [78.01, 84.25 \\ [76.06, 82.94 ] \\ [74.81, 80.79 \\ [62.12, 87.86 ] \end{bmatrix}$	1.4           1.5           1.1           1.5           1.4           1.4           1.5           1.4           1.5           1.4           1.5           1.4           1.5           1.4           1.5           1.4           1.5           1.4           1.5           1.4           1.5           1.4           1.5           1.5           1.5           1.5           1.5           1.5           1.5           1.5           1.5           1.2           1.2
		Barcaui et al, 2018 Sola-Ortigosa et al, 2020 (C) Romero et al, 2010 (A) Romero Aguilera et al, 2014 (C) Rubegni et al, 2011 Sola-Ortigosa et al, 2020 (A) Romero et al, 2010 (B) Sola-Ortigosa et al, 2020 (B) Rios-Yuil, 2012 Gatica, 2015 Ribas et al, 2017 Gatica, 2015 Ribas et al, 2017 Warshaw et al, 2015 (C) Giavina-Bianchi et al, Oct 2020 Borve et al, 2012 (A) Borve et al, 2012 (B) Tran et al, 2011 Marchell et al, 2017 Zanini, 2013	37 884 325 150 114 875 314 835 25 103 142 488 548 576 31 31 31 23 77	41 1000 368 170 130 1000 368 1000 30 125 174 600 684 739 40 40		90.24 88.40 88.32 88.24 87.69 87.50 85.33 83.50 83.33 82.40 81.61 81.33 80.12 77.94 77.50 77.50	[76.73; 96.29] [86.26; 90.24] [84.61; 91.22] [82.47; 92.28] [80.85; 92.32] [85.30; 89.41] [81.33; 88.59] [81.07; 85.67] [65.68; 92.89] [74.71; 88.12] [75.15; 86.69] [78.01; 84.25] [76.96; 82.94] [74.81; 80.79] [62.12; 87.86]	1.1           1.5           1.4           1.4           1.4           1.4           1.4           1.4           1.5           1.4           1.5           1.4           1.5           1.5           1.1           1.4           1.5           1.5           1.5           1.5           1.5           1.5           1.5           1.5           1.5           1.2           1.2
		Sola-Ortigosa et al, 2020 (C) Romero et al, 2010 (A) Romero Aguilera et al, 2014 (C) Rubegni et al, 2011 Sola-Ortigosa et al, 2020 (A) Romero et al, 2010 (B) Sola-Ortigosa et al, 2020 (B) Rios-Yuil, 2012 Gatica, 2015 Ribas et al, 2010 Saleh et al, 2017 Warshaw et al, 2015 (C) Giavina-Bianchi et al, Oct 2020 Borve et al, 2012 (A) Borve et al, 2012 (A) Borve et al, 2011 Marchell et al, 2017 Zanini, 2013	884 325 150 114 875 314 835 25 103 142 488 548 576 31 31 23 77	1000 368 170 130 368 1000 30 125 174 600 684 739 40 40		88.40 88.32 88.24 87.69 87.50 85.33 83.50 83.33 82.40 81.61 81.33 80.12 77.94 77.50	[86.26; 90.24]           [84.61; 91.22]           [82.47; 92.28]           [80.85; 92.32]           [80.85; 92.32]           [81.33; 88.59]           [81.07; 85.67]           [65.68; 92.89]           [74.71; 88.12]           [75.15; 86.69]           [78.01; 84.25]           [76.96; 82.94]           [74.81; 80.79]           [62.12; 87.86]	1.5           1.4           1.4           1.4           1.4           1.4           1.5           1.4           1.5           1.4           1.5           1.4           1.5           1.1           1.4           1.5           1.5           1.5           1.5           1.5           1.5           1.5           1.5           1.5           1.2
		Romero et al, 2010 (A) Romero Aguilera et al, 2014 (C) Rubegni et al, 2011 Sola-Ortigosa et al, 2020 (A) Romero et al, 2010 (B) Sola-Ortigosa et al, 2020 (B) Rios-Yuil, 2012 Gatica, 2015 Ribas et al, 2010 Saleh et al, 2017 Warshaw et al, 2015 (C) Giavina-Bianchi et al, Oct 2020 Borve et al, 2012 (A) Borve et al, 2012 (B) Tran et al, 2011 Marchell et al, 2017 Zanini, 2013	325 150 114 875 314 835 25 103 142 488 548 576 31 31 23 77	368 170 130 368 1000 30 125 174 600 684 739 40 40		88.32 88.24 87.60 87.50 85.33 83.50 83.33 82.40 81.61 81.33 80.12 77.94 77.50 77.50	[84.61, 91.22] [82.47, 92.28] [80.85, 92.32] [85.30, 89.41] [81.33, 88.59] [81.07, 85.67] [65.68, 92.89] [74.71, 88.12] [75.15, 86.69] [78.01, 84.25] [76.06, 82.94] [74.81, 80.79] [62.12, 87.86]	1.4   1.4   1.4   1.5   1.4   1.5   1.4   1.4   1.5   1.5   1.5   1.2   1.2
		Romero Aguilera et al, 2014 (C) Rubegni et al, 2011 Sola-Ortigosa et al, 2020 (A) Romero et al, 2010 (B) Sola-Ortigosa et al, 2020 (B) Rios-Yuil, 2012 Gatica, 2015 Ribas et al, 2017 Warshaw et al, 2017 Giavina-Bianchi et al, 00ct 2020 Borve et al, 2012 (A) Borve et al, 2012 (A) Borve et al, 2012 (B) Tran et al, 2011 Marchell et al, 2017 Zanini, 2013	150 114 875 314 835 25 103 142 488 548 548 576 31 31 23 77	170 130 1000 368 1000 30 125 174 600 684 739 40 40		88.24 87.69 87.50 85.33 83.50 83.33 82.40 81.61 81.33 80.12 77.94 77.50 77.50	[82.47; 92.28] [80.85; 92.32] [85.30; 89.41] [81.33; 88.59] [81.07; 85.67] [65.68; 92.89] [74.71; 88.12] [75.15; 86.69] [78.01; 84.25] [76.96; 82.94] [74.81; 80.79] [62.12; 87.86]	1.4 1.4 1.5 1.4 1.5 1.5 1.1 1.4 1.5 1.5 1.5 1.5 1.2 1.2 1.2
		Sola-Ortigosa et al, 2020 (A) Romero et al, 2010 (B) Sola-Ortigosa et al, 2020 (B) Rios-Yuil, 2012 Gatica, 2015 Ribas et al, 2010 Saleh et al, 2017 Warshaw et al, 2015 (C) Giavina-Bianchi et al, Oct 2020 Borve et al, 2012 (A) Borve et al, 2012 (B) Tran et al, 2011 Marchell et al, 2017 Zanini, 2013	875 314 835 25 103 142 488 548 576 31 31 23 77	1000 368 1000 30 125 174 600 684 739 40 40		87.50 85.33 83.50 83.33 82.40 81.61 81.33 80.12 77.94 77.50 77.50	[85.30; 89.41] [81.33; 88.59] [81.07; 85.67] [65.68; 92.89] [74.71; 88.12] [75.15; 86.69] [78.01; 84.25] [76.96; 82.94] [74.81; 80.79] [62.12; 87.86]	1.5 1.4 1.5 1.1 1.4 1.4 1.4 1.5 1.5 1.5 1.2 1.2 1.2
		Romero et al, 2010 (B) Sola-Ortigosa et al, 2020 (B) Rios-Yuil, 2012 Gatica, 2015 Ribas et al, 2010 Saleh et al, 2017 Warshaw et al, 2015 (C) Giavina-Bianchi et al, Oct 2020 Borve et al, 2012 (A) Borve et al, 2012 (B) Tran et al, 2011 Marchell et al, 2017 Zanini, 2013	314 835 25 103 142 488 548 576 31 31 23 77	368 1000 30 125 174 600 684 739 40 40		85.33 83.50 83.33 82.40 81.61 81.33 80.12 77.94 77.50 77.50	[81.33; 88.59] [81.07; 85.67] [65.68; 92.89] [74.71; 88.129] [75.15; 86.62] [78.01; 84.25] [76.96; 82.94] [74.81; 80.79] [62.12; 87.86]	1.4   1.5   1.1   1.4   1.4   1.5   1.5   1.2   1.2
		Sola-Ortigosa et al, 2020 (B) Rios-Yuil, 2012 Gatica, 2015 Ribas et al, 2010 Saleh et al, 2017 Warshaw et al, 2015 (C) Giavina-Bianchi et al, Oct 2020 Borve et al, 2012 (A) Borve et al, 2012 (B) Tran et al, 2011 Marchell et al, 2017 Zanini, 2013	835 25 103 142 488 548 576 31 31 23 77	1000 30 125 174 600 684 739 40 40		83.50 83.33 82.40 81.61 81.33 80.12 77.94 77.50 77.50	[81.07; 85.67] [65.68; 92.89] [74.71; 88.12] [75.15; 86.69] [78.01; 84.25] [76.96; 82.94] [74.81; 80.79] [62.12; 87.86]	1.5   1.4   1.4   1.5   1.5   1.5   1.5   1.2
		Rios-Yuii, 2012 Gatica, 2015 Ribas et al, 2010 Saleh et al, 2017 Warshaw et al, 2015 (C) Giavina-Bianchi et al, Oct 2020 Borve et al, 2012 (A) Borve et al, 2012 (B) Tran et al, 2011 Marchell et al, 2017 Zanini, 2013	25 103 142 488 548 576 31 31 23 77	30 125 174 600 684 739 40 40		83.33 82.40 81.61 81.33 80.12 77.94 77.50 77.50	[65.68; 92.89] [74.71; 88.12] [75.15; 86.69] [78.01; 84.25] [76.96; 82.94] [74.81; 80.79] [62.12; 87.86]	1.1   1.4   1.4   1.5   1.5   1.2
		Ribas et al, 2010 Saleh et al, 2017 Warshaw et al, 2015 (C) Giavina-Bianchi et al, Oct 2020 Borve et al, 2012 (A) Borve et al, 2012 (B) Tran et al, 2011 Marchell et al, 2017 Zanini, 2013	142 488 548 576 31 31 23 77	174 600 684 739 40 40		81.61 81.33 80.12 77.94 77.50 77.50	[75.15; 86.69] [78.01; 84.25] [76.96; 82.94] [74.81; 80.79] [62.12; 87.86]	1.4   1.5   1.5   1.5   1.2
		Saleh et al, 2017 Warshaw et al, 2015 (C) Giavina-Bianchi et al, Oct 2020 Borve et al, 2012 (A) Borve et al, 2012 (B) Tran et al, 2011 Marchell et al, 2017 Zanini, 2013	488 548 576 31 31 23 77	600 684 739 40 40		81.33 80.12 77.94 77.50 77.50	[78.01; 84.25] [76.96; 82.94] [74.81; 80.79] [62.12; 87.86]	1.4 1.4 1.4 1.4 1.4
		Warshaw et al, 2015 (C) Giavina-Bianchi et al, Oct 2020 Borve et al, 2012 (A) Borve et al, 2012 (B) Tran et al, 2011 Marchell et al, 2017 Zanini, 2013	548 576 31 31 23 77	684 739 40 40		80.12 77.94 77.50 77.50	[76.96; 82.94] [74.81; 80.79] [62.12; 87.86]	1. 1. 1. 1.
		Giavina-Bianchi et al, Oct 2020 Borve et al, 2012 (A) Borve et al, 2012 (B) Tran et al, 2011 Marchell et al, 2017 Marchell et al, 2017 Zanini, 2013	31 31 23 77	40 40		77.94 77.50 77.50	[74.81; 80.79] [62.12; 87.86]	1.1 1.2 1.2
		Borve et al, 2012 (B) Tran et al, 2011 Marchell et al, 2017 Marchell et al, 2017 Zanini, 2013	31 23 77	40		77.50		1.1
		Tran et al, 2011 Marchell et al, 2017 Marchell et al, 2017 Zanini, 2013	23 77					
		Marchell et al, 2017 Marchell et al, 2017 Zanini, 2013	77			76.67	[62.12; 87.86] [58.50; 88.45]	
		Marchell et al, 2017 Zanini, 2013	162	101			[66.99; 83.53]	
				213		76.06	[69.87; 81.31]	1.4
			76	100			[66.68; 83.36]	
		Gerhardt et al, 2013 (A)	570 609	753 809			[72.50; 78.63] [72.19; 78.13]	
		Warshaw et al, 2015 (B)	566	752			[72.06; 78.22]	
		Tan et al, 2010 (B)	162	219			[67.76; 79.35]	
		Tan et al, 2010 (A)	283	385			[68.87; 77.68]	
		Romero Aguilera et al, 2014 (A) Romero Aguilera et al, 2014 (B)	124 123	170 170		72.94 72.35	[65.77; 79.08] [65.16; 78.55]	
		Marchell et al, 2017	81	112			[63.33; 79.81]	
		Muir et al, 2011 (A)	43	60			[59.06; 81.60]	
		Vano-Galvan et al, 2011 Clarke et al, 2021	1381 205	2000 308			[66.99; 71.04] [61.10; 71.61]	
		Gabel et al, 2021	203	41			[50.28; 78.62]	
		Duong et al, 2014 (A)	44	68	— <u>—</u> —		[52.72; 75.09]	
		Barbieri et al, 2014 (A)	32	50	—— <mark>—</mark> —		[49.95; 76.00]	
		Vestergaard et al, 2020 (A) Lamel et al, 2012	372 66	600 107			[58.05; 65.80] [52.16; 70.39]	
		Giavina-Bianchi et al, Nov 2020	490	803	<b>—</b>		[57.60; 64.34]	
		Vestergaard et al, 2020 (B)	361	600			[56.19; 64.01]	
		Warshaw et al, 2015 (F)	357 115	595 195			[56.01; 63.86]	
		Zink et al, 2017, July (A) Altieri et al, 2017 (A)	93	160			[51.94; 65.66] [50.35; 65.52]	
		Azfar et al, 2014 (B)	77	136			[48.18; 64.69]	
		Borve et al, 2013 (B)	39	69			[44.68; 67.66]	
		Barbieri et al, 2014 (B) Patro et al, 2015	28 115	50 206			[42.13; 68.99] [48.98; 62.46]	
		Batalla, 2016	36	65	— <b>—</b> —		[43.22; 66.94]	
		Borve et al, 2013 (A)	38	69	_ <b>_</b> _	55.07	[43.27; 66.33]	1.
		Okita et al, 2016 Warshaw et al. 2015 (E)	54 348	100 652			[44.20; 63.50]	
		Warshaw et al, 2015 (E) Altieri et al, 2017 (B)	348 81	652 152			[49.53; 57.18] [45.34; 61.07]	
		Warshaw et al, 2015 (D)	344	651		52.84	[49.00; 56.65]	1.
		Keller et al, 2020 (B)	28	53			[39.51; 65.76]	
		Altieri et al, 2017 (C) Warshaw et al, 2015 (G)	80 300	152 583			[44.69; 60.44] [47.40; 55.50]	
		Warshaw et al, 2015 (H)	291	579	<b>—</b>		[47.40, 55.50] [46.19; 54.32]	
		Warshaw et al, 2015 (J)	511	1020	<b></b>	50.10	[47.03; 53.16]	1.
		Azfar et al, 2014 (C)	66 104	136			[40.25; 56.89]	
		Chen et al, 2010 Azfar et al, 2014 (A)	194 63	405 136	_ <b>_</b>		[43.07; 52.77] [38.12; 54.73]	
		Warshaw et al, 2015 (I)	473	1034	-		[42.73; 48.79]	
		Keller et al, 2020 (A)	24	53	_ <b>_</b>		[32.52; 58.70]	
		Carter et al, 2017 (B)	30 183	79 528			[27.99; 49.09] [30.72:38.82]	
		Jones et al, 2021 Costello et al, 2020	183	37			[30.72; 38.82] [19.43; 48.86]	
		Duong et al, 2014 (B)	34	110	_ <del></del>		[22.99; 40.13]	
		Carter et al, 2017 (A)	11	79 -	-		[7.88; 23.42]	
		Random effects model	18539	26511		60 07	[64.36; 73.05]	100 /
		Heterogeneity: $I^2 = 98\%$ , $\tau^2 = 0.719$		20011		70.87	[04.00, 70.05]	100.0
			,	0	20 40 60 80 1 agnosis agreement - F2F	00		

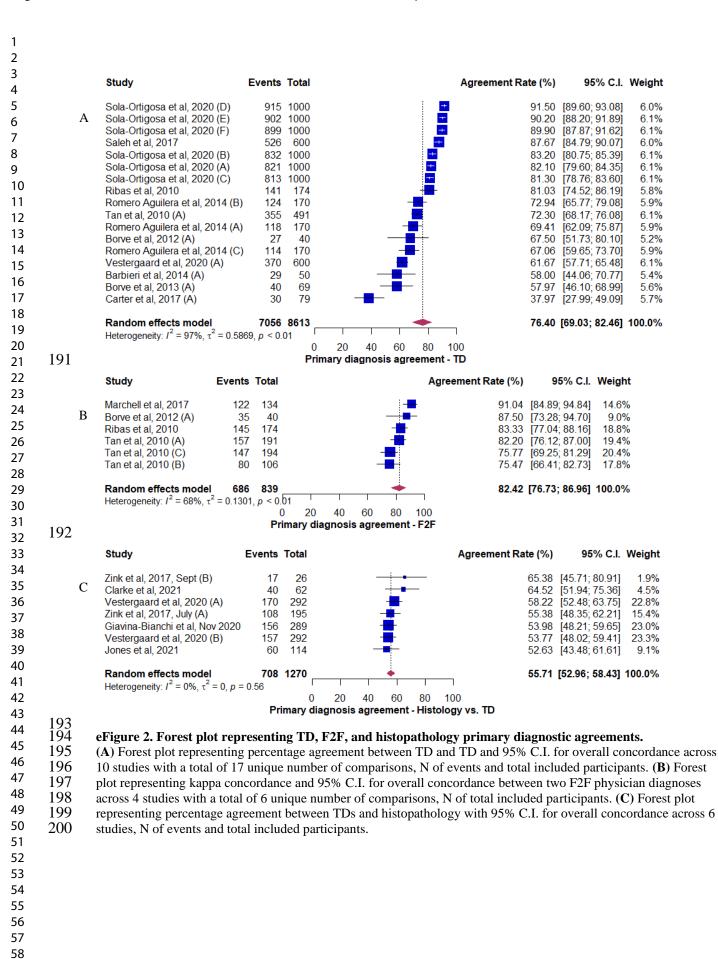


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2								
3 4		Study	Total		Kanna	95% C.I.	Weight	
		Study	TOLAI		Kappa	95 /0 C.I.	weight	
5		Goulart-Silveira, et al, 2019	39		0.96	[0.92; 0.98]	2.0%	
6	В	Muir et al, 2011 (B)	60			[0.89; 0.96]	2.1%	
7		Sola-Ortigosa et al, 2020 (D)	636	+		[0.90; 0.92]	2.3%	
8		Nami et al, 2015	391	+		[0.89; 0.92]	2.3%	
9		Sola-Ortigosa et al, 2020 (E)	636	-	0.90	[0.88; 0.91]	2.3%	
10		Sola-Ortigosa et al, 2020 (C)	636	-		[0.87; 0.91]	2.3%	
11		Sola-Ortigosa et al, 2020 (F)	636	· · · · · · · · · · · · · · · · · · ·		[0.87; 0.91]	2.3%	
		Sola-Ortigosa et al, 2020 (A)	636	<u> </u>		[0.85; 0.89]	2.3%	
12		Rubegni et al, 2011	130			[0.81; 0.90]	2.2%	
13		Senel, et al, 2013 (D)	150			[0.81; 0.90]	2.2%	
14		Senel, et al, 2013 (C) Sola-Ortigosa et al, 2020 (B)	150 636			[0.80; 0.89] [0.80; 0.85]	2.2% 2.3%	
15		Ribas et al, 2010	174			[0.74; 0.85]	2.2%	
16		Senel, et al, 2013 (A)	150			[0.70; 0.83]	2.2%	
17		Senel, et al, 2013 (B)	150			[0.67; 0.81]	2.2%	
18		Giavina-Bianchi et al, Oct 2020		•		[0.74; 0.75]	2.3%	
		Piccoli, et al, 2014	184		0.69	[0.61; 0.76]	2.2%	
19		Rios-Yuil, 2012	30			[0.38; 0.82]	1.9%	
20		Warshaw et al, 2015 (C)	2152			[0.59; 0.65]	2.3%	
21		Clarke et al, 2021	206			[0.50; 0.68]	2.2%	
22		Lamel et al, 2012	86			[0.44; 0.72]	2.2%	
23		Altieri et al, 2017 (C) Warshaw et al. 2015 (A)	232 2152			[0.48; 0.65] [0.53; 0.59]	2.3% 2.3%	
24		Warshaw et al, 2015 (A) Warshaw et al, 2015 (B)	2152			[0.53; 0.59]	2.3%	
25		Saleh et al, 2017	600			[0.46; 0.58]	2.3%	
26		Warshaw et al, 2015 (F)	2152			[0.49; 0.55]	2.3%	
		Altieri et al, 2017 (A)	232			[0.41; 0.60]	2.3%	
27		Altieri et al, 2017 (B)	232	— <u>—</u> —	0.51	[0.41; 0.60]	2.3%	
28		Azfar et al, 2014 (B)	76			[0.32; 0.66]	2.1%	
29		Gonzalez-Coloma, 2019	326			[0.41; 0.58]	2.3%	
30		Borve et al, 2013 (B)	62			[0.26; 0.65]	2.1%	
31		Borve et al, 2013 (A)	62			[0.25; 0.64]	2.1%	
32		Keller et al, 2020 (B)	100			[0.28; 0.59]	2.2%	
33		Warshaw et al, 2015 (E) Warshaw et al, 2015 (D)	2152 2152			[0.42; 0.48]	2.3% 2.3%	
		Azfar et al, 2014 (C)	76			[0.23; 0.60]	2.1%	
34		Muir et al, 2011 (A)	60			[0.19; 0.61]	2.1%	
35		Azfar et al, 2014 (A)	76	<mark></mark>		[0.20; 0.58]	2.1%	
36		Keller et al, 2020 (A)	100	—— <b>—</b> —		[0.22; 0.55]	2.2%	
37		Warshaw et al, 2015 (G)	2152		0.38	[0.34; 0.42]	2.3%	
38		Warshaw et al, 2015 (H)	2152			[0.34; 0.42]	2.3%	
39		Warshaw et al, 2015 (J)	2152			[0.33; 0.41]	2.3%	
40		Gabel et al, 2021	41			[0.02; 0.58]	2.0%	
41		Warshaw et al, 2015 (I)	2152	<b></b>		[0.28; 0.36]	2.3%	
		Giavina-Bianchi et al, Nov 2020	17233	<b>+</b>	0.21	[0.20; 0.23]	2.3%	
42		Random effects model	70954		0.67	[0.60; 0.74]	100 0%	
43		Heterogeneity: $I^2 = 100\%$ , $\tau^2 = 0.1$		0 1 1 1 1	0.07	[0.00, 0.74]	100.070	
44	184	10070, t = 0.1	, <i>p</i> - (	0 0.2 0.4 0.6 0.8 1				
45	185							
10	107							

#### eFigure 1. Forest plot representing F2F and TD primary diagnostic agreement.

(A) Forest plot representing percentage agreement and 95% C.I. for overall concordance across 39 studies with a total of 71 unique number of comparisons, N of events and total included participants. (B) Forest plot representing kappa concordance and 95% C.I. for overall concordance across 21 studies with a total of 45 unique number of comparisons, N of total included participants.



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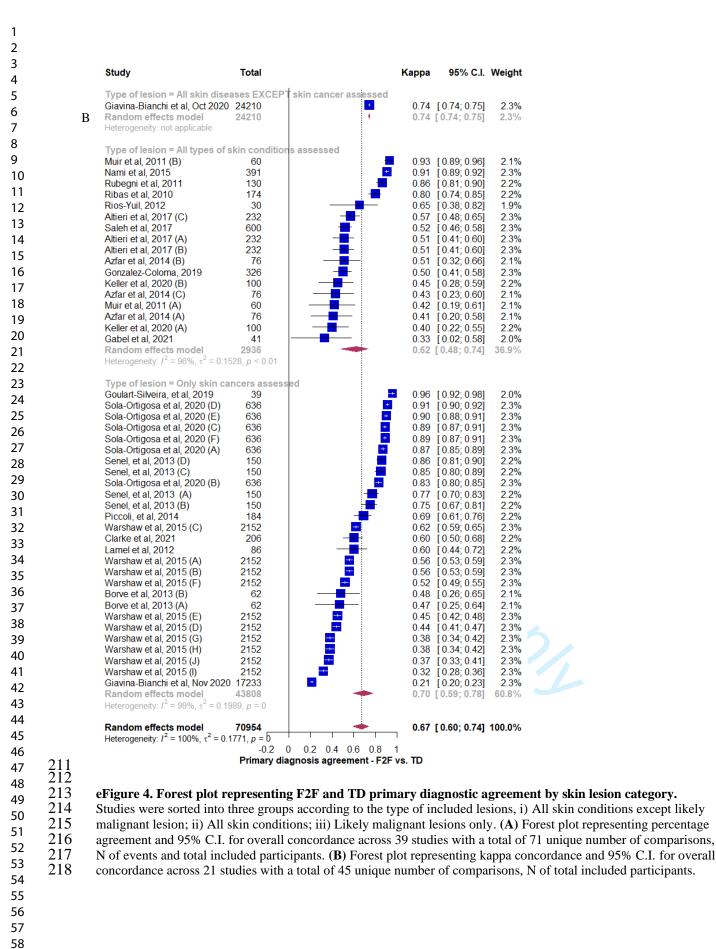
	Study	Events	Total		Agreement Rate (%)	95% C.I.	Weight
	Teledermoscopy = No/Not Me Muir et al. 2011 (B)	ntioned 49	50		• 08.00	[87.12; 99.72]	0.1%
А	Nami et al, 2015	356	391		91.05	[87.79; 93.50]	1.3%
	Sola-Ortigosa et al, 2020 (C) Romero et al, 2010 (A)	884 325	1000 368			[86.26; 90.24] [84.61; 91.22]	2.0% 1.4%
	Romero Aguilera et al, 2014 (C) Sola Ortigosa et al, 2020 (A)	150 875	170 1000			[82.47; 92.28] [85.30; 89.41]	1.0% 2.0%
	Sola-Ortigosa et al, 2020 (A) Romero et al, 2010 (B)	314	368			[81.33; 88.59]	1.6%
	Sola-Ortigosa et al, 2020 (B) Gatica, 2015	835 103	1000 125			[81.07; 85.67] [74.71; 88.12]	2.1% 1.0%
	Ribas et al, 2010	142	174		81.61	[75.15; 86.69]	1.2%
	Saleh et al, 2017 Giavina-Bianchi et al, Oct 2020	488 576	600 739			[78.01; 84.25] [74.81; 80.79]	1.9% 2.1%
	Borve et al, 2012 (A) Borve et al, 2012 (B)	31 31	40 40			[62.12; 87.86] [62.12; 87.86]	0.5% 0.5%
	Tran et al, 2011	23	30		76.67	[58.50; 88.45]	0.4%
	Marchell et al, 2017 Marchell et al, 2017	77 162	101 213			[66.99; 83.53] [69.87; 81.31]	1.0% 1.5%
	Zanini, 2013 Warshaw et al, 2015 (A)	76 570	100 753			[66.68; 83.36] [72.50; 78.63]	1.0% 2.1%
	Gerhardt et al, 2021	609	809		75.28	[72.19; 78.13]	2.1%
	Tan et al, 2010 (B) Tan et al, 2010 (A)	162 283	219 385		73.51	[67.76; 79.35] [68.87; 77.68]	1.5% 1.8%
	Romero Aguilera et al, 2014 (A) Romero Aguilera et al, 2014 (B)	124 123	170 170	-		[65.77; 79.08] [65.16; 78.55]	1.4% 1.4%
	Marchell et al, 2017	81	112		72.32	[63.33; 79.81]	1.1%
	Muir et al, 2011 (A) Vano-Galvan et al, 2011	43 1381	60 2000	+		[59.06; 81.60] [66.99; 71.04]	0.8% 2.4%
	Clarke et al, 2021 Gabel et al, 2021	205 27	308 41			[61.10; 71.61] [50.28; 78.62]	1.8% 0.6%
	Duong et al, 2014 (A) Barbieri et al, 2014 (A)	44 32	68 50		64.71	[52.72; 75.09]	0.9% 0.7%
	Lamel et al, 2012	66	107		61.68	[49.95; 76.00] [52.16; 70.39]	1.2%
	Giavina-Bianchi et al, Nov 2020 Zink et al, 2017, July (A)	490 115	803 195			[57.60; 64.34] [51.94; 65.66]	2.2% 1.6%
	Altieri et al, 2017 (A) Azfar et al, 2014 (B)	93 77	160 136		58.13	[50.35; 65.52] [48.18; 64.69]	1.5% 1.4%
	Barbieri et al, 2014 (B)	28	50		56.00	[42.13; 68.99]	0.8%
	Patro et al, 2015 Batalla, 2016	115 36	206 65			[48.98; 62.46] [43.22; 66.94]	1.6% 0.9%
	Okita et al, 2016 Altieri et al, 2017 (B)	54 81	100 152		54.00	[44.20; 63.50] [45.34; 61.07]	1.2% 1.4%
	Warshaw et al, 2015 (D)	344	651		52.84	[49.00; 56.65]	2.1%
	Keller et al, 2020 (B) Altieri et al, 2017 (C)	28 80	53 152			[39.51; 65.76] [44.69; 60.44]	0.8% 1.4%
	Warshaw et al, 2015 (G) Azfar et al, 2014 (C)	300 66	583 136			[47.40; 55.50] [40.25; 56.89]	2.1% 1.4%
	Chen et al, 2010	194	405		47.90	[43.07; 52.77]	2.0%
	Azfar et al, 2014 (A) Warshaw et al, 2015 (I)	63 473	136 1034			[38.12; 54.73] [42.73; 48.79]	1.4% 2.3%
	Keller et al, 2020 (A) Carter et al, 2017 (B)	24 30	53 79			[32.52; 58.70] [27.99; 49.09]	0.8% 1.0%
	Duong et al, 2014 (B)	34	110	-	30.91	[22.99; 40.13]	1.1%
	Carter et al, 2017 (A) Combined prevalence	11 11983		-		[7.88; 23.42] [66.78; 69.77]	
	Heterogeneity: $I^2 = 97\%$ , $\tau^2 = 0.033$	53, <b>p</b> < 0.0	)1				
	Teledermoscopy = Yes Zink et al, 2017, Sept (B)	24	26	<u>+</u>		[73.93; 98.07]	0.2%
	Sola-Ortigosa et al, 2020 (D) Sola-Ortigosa et al, 2020 (E)	915 912	1000 1000	±	91.20	[89.60; 93.08] [89.28; 92.80]	1.8% 1.9%
	Sola-Ortigosa et al, 2020 (F) Barcaui et al, 2018	903 37	1000 41			[88.30; 91.99] [76.73; 96.29]	1.9% 0.3%
	Rubegni et al, 2011	114	130	-	87.69	[80.85; 92.32]	0.8%
	Rios-Yuil, 2012 Warshaw et al, 2015 (C)	25 548	30 684		80.12	[65.68; 92.89] [76.96; 82.94]	0.3% 2.0%
	Warshaw et al, 2015 (B) Vestergaard et al, 2020 (A)	566 372	752 600	<b></b>		[72.06; 78.22] [58.05; 65.80]	2.1% 2.1%
	Vestergaard et al, 2020 (B)	361 357	600 595	<b></b>	60.17	[56.19; 64.01] [56.01; 63.86]	2.1%
	Warshaw et al, 2015 (F) Borve et al, 2013 (B)	39	69		56.52	[44.68; 67.66]	0.9%
	Borve et al, 2013 (A) Warshaw et al, 2015 (E)	38 348	69 652			[43.27; 66.33] [49.53; 57.18]	0.9% 2.1%
	Warshaw et al, 2015 (H) Warshaw et al, 2015 (J)	291 511	579 1020		50.26	[46.19; 54.32] [47.03; 53.16]	2.1%
	Jones et al, 2021	183	528	• •	34.66	[30.72; 38.82]	2.0%
	Costello et al, 2020 Combined prevalence	12 6556	37 9412			[19.43; 48.86] [66.76; 71.42]	
	Heterogeneity: $I^2 = 99\%$ , $\tau^2 = 0.03$				60 F 4	[67 26· 60 70]	100.0%
	Combined prevalence Heterogeneity: $I^2 = 98\%$ , $\tau^2 = 0.033$ Residual heterogeneity: $I^2 = NA\%$ ,		26511 0	20 40 60 80 1	<b>68.54</b>	[67.26; 69.78]	100.0%
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<ul> <li>Primary diagnosis agreement - F2F vs. TD</li> <li>203</li> <li>eFigure 3. Forest plot representing F2F and TD primary diagnostic agreement by utilization of teledermoscopy.</li> <li>204</li> <li>205</li> <li>205</li> <li>206</li> <li>206</li> <li>207</li> <li>207</li> <li>208</li> <li>208</li> <li>208</li> <li>209</li> <li>200</li> <li>200</li> <li>201</li> <li>201</li> <li>202</li> <li>203</li> <li>204</li> <li>205</li> <li>205</li> <li>206</li> <li>207</li> <li>207</li> <li>208</li> <li>208</li> <li>209</li> <li>209</li> <li>209</li> <li>209</li> <li>209</li> <li>209</li> <li>200</li> <li>200</li> <li>201</li> <li>201</li> <li>202</li> <li>203</li> <li>203</li> <li>204</li> <li>204</li> <li>205</li> <li>205</li> <li>206</li> <li>207</li> <li>208</li> <li>209</li> <li>209</li> <li>209</li> <li>209</li> <li>200</li> <li>200</li> <li>201</li> <li>201</li> <li>202</li> <li>203</li> <li>204</li> <li>204</li> <li>205</li> <li>205</li> <li>206</li> <li>207</li> <li>207</li> <li>208</li> <li>209</li> <li>209</li> <li>209</li> <li>200</li> <li>200</li> <li>201</li> <li>201</li> <li>202</li> <li>203</li> <li>204</li> <li>204</li> <li>205</li> <li>205</li> <li>206</li> <li>207</li> <li>208</li> <li>209</li> <li>209</li> <li>209</li> <li>200</li> <li>200</li> <li>201</li> <li>201</li> <li>201</li> <li>202</li> <li>203</li> <li>203</li> <li>204</li> <li>204</li> <li>204</li> <li>205</li> <li>205</li> <li>206</li> <li>207</li> <li>208</li> <li>208</li> <li>209</li> <li>209</li> <li>209</li> <li>200</li> <li>200</li> <li>200</li> <li>201</li> <li>201</li> <li>201</li> <li>202</li> <li>203</li> <li>203</li> <li>204</li> <li>204</li> <li>205</li> <li>205</li> <li>206</li> <li>207</li> <li>208</li> <li>208</li> <li>208</li> <li>209</li> <li>208</li> <li>209</li> <li>209</li> <li>209</li> <li>200</li> <li>200</li> <li>201</li> <li>201</li> <li>201</li> <li>202</li> <li>203</li> <li>203</li> <li>204</li></ul>	46		Therefore the theory $t = 100\%$ , $t = 0$ .		0 02 04 06 08 1	1			
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56		-07	number of comparisons, iv	51 total III	ended participants.				
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	Study	Events	lotal		Agreement Rate (%)	95% C.I.	Weigh
	Type of lesion = All skin disea Giavina-Bianchi et al, Oct 2020	ses EXC 576	EPT skin cance 739	r assessed	77.04	[74.81; 80.79]	2.0%
А	Patro et al, 2015	115	206			[48.98; 62.46]	1.6%
11	Chen et al, 2010	194	405		47.90	[43.07; 52.77]	2.0%
	<b>Combined prevalence</b> Heterogeneity: $I^2 = 98\%$ , $\tau^2 = 0.035$	<b>885</b> 58. p < 0.0	1350	-		[56.24; 67.82]	5.6%
	,						
	Type of lesion = All types of sl Muir et al, 2011 (B)	49	50			[87.12; 99.72]	0.1%
	Nami et al, 2015	356	391			[87.79; 93.50]	1.3%
	Barcaui et al, 2018 Romero et al, 2010 (A)	37 325	41 368			[76.73; 96.29] [84.61; 91.22]	0.3% 1.4%
	Romero Aguilera et al, 2014 (C)		170	-		[82.47; 92.28]	1.0%
	Rubegni et al, 2011	114	130	_		[80.85; 92.32]	0.8%
	Romero et al, 2010 (B)	314 25	368 30			[81.33; 88.59]	1.6% 0.3%
	Rios-Yuil, 2012 Gatica, 2015	103	125			[65.68; 92.89] [74.71; 88.12]	1.0%
	Ribas et al, 2010	142	174			[75.15; 86.69]	1.2%
	Saleh et al, 2017	488	600			[78.01; 84.25]	1.9%
	Borve et al, 2012 (A) Borve et al, 2012 (B)	31 31	40 40			[62.12; 87.86] [62.12; 87.86]	0.5% 0.5%
	Tran et al, 2011	23	30			[58.50; 88.45]	0.4%
	Marchell et al, 2017	77	101		76.24	[66.99; 83.53]	1.0%
	Marchell et al, 2017 Zanini, 2013	162 76	213 100			[69.87; 81.31]	1.5%
	Gerhardt et al. 2021	609	809			[66.68; 83.36] [72.19; 78.13]	1.0% 2.1%
	Romero Aguilera et al, 2014 (A)	124	170	-	72.94	[65.77; 79.08]	1.4%
	Romero Aguilera et al, 2014 (B)	123	170	-		[65.16; 78.55]	1.4%
	Marchell et al, 2017 Muir et al, 2011 (A)	81 43	112 60			[63.33; 79.81] [59.06; 81.60]	1.1% 0.8%
	Vano-Galvan et al, 2011	1381	2000	<b>—</b>		[66.99; 71.04]	2.3%
	Gabel et al, 2021	27	41		65.85	[50.28; 78.62]	0.6%
	Duong et al, 2014 (A) Barbieri et al, 2014 (A)	44 32	68 50			[52.72; 75.09] [49.95; 76.00]	0.9% 0.7%
	Zink et al, 2017, July (A)	115	195	-		[49.95; 76.00] [51.94; 65.66]	1.6%
	Altieri et al, 2017 (A)	93	160		58.13	[50.35; 65.52]	1.5%
	Azfar et al, 2014 (B)	77	136			[48.18; 64.69]	1.4%
	Barbieri et al, 2014 (B) Batalla, 2016	28 36	50 65			[42.13; 68.99] [43.22; 66.94]	0.8% 0.9%
	Okita et al, 2016	54	100	<b>—</b>		[43.22, 00.94] [44.20; 63.50]	1.2%
	Altieri et al, 2017 (B)	81	152		53.29	[45.34; 61.07]	1.4%
	Keller et al, 2020 (B) Altieri et al, 2017 (C)	28 80	53 152			[39.51; 65.76] [44.69; 60.44]	0.8% 1.4%
	Allen et al, 2017 (C) Azfar et al, 2014 (C)	60 66	136			[44.09, 00.44]	1.4%
	Azfar et al, 2014 (A)	63	136		46.32	[38.12; 54.73]	1.4%
	Keller et al, 2020 (A)	24	53			[32.52; 58.70]	0.8%
	Costello et al, 2020 Duong et al, 2014 (B)	12 34	37 — 110 —	••••••••••••••••••••••••••••••••••••••		[19.43; 48.86] [22.99; 40.13]	0.6% 1.1%
	Combined prevalence	5758	7986	•		[67.94; 71.70]	43.2%
	Heterogeneity: $I^2 = 93\%$ , $\tau^2 = 0.03\%$						
	Type of lesion = Only skin can Zink et al, 2017, Sept (B)	cers ass 24	essed 26	—	92.31	[73.93; 98.07]	0.2%
	Sola-Ortigosa et al, 2020 (D)	915	1000		+ 91.50	[89.60; 93.08]	1.8%
	Sola-Ortigosa et al, 2020 (E)	912	1000			[89.28; 92.80]	1.9%
	Sola-Ortigosa et al, 2020 (F) Sola-Ortigosa et al, 2020 (C)	903 884	1000 1000			[88.30; 91.99] [86.26; 90.24]	1.9% 2.0%
	Sola-Ortigosa et al, 2020 (C) Sola-Ortigosa et al, 2020 (A)		1000		00.10	[85.30; 89.41]	2.0%
	Sola-Ortigosa et al, 2020 (B)	835	1000	_		[81.07; 85.67]	2.1%
	Warshaw et al, 2015 (C) Warshaw et al, 2015 (A)	548 570	684 753			[76.96; 82.94] [72.50; 78.63]	2.0%
	Warshaw et al, 2015 (A) Warshaw et al, 2015 (B)	570 566	753			[72.50; 78.63]	2.1% 2.1%
	Tan et al, 2010 (B)	162	219		73.97	[67.76; 79.35]	1.5%
	Tan et al, 2010 (A)	283	385			[68.87; 77.68]	1.8%
	Clarke et al, 2021 Vestergaard et al, 2020 (A)	205 372	308 600			[61.10; 71.61] [58.05; 65.80]	1.8%
	Vestergaard et al, 2020 (A) Lamel et al, 2012	372 66	107			[58.05; 65.80] [52.16; 70.39]	2.1% 1.2%
	Giavina-Bianchi et al, Nov 2020	490	803	<u></u>	61.02	[57.60; 64.34]	2.2%
	Vestergaard et al, 2020 (B)	361	600	<b>•</b>		[56.19; 64.01]	2.1%
	Warshaw et al, 2015 (F) Borve et al, 2013 (B)	357 39	595 69			[56.01; 63.86] [44.68; 67.66]	2.1% 0.9%
	Borve et al, 2013 (A)	38	69			[44.00, 07.00] [43.27; 66.33]	0.9%
	Warshaw et al, 2015 (E)	348	652	<u>_</u>	53.37	[49.53; 57.18]	2.1%
	Warshaw et al, 2015 (D)	344	651	-		[49.00; 56.65]	2.1%
	Warshaw et al, 2015 (G) Warshaw et al, 2015 (H)	300 291	583 579	-		[47.40; 55.50] [46.19; 54.32]	2.1% 2.1%
	Warshaw et al, 2015 (J)	511	1020	•		[40.19, 54.32] [47.03; 53.16]	2.1%
	Warshaw et al, 2015 (I)	473	1034		45.74	[42.73; 48.79]	2.3%
	Carter et al, 2017 (B)	30	79 -			[27.99; 49.09]	1.0%
	Jones et al, 2021 Carter et al, 2017 (A)	183 11	528 79 -	-		[30.72; 38.82] [7.88; 23.42]	2.0% 0.6%
	Combined prevalence	11896		•		[66.26; 69.82]	
	Heterogeneity: $I^2 = 99\%$ , $\tau^2 = 0.035$					- /	
	Combined prevalence	<b>18539</b>	26511		68.54	[67.26; 69.79]	100.0%
	Heterogeneity: $I^2 = 98\%$ , $\tau^2 = 0.03$ Residual heterogeneity: $I^2 = NA\%$ ,		0 20	40 60 80	100		
)			Primary diagno	osis agreement - I	2F vs. TD		

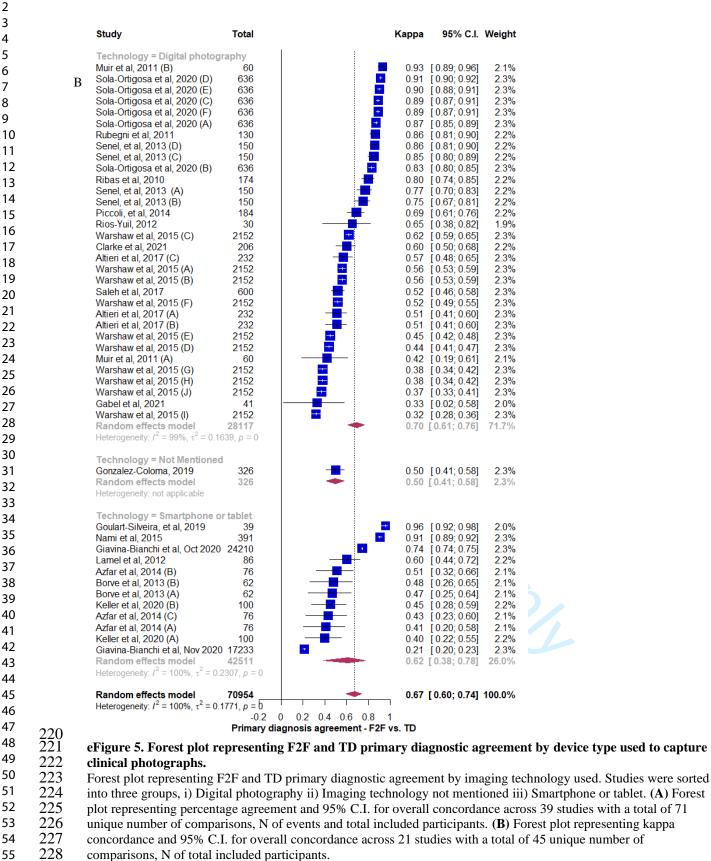


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3		Study	Events	Total		Agreement Rate (%)	95% C.I.	Weight
4		-		TOLAI		Agreement Rate (76)	95 /0 C.I.	weight
5		Technology = Digital photogr Muir et al, 2011 (B)	aphy 49	50	_	- 98.00	[87.12; 99.72]	0.1%
6	А	Sola-Ortigosa et al, 2020 (D)	915	1000	<b>•</b>	91.50	[89.60; 93.08]	1.8%
7		Sola-Ortigosa et al, 2020 (E) Sola-Ortigosa et al, 2020 (F)	912 903	1000 1000	+ +		[89.28; 92.80] [88.30; 91.99]	1.9% 1.9%
		Sola-Ortigosa et al, 2020 (C)	884	1000		88.40	[86.26; 90.24]	2.0%
8		Romero et al, 2010 (A) Romero Aguilera et al, 2014 (C)	325 150	368 170		88.32	[84.61; 91.22] [82.47; 92.28]	1.4% 0.9%
9		Rubegni et al, 2011	114	130			[80.85; 92.32]	0.8%
10		Sola-Ortigosa et al, 2020 (A)	875	1000			[85.30; 89.41]	2.0%
11		Romero et al, 2010 (B) Sola-Ortigosa et al, 2020 (B)	314 835	368 1000			[81.33; 88.59] [81.07; 85.67]	1.6% 2.1%
12		Rios-Yuil, 2012	25	30		83.33	[65.68; 92.89]	0.3%
13		Gatica, 2015 Ribas et al, 2010	103 142	125 174			[74.71; 88.12] [75.15; 86.69]	1.0% 1.2%
14		Saleh et al, 2017	488	600		81.33	[78.01; 84.25]	1.9%
		Warshaw et al, 2015 (C) Zanini, 2013	548 76	684 100			[76.96; 82.94] [66.68; 83.36]	2.0% 1.0%
15		Warshaw et al, 2015 (A)	570	753	<u> </u>	75.70	[72.50; 78.63]	2.1%
16		Warshaw et al, 2015 (B) Tan et al, 2010 (B)	566 162	752 219			[72.06; 78.22] [67.76; 79.35]	2.1% 1.5%
17		Tan et al, 2010 (A)	283	385			[68.87; 77.68]	1.8%
18		Romero Aguilera et al, 2014 (A) Romero Aguilera et al, 2014 (B)		170 170			[65.77; 79.08] [65.16; 78.55]	1.4% 1.4%
19		Muir et al, 2011 (A)	43	60	<b>_</b>		[59.06; 81.60]	0.7%
20		Vano-Galvan et al, 2011 Clarka et al. 2021	1381	2000			[66.99; 71.04]	2.4%
21		Clarke et al, 2021 Gabel et al, 2021	205 27	308 41			[61.10; 71.61] [50.28; 78.62]	1.8% 0.6%
		Warshaw et al, 2015 (F)	357 93	595 160	<b></b>	60.00	[56.01; 63.86]	2.1%
22		Altieri et al, 2017 (A) Patro et al, 2015	115	206	-		[50.35; 65.52] [48.98; 62.46]	1.4% 1.6%
23		Warshaw et al, 2015 (E)	348	652	<b>-</b>		[49.53; 57.18]	2.2%
24		Altieri et al, 2017 (B) Warshaw et al, 2015 (D)	81 344	152 651			[45.34; 61.07] [49.00; 56.65]	1.4% 2.2%
25		Altieri et al, 2017 (C)	80	152			[44.69; 60.44]	1.4%
26		Warshaw et al, 2015 (G) Warshaw et al, 2015 (H)	300 291	583 579			[47.40; 55.50] [46.19; 54.32]	2.1% 2.1%
27		Warshaw et al, 2015 (J)	511	1020	<b></b>	50.10	[47.03; 53.16]	2.3%
28		Chen et al, 2010 Warshaw et al, 2015 (I)	194 473	405 1034			[43.07; 52.77] [42.73; 48.79]	2.0% 2.3%
		Carter et al, 2017 (B)	30	79	_ <b>_</b>	37.97	[27.99; 49.09]	1.0%
29		Carter et al, 2017 (A) Combined prevalence	11 14370	79 20004			[7.88; 23.42] [70.25; 73.14]	0.6% 64.4%
30		Heterogeneity: $I^2 = 98\%$ , $\tau^2 = 0.03$		20004		11112	[10.20, 10.14]	04.470
31		Technology = Not Mentioned						
32		Marchell et al, 2017	77	101		76.24	[66.99; 83.53]	1.0%
33		Marchell et al, 2017 Gerhardt et al, 2021	162 609	213 809			[69.87; 81.31] [72.19; 78.13]	1.4% 2.1%
34		Marchell et al, 2017	81	112	- <b></b> -		[63.33; 79.81]	1.1%
35		Batalla, 2016 Combined prevalence	36 965	65 1300			[43.22; 66.94] [68.10; 76.97]	0.9% 6.5%
36		Heterogeneity: $I^2 = 68\%$ , $\tau^2 = 0.03$				12.10	[00.10, 10.37]	0.070
37		Technology = Smartphone or	tablet					
		Zink et al, 2017, Sept (B)	24	26		92.31	[73.93; 98.07]	0.1%
38		Nami et al, 2015 Barcaui et al, 2018	356 37	391 41			[87.79; 93.50] [76.73; 96.29]	1.3% 0.3%
39		Giavina-Bianchi et al, Oct 2020	576	739			[74.81; 80.79]	2.1%
40		Borve et al, 2012 (A) Borve et al, 2012 (B)	31	40			[62.12; 87.86]	0.5%
41		Tran et al, 2012 (B)	31 23	40 30			[62.12; 87.86] [58.50; 88.45]	0.5% 0.4%
42		Duong et al, 2014 (A)	44	68			[52.72; 75.09]	0.9%
43		Barbieri et al, 2014 (A) Vestergaard et al, 2020 (A)	32 372	50 600			[49.95; 76.00] [58.05; 65.80]	0.7% 2.1%
44		Lamel et al, 2012	66	107		61.68	[52.16; 70.39]	1.2%
		Giavina-Bianchi et al, Nov 2020 Vestergaard et al, 2020 (B)	490 361	803 600	<b>■</b>		[57.60; 64.34] [56.19; 64.01]	2.2% 2.1%
45		Zink et al, 2017, July (A)	115	195		58.97	[51.94; 65.66]	1.6%
46		Azfar et al, 2014 (B) Borve et al, 2013 (B)	77 39	136 69	- <b></b>		[48.18; 64.69] [44.68; 67.66]	1.3% 0.9%
47		Barbieri et al, 2014 (B)	28	50		56.00	[42.13; 68.99]	0.7%
48		Borve et al, 2013 (A) Okita et al, 2016	38 54	69 100	<b>B</b>		[43.27; 66.33] [44.20; 63.50]	0.9% 1.2%
49		Keller et al, 2020 (B)	28	53	<b></b>	52.83	[39.51; 65.76]	0.8%
50		Azfar et al, 2014 (C) Azfar et al, 2014 (A)	66 63	136 136			[40.25; 56.89] [38.12; 54.73]	1.4% 1.4%
51		Keller et al, 2020 (A)	24	53		45.28	[32.52; 58.70]	0.8%
52		Jones et al, 2021 Costello et al, 2020	183 12	528 37	<b>*</b>		[30.72; 38.82] [19.43; 48.86]	2.0% 0.5%
		Duong et al, 2014 (B)	34	110		30.91	[22.99; 40.13]	1.1%
53		<b>Combined prevalence</b> Heterogeneity: $I^2 = 94\%$ , $\tau^2 = 0.03$	<b>3204</b>	<b>5207</b>	*	59.77	[57.19; 62.30]	29.0%
54								
55		Combined prevalence Heterogeneity: $I^2 = 98\%$ , $\tau^2 = 0.03$	18539	26511	· · · · · ·	68.54	[67.29; 69.76]	100.0%
56		Residual heterogeneity: $I^2 = NA\%$		(				
57	010			Prima	ry diagnosis agreement - F2F	vs. TD		
58	219							
59								



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- 56 229 Supplementary eTable Titles and Legends
- 57
- 58

230	Supplementary eTables
231	

		Ореп	ſ
230 231	Supplementary eTables		
201	Inclusion criteria	Exclusion criteria	
	Primary articles assessing diagnostic agreement where store-and-forward technology or live video conference consults were compared with a control group who attend in-person visits.	Survey articles, feasibility studies, studies regarding other forms of telemedicine unrelated to dermatology, cost-effectiveness studies, editorials, and review articles.	
	Primarily comparing TD to F2F, sometimes using histopathology as the gold standard.	Studies that clearly stated they used TDs as the gold- or reference standard.	
		Studies that only compared dermatoscopic images in the absence of clinical images.	
		Studies where patients captured their own photographs.	
232 233 234 235 236	eTable 1. Inclusion and exclusion criteria TD: TeleDermatology, TDs: TeleDermatology	a for screening of literature search results. ogists, F2F: Face-to-Face.	
		country of publication. Patient characteristics: total n umber of participants per study, mean age +/- SD, ag ions evaluated, type of patients evaluated.	
	consult, experience of the TD and F2F phy diagnosis for each patient, total number of and F2F, whether same specialist conduct	for the TD consult, training on TD platform, length ysician, location of TD, number of TDs and F2F phy f TDs and F2F physicians in study, order of visits, w ed TD and F2F visit, specialization of the F2F physi who acquired the clinical photographs and whether th	sicians who made a ait time between TD cian, number of
	images taken, use of teledermoscopy & de	d for viewing images with, distance between camera ermoscopy, brand of dermatoscope, use of histopatho liagnoses agreement and concordance rates, diagnos PPV and NPV.	ology, referral content
237 238	<b>eTable 2. Data extraction form with deta</b> TD: TeleDermatology, F2F: Face-to-Face, 1	<b>ils of domains record.</b> PPV: Positive Predictive Value, NPV: Negative Pred	lictive Value.
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Author and Year	Unique Study Grouping	n_participants	n_lesions	%_primary diagnosis agreement_in_person	N_primary diagnosis agreement_in_person	n agreement	%_primary diagnosis agreement_TD	N_primary diagnosis agreement_TD	n agreement	%_primary diagnosis agreement (TD and F2F	N_primary diagnosis agreement (TD and F2F	n agreement	%_primary diagnosis agreement (TD & Histo)	N_primary diagnosis agreement (TD & Histo)	n agreement	Inter_Kappa (primary diagnosis, TD and F2F)	N_Inter_Kappa (primary diagnosis, TD and F2F)	Inter_Kappa (primary diagnosis, TD and Histo)
Altieri et al, 2017 (A)	F2F Derm vs TD1	232	232							58	160	93				0.51	160	
Altieri et al, 2017 (B)	F2F Derm vs TD2	232	232							53	152	81				0.51	152	
Altieri et al, 2017 (C)	F2F Derm vs TD3	232	232							53	152	80				0.57	152	
Azfar et al, 2014 (A)	F2F Derm vs TD1	76	159						40	47	132	63				0.41	132	
Azfar et al,	F2F Derm vs TD2																	
2014 (B) Azfar et al,	F2F Derm vs TD3	76	159						63	57	136	77				0.51	136	
2014 (C) Barbieri et	F2F Derm vs TD1	76	159						59	49	136	66				0.43	136	
al, 2014 (A)		50	50				58	50	29	64	50	32						
Barbieri et al, 2014 (B)	F2F Derm vs TD2	50	50							56	50	28						
Barcaui et al, 2018	F2F Derm vs TD	31	41							90	41	37						
Batalla, 2016	F2F Derm vs TD	183	183							55	65	36						

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Borve et al, 2012 (A)	F2F Derm vs TD1	40	40	88	40	35	68	40	27	78	40	31						
Borve et al,	F2F Derm vs TD2								_,									
2012 (B)		40	40							78	40	31						
Borve et al, 2013 (A)	F2F Derm vs TD1	62	69				58	69	40	55	69	38				0.47	69	.51
Borve et al, 2013 (B)	F2F Derm vs TD2	62	69							57	69	39				0.48	69	
Carter et al, 2017 (A)	F2F nonspecialist vs TD	79	79				38	79	30	14	79	11						
Carter et al, 2017 (B)	F2F Derm vs TD	79	79							38	79	30						
Chen et al, 2010	F2F nonspecialist vs TD	405	405							48	405	194						
Clarke et al, 2021	F2F Derm vs TD	206	308							67	308	205	65	62	40	0.6	308	
Costello et al, 2020	F2F nonspecialist vs TD	37	37							32	37	12						
Duong et al, 2014 (A)	F2F nonspecialist vs TD (Videoconference)	111	110							65	68	44						
Duong et al, 2014 (B)	F2F nonspecialist vs TD (SFTD)	111	110							31	110	34						
Gabel et al, 2021	F2F Derm vs TD	41	41							67	41	27				0.33	41	
Gatica, 2015	F2F Derm vs TD	125	125							82	125	103						
Gerhardt et al, 2021	F2F Derm vs TD	809	809							75	809	609						
Giavina- Bianchi et al, Nov 2020	F2F Derm vs TD																	
Giavina- Bianchi et	F2F Derm vs TD	17233	17233							61	803	490	54	289	156	0.21	803	.09
al, Oct 2020		24210	27519							78	739	576				0.74	739	

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Gonzalez- Coloma, 2019	F2F nonspecialist vs TD	326	326											0.5	326
Goulart- Silveira, et al, 2019	F2F Derm vs TD	520	520											0.5	520
		39	39											0.96	39
Jones et al, 2021	F2F nonspecialist vs TD (Suspicious Skin Cancer														
Kallan et al	pathway)	NA	528					35	528	183	53	114	60		
Keller et al, 2020 (A)	F2F nonspecialist vs TD	100	100					45	53	24				0.4	53
Keller et al, 2020 (B)	F2F Derm vs TD	100	100					53	53	28				0.45	53
Lamel et al, 2012	F2F Derm vs TD	86	107					62	107	66				0.6	107
Marchell et al, 2017	F2F Derm vs TD (SFTD)	216	216	91	134	122		76	162	213					
Marchell et al, 2017	F2F Derm vs TD (Uncompressed video)	216	216					76	76.8	101					
Marchell et al, 2017	F2F Derm vs TD (Compressed video)														
Muir et al,	F2F nonspecialist	216	216					72	80.6	112					
2011 (A) Muir et al,	vs TD F2F Derm vs TD	60	60					72	60	43				0.42	60
2011 (B)	1.21, Denni vs ID	60	60					98	50	49				0.93	50
Nami et al, 2015	F2F Derm vs TD	391	391					91	391	356				0.91	391
Okita et al, 2016	F2F Derm vs TD	100	100					54	100	54					
Patro et al, 2015	F2F nonspecialist vs TD	206	206					56	206	115					
Piccoli, et al, 2014	F2F nonspecialist vs TD	184	184											0.69	184

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Ribas et al, 2010	F2F Derm vs TD	174	174	83	174	145	81	174	141	82	174	142		0.8	174
Rios-Yuil, 2012	F2F Derm vs TD	30	30							83	30	25	67	0.65	30
Romero Aguilera et al, 2014	F2F Derm vs TD1														
(A)		457	192				69	170	118	73	170	124			
Romero Aguilera et	F2F Derm vs TD2														
al, 2014 (B)		457	192				73	170	124	72	170	123			
Romero Aguilera et	F2F Derm vs TD3														
al, 2014 (C)		457	192				67	170	114	88	170	150			
Romero et al, 2010	F2F Derm vs TD (SFTD)														
(A)		457	192							88	368	325			
Romero et al, 2010 (B)	F2F Derm vs TD (SFTD and videoconferencing)														
		457	176							85	368	314			
Rubegni et al, 2011	F2F Derm vs TD	130	130							88	130	114		0.86	130
Saleh et al,	F2F Derm vs TD													0.46-	
2017		600	600				88	600	526	81	600	488		0.52	600
Senel, et al, 2013	F2F Derm vs TD1 (no dermoscopy)	150	150											0.77	150
Senel, et al, 2013	F2F Derm vs TD2 (no dermoscopy)	150	150											0.75	150
Senel, et al, 2013	F2F Derm vs TD1 (dermoscopy)	150	150											0.85	150
Senel, et al, 2013	F2F Derm vs TD2 (dermoscopy)	150	150											0.86	150
Sola- Ortigosa et al, 2020 (A)	F2F Derm vs TD1 (no dermoscopy)	636	1000				82	1000	821	88	1000	875		0.87	1000
Sola- Ortigosa et	F2F Derm vs TD2 (no dermoscopy)														
al, 2020 (B)		636	1000				83	1000	832	84	1000	835		0.83	1000

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Sola- Ortigosa et al, 2020 (C)	F2F Derm vs TD3 (no dermoscopy)	636	1000				81	1000	813	88	1000	884				0.89	1000
Sola- Ortigosa et al, 2020	F2F Derm vs TD1 (dermoscopy)																
(D)		636	1000				92	1000	915	92	1000	915				0.91	1000
Sola- Ortigosa et al, 2020 (E)	F2F Derm vs TD2 (dermoscopy)	636	1000				90	1000	902	91	1000	912				0.9	100
Sola- Ortigosa et	F2F Derm vs TD3 (dermoscopy)						70										
al, 2020 (F) Tan et al,	F2F Derm vs TD1,	636	1000				90	1000	899	90	1000	903				0.89	1000
2010 (A)	F2F Derm 1 vs F2F Derm 2	200	491	82	191	157	72	491	355	74	385	283					
Tan et al, 2010 (B)	F2F Derm vs TD2, F2F Derm 2 vs																
	F2F Derm 3	200	491	76	106	80				74	219	162					
Tan et al, 2010 (C)	F2F Derm 1 vs F2F Derm 3	200	491	76	194	147											
Tran et al, 2011	F2F Derm vs TD	30	30							75	30	23					
Vano- Galvan et al, 2011	F2F Derm vs TD	100	100							69	2000	1381					
Vestergaard et al, 2020	A F2F Derm vs TD1	100	100							09	2000	1301					
(A)	IDI	519	600				62	600	370	62	600	372	58	292	170		
Vestergaard et al, 2020	F2F Derm vs TD2													_, _			
(B)		519	600							60	600	361	54	292	157		
Warshaw et al, 2015 (A)	F2F Derm vs TD (non biopsied pigmented lesions,																
(**)	Macro)	2152	3021							76	753	570				0.56	753
Warshaw et al, 2015 (B)	F2F Derm vs TD (non biopsied pigmented lesions,																
	Macro+PLD)	2152	3021								752						

Warshaw et al, 2015 (C)	F2F Derm vs TD (non biopsied pigmented lesions,											
Warshaw et	Macro+PLD) F2F Derm vs TD	2152	3021		80	684	548				0.62	684
al, 2015 (D)	(biopsied pigmented lesions,											
	Macro)	2152	3021		53	651	344				0.44	651
Warshaw et al, 2015 (E)	F2F Derm vs TD (biopsied pigmented lesions,											
	Macro+PLD)	2152	3021		53	652	348				0.45	652
Warshaw et al, 2015 (F)	F2F Derm vs TD (biopsied pigmented lesions,											
	Macro+PLD)	2152	3021		60	595	357				0.52	595
Warshaw et al, 2015 (G)	F2F Derm vs TD (NONbiopsied NONpigmented											
	lesions, Macro)	2152	3021		52	583	300				0.38	583
Warshaw et al, 2015 (H)	F2F Derm vs TD (NONbiopsied NONpigmented lesions,											
	Macro+PLD)	2152	3021		50	579	291				0.38	579
Warshaw et al, 2015 (I)	F2F Derm vs TD (biopsied NONpigmented					C	6					
***	lesions, Macro)	2152	3021		46	1034	473				0.32	1034
Warshaw et al, 2015 (J)	F2F Derm vs TD (biopsied NONpigmented lesions,											
	Macro+PLD)	2152	3021		50	1020	511				0.37	1020
Zanini, 2013	F2F Derm vs TD	100	100		76	100	76					
Zink et al, 2017, July	F2F Derm vs TD	10-	10.5						10-	4.6.2		
(A)		195	195		59	195	115	56	195	108		

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	<b>Zink</b> at al <b>P</b>	2F Derm vs TD									
	(B)		26	26		92	26	24	67 26	17	
239	eTable 3. Include	ed unique study g	groupings	and letter codes.	•						
240	TD: TeleDermato	logy, TDs: TeleDe	ermatolog	ists, Derm: Derma	atologist, F2F: Face-	to-Face, SFTI	D: Store	And For	ward Tech	nology, PLI	D: Polarized
241	Dermoscopy, Mac	ero: Macroscopic	clinical ir	nages.							
					atologist, F2F: Face-						
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						-	2				

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Study ID	Journal	Reason For Exclusion
NCT03034694, 2016	ClinicalTrials.gov	Wrong study design
Andersson et al, 2017	Lakartidningen	Wrong study design
Romero et al, 2018	Actas dermo-sifiliograficas	Wrong study design
Orruno et al, 2016	Health Technology Assessment Database	Wrong study design
Batalla et al, 2016	Piel	Wrong study design
Kroemer et al, 2011	British Journal of Dermatology	Wrong study design
Ernstberger et al, 2014	Zentralblatt fur Chirurgie	Wrong study design
Totty et al, 2018	Journal of wound care	Wrong study design
Wurm et al, 2013	Journal of Telemedicine and Telecare	Wrong study design
Wang et al, 2017	Telemedicine journal and e-health : the official journal of the American Telemedicine Association	Wrong study design
Singh et al, 2011	Australasian Journal of Dermatology	Wrong study design
Grey et al, 2017	Dermatitis	Wrong study design
Crompton et al, 2010	Journal of Visual Communication in Medicine	Wrong study design
Ali et al, 2021	JMIR formative research	Wrong study design
Boyce et al, 2011	Dermatology	Wrong study design
Berg et al, 2017	Sarcoidosis Vasculitis and Diffuse Lung Diseases	Wrong study design
Shin et al, 2014	Journal of telemedicine and telecare	Wrong study design
Gacto-Sanchez et al, 2020	Burns : journal of the International Society for Burn Injuries	Wrong study design
Tian et al, 2017	Journal of Cosmetic Dermatology	Wrong study design
Thind et al, 2011	Clinical and Experimental Dermatology	Wrong study design
Silveira et al, 2014	BMC Dermatology	Wrong study design
O'Connor et al, 2017	JAMA Dermatology	Wrong study design
Janda et al, 2020	The Lancet. Digital health	Wrong study design
Day et al, 2020	Military medicine	Wrong study design
Karlsson et al, 2015	Acta Dermato-Venereologica	Wrong study design
Seghers et al, 2015	Australasian Journal of Dermatology	Wrong study design
Hazenberg et al, 2010	Journal of Medical Engineering and Technology	Wrong study design
Borve et al, 2015	Acta Dermato-Venereologica	Wrong study design
Boissin et al, 2015	Burns	Wrong study design
Da Silva et al, 2018	Dermatology online journal	Wrong study design
Devrim et al, 2019	BMC pediatrics	Wrong study design
Danielsson et al, 2016	Health Technology Assessment Database	Wrong study design

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Berglund et al, 2020	Journal of the European Academy of Dermatology and Venereology : JEADV	Wrong study design
Forsblom et al, 2013	Clinical Infectious Diseases	Wrong study design
G Bianchi et al, 2020	Journal of medical Internet research	Wrong study design
Congalton et al, 2015	Journal of the European Academy of Dermatology and Venereology	Wrong study design
Ferrandiz et al, 2012	Archives of Dermatology	Wrong study design
Ismail et al, 2018	International Journal of Women's Dermatology	Wrong study design
Gamus et al, 2019	International journal of medical informatics	Wrong study design
Paudel et al, 2020	Case reports in dermatological medicine	Wrong study design
Georgesen et al, 2020	Telemedicine journal and e-health : the official journal of the American Telemedicine Association	Wrong study design
Gagnon et al, 2015	Dermatology Times	Wrong study design
Philp et al, 2013	Pediatric Dermatology	Wrong study design
Mooney et al, 2011	Skin Research and Technology	Wrong study design
Do Khac et al, 2021	JMIR mHealth and uHealth	Wrong study design
Chambers et al, 2012	Journal of the American Academy of Dermatology	Wrong study design
Garcia-Romero et al, 2011	Telemedicine journal and e-health : the official journal of the American Telemedicine Association	Wrong study design
Ahmed et al, 2020	Annals of internal medicine	Wrong study design
Marwaha et al, 2019	Journal of the American Academy of Dermatology	Wrong study design
NCT02122432, 2014	ClinicalTrials.gov	Wrong study design
Lowe et al, 2021	Clinical and experimental dermatology	Wrong study design
Bowling et al, 2011	Wound Repair and Regeneration	Wrong study design
Marin-Gomez et al, 2020	Journal of primary care & community health	Wrong study design
Veronese et al, 2021	Diagnostics (Basel, Switzerland)	Wrong study design
Ismail et al, 2018	International journal of dermatology	Wrong study design
NCT02905851, 2016	ClinicalTrials.gov	Wrong study design
Trinidad et al, 2020	Journal of the American Academy of Dermatology	Wrong study design
Tensen et al, 2019	Studies in health technology and informatics	Wrong study design
Karavan et al, 2014	Journal of telemedicine and telecare	Wrong study design
Viola et al, 2011	Archives of Dermatology	Wrong study design
van Netten et al, 2017	Scientific reports	Wrong study design

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Cai et al, 2016	Burns : journal of the International Society for Burn Injuries	Wrong study design
Hazenberg et al, 2010	Diabetes Technology and Therapeutics	Wrong study design
Jacoby et al, 2021	Journal of drugs in dermatology : JDD	Wrong study design
Pak et al, 2018	Wound repair and regeneration : official publication of the Wound Healing Society [and] the European Tissue Repair Society	Wrong study design
Kummerow Broman et al, 2019	JAMA surgery	Wrong study design
Munoz-Lopez et al, 2021	Journal of the European Academy of Dermatology and Venereology : JEADV	Wrong study design
Markun et al, 2017	Medicine	Wrong study design
Piette et al, 2017	Journal of telemedicine and telecare	Wrong study design
Tan et al, 2010	British Journal of Dermatology	Wrong study design
Watson et al, 2010	Archives of Dermatology	Wrong study design
Wiseman et al, 2016	Journal of vascular surgery. Venous and lymphatic disorders	Wrong study design
Wolf et al, 2013	JAMA dermatology	Wrong study design
Laggis et al, 2020	The American Journal of dermatopathology	Wrong study design
Kazi et al, 2021	Telemedicine journal and e-health : the official journal of the American Telemedicine Association	Wrong study design
Kanthraj et al, 2013	Indian Journal of Dermatology, Venereology and Leprology	Wrong study design
Shah et al, 2016	Journal of the American Academy of Dermatology	Wrong study design
Kim et al, 2018	Skin research and technology	Wrong study design
Nguyen et al, 2017	Journal of Clinical and Aesthetic Dermatology	Wrong study design
Rizvi et al, 2020	PloS one	Wrong study design
Mehrtens et al, 2019	Clinical and experimental dermatology	Wrong study design
Knudsen et al, 2012	Lakartidningen	Research letter or letter to the editor
Korman et al, 2020	Journal of the American Academy of Dermatology	Research letter or letter to the editor
Mercer et al, 2014	Journal of Cutaneous Medicine and Surgery	Research letter or letter to the editor
Grunig et al, 2015	JAMA Dermatology	Research letter or letter to the editor
Cartron et al, 2020	Dermatologic therapy	Research letter or letter to the editor

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McAfee et al, 2020	Journal of the American Academy of Dermatology	Research letter or letter to the editor
Wong et al, 2021	JAMA dermatology	Research letter or letter to the editor
Baranowski et al, 2020	Journal of the American Academy of Dermatology	Research letter or letter to the editor
Micheletti et al, 2014	Journal of the American Academy of Dermatology	Research letter or letter to the editor
Osei-Tutu et al, 2013	Journal of the American Academy of Dermatology	Research letter or letter to the editor
Nair et al, 2015	International Journal of Dermatology	Research letter or letter to the editor
Miller et al, 2021	Journal of the American Academy of Dermatology	Research letter or letter to the editor
Keleshian et al, 2017	Journal of the American Academy of Dermatology	Research letter or letter to the editor
HAYES; Inc et al, 2016	Health Technology Assessment Database	Research letter or letter to the editor
Jacob et al, 2017	Journal of telemedicine and telecare	Research letter or letter t the editor
Perkins et al, 2020	Journal of the American Academy of Dermatology	Research letter or letter t the editor
Halpern et al, 2010	British Journal of Dermatology	Research letter or letter t the editor
Newman et al, 2020	Journal of the American Academy of Dermatology	Research letter or letter t the editor
Hunt et al, 2020	Clinical and experimental dermatology	Research letter or letter t the editor
2018	Nursing	Research letter or letter t the editor
Taneja et al, 2021	Indian journal of dermatology, venereology and leprology	Research letter or letter t the editor
Echeverria-Garcia et al, 2019	Actas dermo-sifiliograficas	Research letter or letter t the editor
Henning et al, 2010	Archives of Dermatology	Research letter or letter t the editor
Demo et al, 2019	Clinical and experimental dermatology	Research letter or letter t the editor
Byamba et al, 2015	British Journal of Dermatology	Research letter or letter t the editor
Gupta et al, 2020	Journal of the American Academy of Dermatology	Research letter or letter t the editor
De Giorgi et al, 2017	Journal of the European Academy of Dermatology and Venereology	Research letter or letter t the editor
Duong et al, 2016	Annales de Dermatologie et de Venereologie	Research letter or letter t the editor

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Mortimer et al, 2021	Journal of the American Academy of Dermatology	Research letter or letter to the editor
Gravely et al, 2010	Journal of the American Academy of Dermatology	Research letter or letter to the editor
Choi et al, 2021	International journal of dermatology	Research letter or letter to the editor
Motley et al, 2012	BMJ: British Medical Journal (Clinical Research Edition)	Research letter or letter to the editor
Leavitt et al, 2016	Journal of the American Academy of Dermatology	Research letter or letter to the editor
Cheng et al, 2020	Dermatitis : contact, atopic, occupational, drug	Research letter or letter to the editor
Clark et al, 2021	Journal of the American Academy of Dermatology	Research letter or letter to the editor
Fuesl et al, 2010	MMW-Fortschritte der Medizin	Research letter or letter to the editor
English III et al, 2013	Journal of the American Academy of Dermatology	Research letter or letter to the editor
Cotes et al, 2021	Journal of the American Academy of Dermatology	Research letter or letter to the editor
Abi Rafeh et al, 2021	Journal of cutaneous medicine and surgery	Research letter or letter to the editor
Okeke et al, 2020	The Journal of dermatological treatment	Research letter or letter to the editor
Splete et al, 2014	Emergency Medicine (00136654)	Research letter or letter to the editor
Khosravi et al, 2021	Clinical and experimental dermatology	Research letter or letter to the editor
Sivesind et al, 2021	Journal of the American Academy of Dermatology	Research letter or letter to the editor
Stoecker et al, 2013	JAMA dermatology	Research letter or letter to the editor
Skayem et al, 2020	Journal of the European Academy of Dermatology and Venereology : JEADV	Research letter or letter to the editor
Su et al, 2020	Journal of the American Academy of Dermatology	Research letter or letter to the editor
Massone et al, 2021	Anais brasileiros de dermatologia	Research letter or letter to the editor
Li et al, 2021	The Journal of infection	Research letter or letter to the editor
Afanasiev et al, 2021	Journal of the American Academy of Dermatology	Research letter or letter to the editor
Varma et al, 2011	British Journal of Dermatology	Research letter or letter to the editor
Van Der Heijden et al, 2010	Journal of the European Academy of Dermatology and Venereology	Research letter or letter to the editor

Motley et al, 2012	BMJ (Online)	Research letter or letter t the editor
Villani et al, 2020	Dermatologic therapy	Research letter or letter t the editor
Portnoy et al, 2018	The journal of allergy and clinical immunology. In practice	Research letter or letter t the editor
Tschandl et al, 2018	British Journal of Dermatology	Research letter or letter t the editor
Poolworaluk et al, 2020	Future healthcare journal	Research letter or letter the editor
Anonymous et al, 2020	Journal of drugs in dermatology : JDD	Research letter or letter the editor
Tan et al, 2021	Annals of the Academy of Medicine, Singapore	Research letter or letter the editor
Silva et al, 2021	Anais brasileiros de dermatologia	Research letter or letter the editor
de Giorgi et al, 2016	International Journal of Dermatology	Wrong outcomes
Senel et al, 2014	Journal of telemedicine and telecare	Wrong outcomes
Goodier et al, 2021	Contact dermatitis	Wrong outcomes
Foolad et al, 2017	International Journal of Dermatology	Wrong outcomes
Wells et al, 2020	The Journal of clinical and aesthetic dermatology	Wrong outcomes
Arzberger et al, 2016	Acta Dermato-Venereologica	Wrong outcomes
Creighton-Smith et al, 2017	International Journal of Dermatology	Wrong outcomes
Marwaha et al, 2019	Journal of the American Academy of Dermatology	Wrong outcomes
Pasquali et al, 2021	Actas dermo-sifiliograficas	Wrong outcomes
Vestergaard et al, 2020	Family practice	Wrong outcomes
Kravets et al, 2018	Acta dermatovenerologica Alpina, Pannonica, et Adriatica	Wrong outcomes
Speiser et al, 2014	American Journal of Dermatopathology	Wrong outcomes
N/A	Journal of the American Academy of Dermatology	Wrong outcomes
Whited et al, 2013	Journal of Telemedicine and Telecare	Wrong outcomes
Abhishek et al, 2021	medRxiv	Wrong outcomes
Villa et al, 2020	Internal and emergency medicine	Wrong outcomes
Lubeek et al, 2016	Tijdschrift voor gerontologie en geriatrie	review
Ndegwa et al, 2016	Health Technology Assessment Database	review
Moreno-Ramirez et al, 2017	Acta dermato-venereologica	review
Moreno-Ramirez et al, 2017	Acta Dermato-Venereologica	review

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Van Der Heijden et al, 2010	Huisarts en Wetenschap	review
Walocko et al, 2017	Dermatologic Clinics	review
Roman et al, 2014	Journal of the Dermatology Nurses' Association	review
Hart et al, 2011	Telemedicine journal and e-health : the official journal of the American Telemedicine Association	review
Elsner et al, 2020	Journal der Deutschen Dermatologischen Gesellschaft = Journal of the German Society of Dermatology : JDDG	review
Kaliyadan et al, 2020	Indian journal of dermatology	review
Burch et al,		review
Evans et al, 2017	Pharmazeutische Zeitung	Editorial
Anonymous. et al, 2016	Journal of AHIMA / American Health Information Management Association	Editorial
Luk et al, 2018	Hong Kong Journal of Dermatology and Venereology	Editorial
Queen et al, 2018	International wound journal	Editorial
Anguita et al, 2014	Nurse Prescribing	Editorial
Haworth et al, 2020	Clinical and experimental dermatology	Editorial
Romero-Aguilera et al, 2019	Actas dermo-sifiliograficas	Editorial
Barrio Garde et al, 2016	Piel	Editorial
Morand et al, 2010	Annales de dermatologie et de venereologie	Editorial
N/A	Journal of the American Academy of Dermatology	Abstract
N/A	Journal of the American Academy of Dermatology	Abstract
Bianchi et al, 2020	Journal of the American Academy of Dermatology	Abstract
Creadore et al, 2020	Journal of the American Academy of Dermatology	Abstract
N/A	Journal of the American Academy of Dermatology	Abstract
Tognetti L et al, 2020		Abstract
SPLETE et al, 2014	Emergency Medicine (00136654)	Abstract
N/A	Journal of the American Academy of Dermatology	Abstract
Dahlen Gyllencreutz et al, 2017	Journal of the European Academy of Dermatology and Venereology	Wrong intervention
Tandjung et al, 2015	Journal of Evaluation in Clinical Practice	Wrong intervention

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Paradela-De-La-Morena et al, 2015	European Journal of Dermatology	Wrong intervention
Horsham et al, 2015	British Journal of Dermatology	Wrong intervention
Saenz et al, 2018	International Journal of Telemedicine and Applications	Wrong intervention
Kochmann et al, 2016	Telemedicine journal and e-health : the official journal of the American Telemedicine Association	Wrong comparator
Markun et al, 2017	Medicine (United States)	Wrong comparator
Feigenbaum et al, 2017	Pediatric Dermatology	Wrong comparator
Massone et al, 2014	Journal of the European Academy of Dermatology and Venereology	Wrong comparator
MacLellan et al, 2021	Journal of the American Academy of Dermatology	Wrong comparator
Koysombat et al, 2021	Journal of plastic, reconstructive & aesthetic surgery : JPRAS	Corrrespondence
Jakhar et al, 2020	Clinical and experimental dermatology	Corrrespondence
Alkmim et al, 2013	Journal of Telemedicine and Telecare	Corrrespondence
NCT02836665, 2016	ClinicalTrials.gov	Clinical trial - no associated manuscript
JPRN-UMIN000020873 et al, 2016		Clinical trial - no associated manuscript
Fogel et al, 2016	Journal of the American Academy of Dermatology	Commentary
Hoyer et al, 2020	Cutis	Commentary
Pasadyn et al, 2020	Journal of the American Academy of Dermatology	Duplicate
Moreno-Ramirez et al, 2017	American Journal of Clinical Dermatology	Erratum
Trovato et al, 2011	Eplasty	Wrong patient population
Bowns et al, 2016	Health Technology Assessment Database	Wrong publication date
Gemelas et al, 2019	Telemedicine journal and e-health : the official journal of the American Telemedicine Association	Wrong setting
eTable 4. List of studies ex	cluded at the full-text screening stage.	

А Risk of bias domains D1 D2 D4 Overall D3 Altieri, et al. 2017 + (+) $(\pm)$  $(\pm$ (+)Azfar, et al, 2014 (+)(+)(+)(+) $\mathbf{X}$ Barbieri, et al, 2014 - $(\pm)$  $\overline{\phantom{a}}$  $(\pm)$ (+)Barcaui, et al, 2018  $(\pm)$ (+)X X X **–** -(+)(+)(+)Batalla, et al, 2015 Borve, et al, 2012 (+)X X X  $(\pm)$ **–** X  $(\pm)$ Borve, et al, 2013 X (+)Carter, et al, 2017 -(+)X X X **-**Chen, et al. 2010 (+)X  $\mathbf{X}$ X X Clarke, et al, 2021 X (+)(+)Costello, et al, 2019 (+)X X X (-)X Duong, et al, 2014 (+) $\mathbf{X}$  $(\mathbf{X})$ Gabel, et al, 2021 (+)(+)X X X -**–** Gatica, 2015 (+)(+(+)-Gerhardt, et al, 2021 X X X X X Giavina-Bianchi, et al, Oct 2020 (+)-X  $\mathbf{X}$ - $(\pm)$ X X Giavina-Bianchi, et al, Nov 2020 X Gonzalez-Coloma, et al, 2019 (+)X X  $(\pm)$ X Goulart-Silveira, et al, 2019 (+)(+)X  $\mathbf{X}$ -(+**—** (+) $(\pm)$ Jones, et al, 2021 Study Keller, et al, 2020 (+)(+)(+)(+)(+)• Lamel, et al, 2012 --(+)(+)+ (+)(+)(+Marchell, et al, 2017 (+)× × × Muir, et al, 2011 X (+)(+)X Nami, et al, 2015 (+)(+)(+)X (+)(+)Okita, et al, 2016 (+)(+)Patro, et al, 2015 (+)(+)X (+)X Piccoli, et al, 2015 X (+) $\mathbf{X}$  $(\mathbf{X})$ X Ribas, et al, 2010  $(\pm)$ X X X (+)(+)(+)(+)Rubegni, et al, 2011  $(\pm)$ (+)Saleh, et al, 2017 (+)(+)(+)+(+)(+)X Senel, et al, 2013 X X (+)(+)X X  $\mathbf{X}$ Sola-Ortigosa, et al. 2020 Tan, et al, 2010 X (+) $\mathbf{X}$ X X  $(\pm)$ Tran, et al, 2011 (+)X  $(\pm$  $\mathbf{X}$ X (+)(+)(+)Vano-Galvan, et al, 2010 +Vestergaard, et al, 2020 (+)(+)X X (+)-**—** Warshaw, et al, 2015  $(\pm)$  $(\pm$ (+)-0 -(+) $(\pm)$ Zanini, 2013 Zink, et al, 2017, July (-)+  $\mathbf{X}$  $(\mathbf{X})$ Zink, et al, 2017, Sept (+)Domains: D1: Patient selection. D2: Index test. D3: Reference standard. D4: Flow & timing. Judgement 🗙 High Some concerns + Low

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4		Patient selection					
5 6		Index test					
7		Reference standard					
8		Flow & timing					
9 10		Overall risk of bias					
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15 16		C	D1 D2	isk of bias domains D3 D4	D5 Overall		
17		Rios-Yuil, 2011		$+$ $\otimes$ (	+ 🗴		
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21			Domains: D1: Bias arising from the ra D2: Bias due to deviations f	rom intended intervention.	Judgement High		
22 23			D3: Bias due to missing out D4: Bias in measurement of D5: Bias in selection of the	f the outcome.	- Some concerns + Low		
24	245	D					
25 26	210	Bias arising from t	he randomization pro	ocess			
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32 33			Overall risk of				
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36 37	246 247	eTable 5. Risk of Bia	s (ROB) results.				
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3	250	eReferences.
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16	263	Journal of telemedicine and telecare. 2017;23(1):68-73. doi: <u>http://dx.doi.org/10.1177/1357633X15621226</u>
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24	271	Medical Sciences, State University of Rio de Janeiro, PhD in Medicine (Dermatology), University of Sao Paulo,
25	272	Dermatology Department, Pedro Ernesto University Hospital, Rio de Janeiro State University):1624073.
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33	391	dermatology for specific categories of skin neoplasms. Journal of the American Academy of Dermatology.
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60		For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml

Item No	Recommendation	Reported on Page No
Reporting o	f background should include	•
1	Problem definition	4
2	Hypothesis statement	4
3	Description of study outcome(s)	4-5
4	Type of exposure or intervention used	6-8
5 Type of study designs used		6-8
6 Study population		6-8
Reporting o	f search strategy should include	
7	Qualifications of searchers (eg, librarians and investigators)	6
8	Search strategy, including time period included in the synthesis and key words	6-8
9	Effort to include all available studies, including contact with authors	6-8
10	Databases and registries searched	6-8
11	Search software used, name and version, including special features used (eg, explosion)	6-8
12	Use of hand searching (eg, reference lists of obtained articles)	6-8
13	List of citations located and those excluded, including justification	Supplemer
14	Method of addressing articles published in languages other than English	6-8
15	Method of handling abstracts and unpublished studies	6-8, Supplemer
16	Description of any contact with authors	6-8, Supplemer
Reporting o	f methods should include	
17	Description of relevance or appropriateness of studies assembled for assessing the hypothesis to be tested	9-12
18 Rationale for the selection and coding of data (eg, sound clinical principles or convenience)		9-12
19 Documentation of how data were classified and coded (eg, multiple raters, blinding and interrater reliability)		9-12
20 Assessment of confounding (eg, comparability of cases and controls in studies where appropriate)		9-12
21	Assessment of study quality, including blinding of quality assessors, stratification or regression on possible predictors of study results	9-12
22	Assessment of heterogeneity	9-12
23 Description of statistical methods (eg, complete description of fixed or random effects models, justification of whether the chosen models account for predictors of study results, dose-response models, or cumulative meta-analysis) in sufficient detail to be replicated		9-12
24	Provision of appropriate tables and graphics	9-12, Supplemer
Reporting o	f results should include	
25	Graphic summarizing individual study estimates and overall estimate	Fig 1-3, Supplemer
26	Table giving descriptive information for each study included	Tables 1, 2 Supplemer
27	Results of sensitivity testing (eg, subgroup analysis)	9-12
28	Indication of statistical uncertainty of findings	9-12

## **MOOSE** Checklist for Meta-analyses of Observational Studies

1

Item No	Recommendation	Rej on
Reporting o	f discussion should include	
29	Quantitative assessment of bias (eg, publication bias)	9
30	Justification for exclusion (eg, exclusion of non-English language citations)	ę
31	Assessment of quality of included studies	ç
Reporting o	f conclusions should include	
32	Consideration of alternative explanations for observed results	1
33	Generalization of the conclusions (ie, appropriate for the data presented and within the domain of the literature review)	1
34	Guidelines for future research	1
35	Disclosure of funding source	

Reported

on Page

No

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# PRISMA 2020 Checklist

Section and Topic	ltem #	Checklist item	Location where item is reported
TITLE			
Title	1	Identify the report as a systematic review.	p1
ABSTRACT			
Abstract	2	See the PRISMA 2020 for Abstracts checklist.	р3-4
Rationale	3	Describe the rationale for the review in the context of existing knowledge.	p5-6
4       Provide an explicit statement of the objective(s) or question(s) the review addresses.		p5-6	
METHODS			
5 Eligibility criteria	5	Specify the inclusion and exclusion criteria for the review and how studies were grouped for the syntheses. p8, Su	pplementary p15
6 Information 7 sources	6	Specify all databases, registers, websites, organisations, reference lists and other sources searched or consulted to identify studies. Specify the date when each source was last searched or consulted.	р7
8 Search strategy	7	Present the full search strategies for all databases, registers and websites, including any filters and limits used.	Supplementary p2
9 Selection process	8	Specify the methods used to decide whether a study met the inclusion criteria of the review, including how many reviewers screened each record and each report retrieved, whether they worked independently, and if applicable, details of automation tools used in the process.	p8
Data collection process	9	Specify the methods used to collect data from reports, including how many reviewers collected data from each report, whether they worked independently, any processes for obtaining or confirming data from study investigators, and if applicable, details of automation tools used in the process.	р8
Data items	10a	List and define all outcomes for which data were sought. Specify whether all results that were compatible with each outcome domain in each study were sought (e.g. for all measures, time points, analyses), and if not, the methods used to decide which results to collect.	Supplementary p15
27 27	10b	List and define all other variables for which data were sought (e.g. participant and intervention characteristics, funding sources). Describe any assumptions made about any missing or unclear information.	p8 and Supplementary p15
Study risk of bias assessment	11	Specify the methods used to assess risk of bias in the included studies, including details of the tool(s) used, how many reviewers assessed each study and whether they worked independently, and if applicable, details of automation tools used in the process.	p9
Effect measures	12	Specify for each outcome the effect measure(s) (e.g. risk ratio, mean difference) used in the synthesis or presentation of results.	p8-9
2 Synthesis 3 methods	13a	Describe the processes used to decide which studies were eligible for each synthesis (e.g. tabulating the study intervention characteristics and comparing against the planned groups for each synthesis (item #5)).	p8-9
4 5	13b	Describe any methods required to prepare the data for presentation or synthesis, such as handling of missing summary statistics, or data conversions.	p 8-9 Supplementary p2
6	13c	Describe any methods used to tabulate or visually display results of individual studies and syntheses.	Supplementary p2
7 8	13d	Describe any methods used to synthesize results and provide a rationale for the choice(s). If meta-analysis was performed, describe the model(s), method(s) to identify the presence and extent of statistical heterogeneity, and software package(s) used.	p 8-9 Supplementary p2
9	13e		Supplementary p2
.1	13f	Describe any sensitivity analyses conducted to assess robustness of the synthesized results.	NA
2 Reporting bias 3 assessment	14	Describe any methods used to assess risk of bias due to missing results in a synthesis (arising from reporting biases).	p9
4 Certainty 5 assessment	15	Describe any methods used to assess certainty (or confidence) in the body of evidence for an outcome. For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml	NA

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#### PRISMA 2020 Checklist

Page 81 of 80	

Section and Topic	ltem #	Checklist item	Location where item is reported
RESULTS			
Study selection	16a	Describe the results of the search and selection process, from the number of records identified in the search to the number of studies included in the review, ideally using a flow diagram.	Figure 1, p10
	16b	Cite studies that might appear to meet the inclusion criteria, but which were excluded, and explain why they were excluded.	Supplementary p23
Study characteristics	17	Cite each included study and present its characteristics.	p10-11, Table 1, 2
Risk of bias in       18       Present assessments of risk of bias for each included study.         studies       18		p15, Supplementa eTable 5	
Results of individual studies	19	For all outcomes, present, for each study: (a) summary statistics for each group (where appropriate) and (b) an effect estimate and its precision (e.g. confidence/credible interval), ideally using structured tables or plots.	p15, Supplementa eTable 5
Results of	20a	For each synthesis, briefly summarise the characteristics and risk of bias among contributing studies.	mentary eFigure 1-5
syntheses	20b	Present results of all statistical syntheses conducted. If meta-analysis was done, present for each the summary estimate and its precision (e.g. confidence/credible interval) and measures of statistical heterogeneity. If comparing groups, describe the direction of the effect.	p 11-13 Supplementary p3
•	20c	Present results of all investigations of possible causes of heterogeneity among study results.	p 11-13 Supplementary p3
	20d	Present results of all sensitivity analyses conducted to assess the robustness of the synthesized results.	NA
Reporting biases	21	Present assessments of risk of bias due to missing results (arising from reporting biases) for each synthesis assessed.	ementary eTable 5
Certainty of evidence       22       Present assessments of certainty (or confidence) in the body of evidence for each outcome assessed.		p 11-13 Supplementary p3	
DISCUSSION	T		
Discussion	23a	Provide a general interpretation of the results in the context of other evidence.	p14
8	23b	Discuss any limitations of the evidence included in the review.	p15-16
<b>P</b>	23c	Discuss any limitations of the review processes used.	p16
	23d	Discuss implications of the results for practice, policy, and future research.	p17
OTHER INFORMA	1		
3 Registration and protocol 5	24a	Provide registration information for the review, including register name and registration number, or state that the review was not registered.	p7
	24b	Indicate where the review protocol can be accessed, or state that a protocol was not prepared.	р7
	24c	Describe and explain any amendments to information provided at registration or in the protocol.	NA
Support	25	Describe sources of financial or non-financial support for the review, and the role of the funders or sponsors in the review.	p18
Competing interests	26	Declare any competing interests of review authors.	p18
Availability of data, code and studies; data used for all analyses; analytic code; any other materials used in the review.			

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44 From: Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ 2021;372:n71. doi: 45 10.1136/bmj.n71 For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml For more information, visit: <u>http://www.prisma-statement.org/</u>

# **BMJ Open**

### **Diagnostic Reliability in Teledermatology: A Systematic Review and a Meta-Analysis**

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Secondary Subject Heading:	Health informatics, General practice / Family practice
Keywords:	Telemedicine < BIOTECHNOLOGY & BIOINFORMATICS, DERMATOLOGY, PRIMARY CARE, Information technology < BIOTECHNOLOGY & BIOINFORMATICS, STATISTICS & RESEARCH METHODS

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26 Abstract

27 <u>Objectives:</u> To compare teledermatology and face-to-face (F2F) agreement in primary diagnoses
28 of dermatological conditions.

29 <u>Design:</u> Systematic Review and Meta-Analysis

30 <u>Methods:</u> MEDLINE, Embase, Cochrane Library (Wiley), CINAHL, and medRxiv were

31 searched between January 2010 and May 2022. Observational studies and randomized clinical

32 trials that reported percentage agreement or kappa concordance for primary diagnoses between

teledermatology and F2F physicians were included. Titles, abstracts, and full-text articles were

34 screened in duplicate. From 7,173 citations, 44 articles were included. A random-effects meta-

analysis was conducted to estimate pooled estimates. Primary outcome measures were mean

36 percentage and kappa concordance for assessing diagnostic matches between teledermatology

37 and F2F physicians. Secondary outcome measures included the agreement between

38 teledermatologists, F2F dermatologists, and teledermatology and histopathology results.

39 <u>Results:</u> 44 studies were extracted and reviewed. The pooled agreement rate was 68.9%, and

40 kappa concordance was 0.67. When dermatologists conducted F2F and teledermatology consults,

41 the overall diagnostic agreement was significantly higher at 71%, compared to 44% for non-

42 specialists. Kappa concordance was 0.69 for teledermatologist vs specialist and 0.52 for non-

43 specialists. Higher diagnostic agreements were also noted with image acquisition training and

44 digital photography. The agreement rate was 76.4% between teledermatologsists, 82.4% between

45 F2F physicians, and 55.7% between teledermatology and histopathology.

46 <u>Conclusions and Relevance:</u> Teledermatology can be an attractive option particularly in

47 resource-poor settings. Future efforts should be placed on incorporating image acquisition

48 training and access to high-quality imaging technologies.

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2 3 4	49	Registration number: 10.17605/OSF.IO/FJDVG
5 6	50	
7 8 9	51	Keywords: teledermatology, dermatology consultations, store-and-forward, telemedicine,
9 10 11	52	remote consultation, dermatology hospitalists
12 13	53	
14 15 16	54	Article Summary:
16 17 18	55	Strengths and limitations of this study:
19 20	56	• This is the most comprehensive systematic review and meta-analysis of the topic to date
21 22 22	57	without language restrictions applied.
23 24 25	58	• Inclusion criteria were broad, including all types of dermatological diseases, imaging
26 27 28 29 30 31 32 33 34	59	technologies, in-person physician specializations (GPs, hospitalists, and dermatologists),
	60	and the presence or absence of image acquisition training.
	61	• The article search was limited to 2010 and later due to the recent incorporation of
	62	smartphones in teledermatology practices.
35 36	63	• Due to considerable heterogeneity between studies, meta-analysis and synthesis of
37 38 39	64	predictors for accurate diagnoses remotely were limited even after subgrouping.
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## 65 Introduction

With the emergence of COVID-19, the introduction of virtual consults in healthcare settings, especially dermatology, has been expanded to allow many patients the opportunity for equitable access to care when in-person appointments pose a challenge and risk to patients. <sup>1</sup> Different modalities were introduced to support teledermatology. This involves remote sharing of patient data, including synchronous video-streaming teledermatology and asynchronous sharing of still images via emails, or text messages, or store-and-forward teledermatology (SFTD).

> Although both synchronous and asynchronous approaches have been shown to be cost-effective, SFTD is particularly popular as it requires fewer resources and less coordination than synchronous teledermatology. <sup>2 3</sup> With the advent of higher resolution smartphone cameras, relatively minimal training is required to capture data for remote dermatologists correctly; multiple SFTD studies opted to provide no training in image capture and still found value in teledermatology. <sup>4 5</sup>

There is valid concern over the reliability of teledermatology given the significant variability in diagnostic accuracy predicted across pre-pandemic research. <sup>6</sup> This is expected given the lack of standardization across studies and the potential for confounders across teledermatology methodologies and applications, e.g., level of training or skin lesion type. This variability in approach may benefit from an increased demand, which could provide greater impetus to optimize and standardize teledermatology.

To our knowledge, this is the first and most inclusive meta-analysis (MA) that compares teledermatology consults to face-to-face (F2F) that looked at all relevant studies without overly

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exclusive inclusion criteria. The primary objective of this study was to compare the reliability of teledermatology diagnoses to F2F consults, as determined by Cohen's kappa interrater agreement and total agreement rates. Teledermatology can assume important roles as a routine complement to primary care and an alternate route to the typical in-person referrals. Consequently, we wanted to determine agreement for teledermatology and all F2F consults, teledermatology and F2F primary care consults, and finally teledermatology and F2F dermatologist consults, which would arguably best capture the limitations introduced by the change in medium from F2F to teledermatology.

97 Additional subset analyses were performed to control for potential confounders (e.g., 98 inflammatory vs. malignant, staff training for image acquisition, teledermoscopy, and smartphone 99 vs digital cameras) introduced by the heterogenous methodology. The secondary objectives sought 100 to determine the agreement rate within teledermatology diagnoses and F2F consults to provide an 101 idea of each medium's consistency, and provide the best estimate of accuracy for the agreement 102 rate between teledermatology and histopathology. This study was performed in accordance with the Preferred Reported Items for Systematic Reviews

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105 and Meta-Analyses (PRISMA) guidelines. 106 107 **Protocol Registration** 108 Prior to the conduct of this review, a protocol which adhered to the PRISMA-protocols (i.e., 109 PRISMA-P) guidelines was developed and then registered on Open Science Framework (OSF).

Access: https://osf.io/fidvg. 7 110

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Methods

112 Search Strategy

A comprehensive search of major bibliographic databases, MEDLINE, Embase, Cochrane Library 113 114 (Wiley), CINAHL, and medRxiv was performed in August 2021. MEDLINE was searched again 115 between August 2021 and May 2022 to screen any new articles published after our protocol was 116 registered. The search strategy was developed by a medical librarian at Queen's University 117 (Kingston, ON). Please see the supplementary appendix for additional information on the search 118 strategy.

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120 No restrictions were placed on the language or status of the publications. Search results were 121 limited to studies published between January 2010 and May 2022 due to the novelty of incorporating smartphones in teledermatology remote consultations. <sup>8</sup> The International 122 123 Prospective Register of Systematic Reviews (PROSPERO) and OSF were searched up to May 124 2022 for relevant ongoing systematic reviews using the terms 'telemedicine,' 'teledermatology,'

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- 3 4	125	'dermatology,' 'diagnostic accuracy,' and 'diagnostic concordance.' Reference lists of included
5 6	126	studies were screened to identify additional studies not captured in the search.
7 8 9	127	
9 10 11	128	Eligibility Criteria
12 13	129	Studies evaluating the diagnostic reliability of teledermatology that reported on patients with
14 15	130	dermatological conditions assessed by a clinician using asynchronous or synchronous telemedicine
16 17 18	131	systems were included. All articles were required to compare tele- to F2F diagnoses conducted by
19 20	132	a physician. Exclusion criteria encompassed survey articles, feasibility studies, non-
21 22	133	dermatological telemedicine studies, cost-effectiveness studies, editorials, review articles, studies
23 24 25	134	using teledermatology as the reference standard, studies comparing only dermatoscopic images
25 26 27 28 29 30 31 32 33 34	135	without clinical images, and studies where patients captured their own photographs. The latter was
	136	excluded to ensure consistent image quality, enabling a more accurate comparison of diagnostic
	137	reliability between tele- and F2F methods. Included articles are summarized in eTable 1 in the
	138	supplementary appendix. Inclusion and exclusion criteria are summarized in eTable 2, available
35 36	139	in the supplementary appendix.
37 38	140	
39 40 41	141	Data Selection & Extraction
41 42 43	142	Following the removal of duplicated citations, the titles and abstracts were screened. Following
44 45	143	this step, a full-text assessment was conducted. At both stages, two reviewers performed screening
46 47	144	independently [AB and NB]. Any disagreements were resolved through consensus by the two
48 49 50	145	reviewers and when necessary, through discussion with a third reviewer [JLRG].
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A data collection form was created on the *Covidence* website and piloted by two reviewers [AB, NB]. Three additional reviewers assisted with data extraction [JLRG, MB, MM]. Two reviewers were assigned to each paper. One reviewer extracted all characteristics of the included literature, and the second reviewer validated the characteristics for accuracy. Any disagreements were resolved by consensus. In the supplementary appendix, **eTable 3** summarizes the information extracted from full-text articles.

154 Data Synthesis

This meta-analysis assessed the effectiveness of SFTD technologies and live video conferencing in diagnosing skin conditions. Outcomes regarding complete diagnostic percentage agreement rates and Cohen's kappa concordance were evaluated separately, with some studies being part of both analyses if they reported both variables. The patient, intervention type, lesion, and geographic characteristics were summarized qualitatively. Please see the supplementary appendix and **eTable 4** for more details on data synthesis and nomenclature for each study grouping.

#### 162 <u>Risk of Bias</u>

163 Three reviewers [AB, NB, MB] completed the risk of bias assessment; all studies were 164 independently reviewed. Version 2 of the Cochrane risk-of-bias tool for randomized trials (RoB 165 2) was used to assess the risk of bias in three randomized trials. <sup>9-11</sup> RoB 2 is structured into a fixed 166 set of domains of bias, focusing on different aspects of trial design, conduct, and reporting. <sup>12</sup> The 167 Quality Assessment of Diagnostic Assessment of Diagnostic Accuracy (2<sup>nd</sup> Edition, QUADAS-2) 168 was used to assess the risk of bias. Uncertain risk of bias was assigned to studies with insufficient

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information except for studies that were likely to be biased due to missing data. In the latter case,

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# 172 Synthesis of Results

a high risk of bias was assigned.

173 Statistical analysis was performed using the dmetar package in R v.4.0.1 (R Foundation for 174 Statistical Computing, 2022). Agreement rates and Cohen's kappa concordances for unique study 175 groupings were treated as individual and independent values. For the percentage of agreement, 176 meta-analyses were conducted using the aggregated data, and proportions were calculated with the 177 corresponding 95 percent confidence intervals (CI). Point-biserial correlations were utilized to 178 calculate pooled kappa values. Statistical heterogeneity was investigated using the I<sup>2</sup> index and the 179  $\tau^2$  statistic, leading to the use of a random-effects model for overall complications with a logit 180 transformation due to the high degree of heterogeneity. Possible sources of heterogeneity were 181 explored through sub-group analysis, and confounding factors were controlled using metaregression. A random-effects model, as proposed by DerSimonian and Laird, was chosen as the 182 183 primary method to estimate all pooled estimates. Further details on the statistical analysis can be 184 found in the supplementary appendix.

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186 <u>Patient and Public Involvement</u>

187 Patients or the public were not involved in our research's design, conduct, reporting, or188 dissemination plans.

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**Results** 

A total of 7,173 studies were screened for eligibility of which 44 were included in this study. Of these, 40 studies reported diagnostic agreement rates <sup>4 5 9-11 13-47</sup> and 21 studies reported kappa concordance. <sup>5 9 13 14 19 22 25 28-33 35-37 48-52</sup> Further details are provided in the PRISMA diagram in **Figure 1**. The complete list of excluded studies can be found in the supplementary appendix,

- 196 <u>Study and patient characteristics</u>

eTable 5.

eTable 1 summarizes the study and participant characteristics for the 44 included papers. Forty of
the included studies were observational, of which 31 were prospective, nine were retrospective.
One study was ambispective. Three studies were randomized controlled trials and one study was
a quasi-randomized trial. Studies selected for the review included a total of 52,075 patients (Range:
26 to 24,210 patients). Some patients had multiple lesions and the total number of lesions included
in the study was 57,222 (Range: 26 to 27,519 lesions).

The mean age reported in 27 (61%) studies was  $54.78 \pm 15.69$  years (Range: 0 to 100 years old). Thirty-four (77%) studies reported participant gender, with a mean of 57% females (Range: 3.2% to 74%). Only 13 (29%) studies reported information on Fitzpatrick skin types, ethnicity, or race. Twenty-eight studies (64%) included in this analysis were inclusive of all types of dermatoses, 13 (29%) studies looked specifically at suspicious lesions, and three (7%) studies excluded skin cancers completely.

1		
2 3 4	210	
5 6 7	211	Diagnostic reliability of teledermatology when compared to F2F (specialist and non-specialist)
7 8 9	212	evaluation
10 11	213	We assessed the diagnostic reliability of teledermatology compared to F2F evaluations by
12 13 14	214	analyzing diagnostic agreement rates and concordance. The overall diagnostic agreement rate
14 15 16 17 18	215	ranged from 13.9% to 98.0% (mean 68.9%, CI 64.4% to 73.1%), with a concordance that ranged
	216	from 0.21 to 0.96 (mean 0.67, CI 0.60 to 0.74). See eFigure 1 and the supplementary appendix
19 20	217	for further details.
21 22 23	218	
24 25	219	Sub-group analyses
26 27	220	
28 29 30 31 32	221	Diagnostic agreement between teledermatologist and teledermatologist, F2F and F2F physicians,
	222	and teledermatology and histopathology
33 34	223	See supplementary appendix and eFigure 2 for further details.
35 36	224	
37 38 39	225	Diagnostic reliability of teledermatologist vs F2F specialist and non-specialist
40 41	226	See supplementary appendix and eFigure 3 for further details.
42 43	227	
44 45 46	228	Diagnostic reliability of teledermatology vs F2F by training provided for image acquisition
46 47 48	229	Twenty studies with 37 unique comparisons explicitly provided training to those in charge of
49 50	230	image acquisition shown in Figure 2.9-11 14-16 19 20 23 26 29 32 35-41 43 44 The mean agreement rate
51 52	231	between teledermatology and F2F physicians in these studies was 75.9% (CI 74.4% to 77.27%),
53 54 55	232	significantly higher than the 62.1% (CI 60.5% to 63.7%) observed when no training was provided
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(p = 0.033, heterogeneity:  $I^2 = 98\%$ ). Concordance values were also higher when training was provided (mean 0.77, CI 0.66-0.84) compared to when no training was provided (mean 0.60, CI 0.49-0.69) (p = 0.01, I^2=98\%).

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237 Diagnostic reliability of teledermatology vs F2F by type of technology used for image acquisition 238 Approximately half of the studies with 41 unique comparisons that compared Teledermatologists 239 with F2F physicians used digital cameras for image acquisition. Eighteen studies comparing F2F 240 and teledermatology agreement rates with 26 unique comparisons reported the use of smartphones 241 and tablets for image acquisition. Figure 3 shows that the mean percentage agreement rate for 242 digital cameras was 71.7% (CI 70.3% to 73.1% compared to 59.8% (CI 57.2% to 62.3%) for 243 smartphones or tablets. The higher agreement rate with digital photography was statistically 244 significant (p = 0.029, heterogeneity: I<sup>2</sup>=98%). The concordance values for digital photography 245 were reported for twelve studies with a mean of 0.70 (CI 0.61 to 0.76). Concordance values for 246 smartphone or tablet technologies were reported for eight studies with a mean of 0.62 (CI 0.38 to 247 (0.78). The higher concordance with digital photography was statistically significant (p = 0.003, 248 heterogeneity:  $I^2=100\%$ ).

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#### 250 Other sub-group analyses

No statistically significant patterns could be identified with the inclusion of teledermoscopy in addition to clinical images (**eFigure 4**), lesion type (**eFigure 5**), grouping studies as pre- or postpandemic (figure not shown), or risk of bias (figure not shown). Please see the supplementary appendix for further details.

1 2		
3 4	255	
5 6 7 8 9 10 11 12 13 14 15 16 17	256	Quality assessment
	257	The quality assessment results for risk of bias and applicability in individual studies are displayed
	258	in the supplementary appendix and eTable 6.
	259	
	260	Discussion:
	261	To our knowledge, this study constitutes the most extensive systematic review and meta-analysis
18 19 20	262	on teledermatology, including 44 studies across four languages.
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23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45	264	Our sub-group analyses revealed that agreement rates between teledermatology consultations and
	265	F2F physicians were significantly higher when dermatologists conducted in-person assessments
	266	compared to non-specialists. This finding suggests that teledermatology may be more beneficial
	267	in supplementing primary care than specialist care, as lower concordance with non-specialists
	268	indicates reduced reference test accuracy. Although we did not directly assess the impact of
	269	consulting teledermatologists on non-specialist accuracy, the included studies report high levels of
	270	non-specialist satisfaction with the teleconsultation process. In fact, 96% of non-specialists agreed
	271	that they learned about the dermatologic diagnosis, and 100% agreed that it helped patient care. <sup>23</sup>
	272	These results are consistent with prior research attributing high provider satisfaction to streamlined
	273	workflows, effective communication, and fast turnaround times in teledermatology. <sup>2 53</sup>
46 47 48	274	
48 49 50	275	The study emphasizes the importance of standardized training on image acquisition in improving
51 52	276	agreement rates between in-person and remote care. Additionally, digital photography was linked
53 54	277	to increased agreement rates, potentially due to enhanced image resolution and experienced staff
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conducting virtual consultations using standardized procedures. This suggests a crucial need for comprehensive training in image acquisition, highlighting the importance of equipping primary care providers supporting telehealth delivery with high-quality cameras and the latest smartphone models.<sup>24 54 55</sup>

Assessing agreement on the management plan is crucial in teledermatology as it serves as a triage tool for distinguishing mild/benign cases from severe/malignant/uncertain cases. Ensuring concordance in the management plan between telemedicine and face-to-face consultations is vital for optimizing patient care. Future research should explore the consistency of treatment recommendations and interventions between telemedicine and in-person consultations to further enhance the evaluation of telemedicine's effectiveness in guiding appropriate patient management.

Pathological assessment of skin lesions is the cornerstone of skin cancer diagnosis. This metaanalysis found a 55.7% (CI 53.0% to 58.4%) agreement rate between teledermatology and histopathology. This low agreement rate reflects all skin biopsies and specific diagnostic accuracy rates could not be calculated by lesion type due to the small number of studies that reported this value. Through sub-group analyses, we were able to compare cancerous and non-cancerous lesions; slightly higher concordance was seen with skin cancers compared to studies that also included non-suspicious lesions like dermatitis and psoriasis. However, the data was too heterogeneous for any significant conclusions. We also looked at the use of teledermoscopy, another technique that could help improve the diagnostic accuracy of teledermatology for suspicious lesions, but no significant trends could be identified. These findings reflected the results of a 2016 systematic review on teledermatology.<sup>6</sup>

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Many teledermoscopy studies grouped statistics from lesions analyzed with and without dermoscopy, preventing the assessment of the dermatoscope's incremental contributions without the influence of potentially less accurate, dermatoscope-free analysis. Supporting this explanation, the three teledermoscopy studies focused on cancer lesions demonstrated greater concordance rates than the teledermoscopy studies targeting broader lesions. One study identified agreement rates between teledermatology and F2F dermatology of 92.3% (24/26) and between teledermatology and histopathology of 66.7% (17/26), both above our identified median.<sup>45</sup> Another study found an agreement rate of 90% (37/41) when targeting pigmented lesions, although the rate may have been inflated due to recall bias introduced by having the same dermatologist perform teledermatology and F2F consults.<sup>16</sup> Finally, one study diagnosed keratotic lesions in sun-exposed areas, finding a high agreement rate of 92% (915/1000).<sup>37</sup> However, this study also risked bias from its experimental design, which excluded lesions with poor image quality. This fails to recapitulate the complexities of practical teledermatology, which must contend with potentially difficult image acquisition.

The 68.9% (CI 64.4% to 73.05%) combined agreement rate between teledermatology and F2F is lower than the agreement rates outlined in a recent review.<sup>56</sup> This suggests our greater sample size introduces more studies with poor agreement, which may better reflect the reality of adopting teledermatology at a larger scale and signal risk from a lack of standardization.<sup>55</sup> Our date cut-off of 2010 means our dataset has little overlap with existing reviews, and more heavily features new relevant technologies like smartphone apps for image acquisition.<sup>6 57</sup> The most recent MA<sup>57</sup> on

teledermatology limited its dataset to studies with multiple teledermatology and F2F consults and
 variably choosing to filter low-frequency diagnoses from certain studies.<sup>46</sup>

We acknowledge several potential limitations. The heterogeneity of the data, though at first glance might limit generalizability, enhances the adaptability and applicability of teledermatology across diverse real-world contexts. Challenges exist due to the absence of stratification by study design and a limited number of randomized controlled trials. Nevertheless, our findings emphasize the critical importance of standardized processes for effective teledermatology, such as training in image acquisition, reporting guidelines, and addressing privacy concerns. Our study reveals a greater degree of heterogeneity compared to previous meta-analyses, reflecting real-world application and clinical practice, bolstering the robustness of our conclusions. We advocate for a nuanced interpretation when generalizing these findings across all settings, recognizing the demographic and technological diversity in our sample as an asset. While our attempts to filter biased studies didn't yield significant improvements to our meta-analysis model, we are mindful of the potential risk of publication bias in our review.

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> Furthermore, our study only included a limited number of live video conferencing studies,<sup>11 24 46</sup> and our ability to draw meaningful conclusions regarding the differences between live video conferencing and SFTD methods is therefore limited. A recent study by Duong et al. demonstrated that live video conferencing can significantly contribute to diagnosis in teledermatology by improving the quality of collected information and accuracy of the patient's status evaluation.<sup>24</sup> The study found that videoconferencing significantly improved the diagnostic performance in

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68.7% of cases. While these results are promising, further research is needed to explore thepotential differences between clinical images and live video conferencing.

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In addition, our search was limited to published literature and may have missed relevant studies in the grey literature and reports from low- and middle-income countries. Nonetheless, the variability across providers and settings underlines the need for a standardized framework to employ and assess teledermatologists. Future research is needed to explore the differences between these methods and other potential factors that may impact the efficacy of teledermatology, particularly in low- and middle-income countries. We acknowledge these limitations and encourage further research to address these gaps in the literature.

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Current trends suggest that teledermatology will continue to expand, there have been many recent studies examining its accuracy without the design considerations necessary to allow comparisons beyond siloed investigations.<sup>1</sup> The implementation of evidence-informed processes is critical to the success of teledermatology services, and the accurate assessment of teledermatology will be required to assess which contexts it should be employed in, e.g., suspected malignancy vs. erythema.

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While acknowledging the significant potential of artificial intelligence (AI) in enhancing teledermatology, particularly in areas like image recognition and diagnosis, it is crucial to note that our current study does not incorporate these aspects. The impact of AI on teledermatology, while promising, introduces an additional layer of complexity, necessitating a dedicated, separate investigation beyond the scope of our current study.

The factors targeted by our sub-analysis are undoubtedly important to standardize with best practices requiring the inclusion of primary care provider training in image acquisition, explicitly outlined conditions where dermatoscope attachments are required, and standardized reporting with a lesion's anatomical site, size, distribution, morphology, and colour. Additional guidelines for data reporting could be designed with a mind to future research goals, e.g., the inclusion of Fitzpatrick grading to identify gaps in medical care. Finally, both clinical and research guidelines must address privacy concerns, as integrating EMR and sharing of patient images or videos erabilities. presents potential vulnerabilities.

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## 377 Conclusion:

This meta-analysis indicates that diagnostic agreement between remote and in-person dermatologists is acceptable in select conditions (i.e., when training for image acquisition is provided and technologies for high-quality images are used). Telemedicine adoption rates are accelerating globally, and teledermatology must be considered for enhanced accessibility, flexibility, reduced costs, and safer environments it can provide patients.

The results of this meta-analysis represent significant evidence to indicate the suitability of teledermatology for remote care, particularly as a complement to primary care, where it can serve as an intermediate step before F2F specialist consultations. Furthermore, the categorization of diagnostic concordance highlights important factors to further improve diagnostic accuracy. Additionally, it highlights the lack of standardization in teledermatology studies, calling for greater structure in clinical practice and conducting primary research.

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#### 7 396 <u>Author Contributions:</u>

JLRG is the guarantor of the review and supervised study design. JLRG also contributed to data
analysis and provided statistical expertise. AB and NB oversaw study design, data collection,
data analysis, and original draft preparation. AB designed the search strategy with the guidance

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#### 400 of the medical librarian, AKP. AB, NB, MB, and MM participated in the abstract and full-text

401 screen, data extraction, and risk of bias assessment. RDJF, AL, and SCW contributed to the draft

- 402 review and editing. All authors read, provided feedback and approved the final manuscript.
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408 **Competing interests:** 

409 RDJF is an employee, and SCW is a co-founder, chief medical officer, and shareholder of Swift 410 Medical. JRGL and AL were formerly employees of Swift. No funding bodies have any role in 411 study design, data collection and analysis, decision to publish, or preparation of the manuscript.

All other authors declare no conflict of interest. 412

#### 414 Data availability statement:

415 Data are available in a public, open access repository. All data relevant to the study are included 416 in the article, uploaded as supplementary information, or deposited on Open Science Framework: 417 https://osf.io/fjdvg. Data are available under the terms of the Creative Commons Zero "No rights 418 reserved" data waiver (CC0 1.0 Public domain dedication). Our systematic review produced a 419 large amount of information, and the arising database is available for future collaboration on 420 additional analyses. Please contact the corresponding author with any inquiries. 421 422 **Patient consent for publication:** 

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### **Figure Legends**

#### Figure 2. Forest plot representing F2F and teledermatology primary diagnostic agreement by whether imaging acquisition training was indicated by the study.

Figure 1. PRISMA Flow diagram of study selection.

Forest plot representing F2F and teledermatology primary diagnostic agreement when image acquisition training is involved. Studies were sorted into two groups, a) Did not conduct or did not report training personnel on image acquisition; b) Stated that person in charge of image acquisition was trained. (Left) Forest plot representing percentage agreement and 95% C.I. for overall concordance across 40 studies with a total of 72 unique number of comparisons, N of events and total included participants. (Right) Forest plot representing kappa concordance and 95% C.I. for overall concordance across 21 studies with a total of 45 unique number of comparisons, N of total included participants. Abbreviations: F2F (Face-to-Face), PCP (Primary Care Provider), TD (Teledermatology or Teledermatologist). 

#### Figure 3. Forest plot representing F2F and teledermatology primary diagnostic agreement by device type used to capture clinical photographs.

Forest plot representing F2F and teledermatology primary diagnostic agreement by imaging technology used. Studies were sorted into three groups, i) Digital photography ii) Imaging technology not mentioned iii) Smartphone or tablet. (Left) Forest plot representing percentage agreement and 95% C.I. for overall concordance across 40 studies with a total of 72 unique number of comparisons, N of events and total included participants. (Right) Forest plot representing kappa concordance and 95% C.I. for overall concordance across 21 studies with a total of 45 unique number of comparisons. N of total included participants. Abbreviations: F2F (Face-to-Face), PCP (Primary Care Provider), TD (Teledermatology or Teledermatologist) 

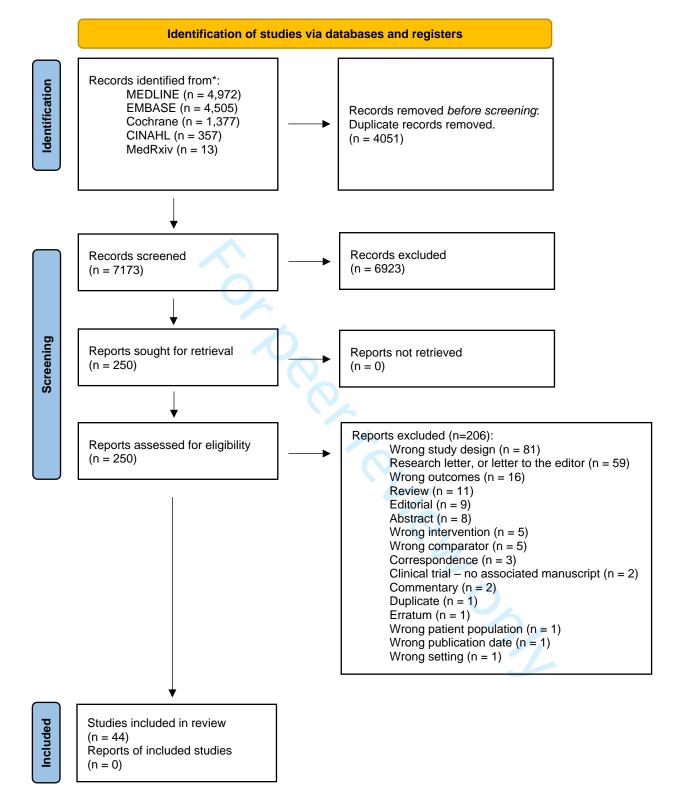


Figure 1. PRISMA Flow diagram of study selection.

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Page 31 of 72	Study E	vents	Total	Agreement Rate (%	) 95% C.L. \	BMJ Op	ben	Study	Total		(anna 95%	C I Weight
$     \begin{array}{c}       1 \\       2 \\       3 \\       4 \\       5 \\       6 \\       7 \\       8 \\       9 \\       10 \\       11 \\       12 \\       13 \\       14 \\       15 \\       16 \\       17 \\       18 \\       19 \\       20 \\       21 \\       22 \\       23 \\       24 \\       25 \\       26 \\       27 \\       28 \\       29 \\       30 \\       31 \\       32 \\       33 \\       34 \\       35 \\       36 \\       37 \\       38 \\       39 \\       40 \\     \end{array} $	Technology = Digital photograp Muir et al. 2011 (B) Sola-Ortigosa et al. 2020 (C) Sola-Ortigosa et al. 2020 (C) Sola-Ortigosa et al. 2020 (C) Sola-Ortigosa et al. 2020 (C) Romero et al. 2010 (A) Romero et al. 2010 (A) Romero et al. 2010 (B) Sola-Ortigosa et al. 2020 (A) Romero et al. 2010 (B) Sola-Ortigosa et al. 2020 (B) Rios-Yuil. 2012 Gatica. 2015 Ribas et al. 2017 Warshaw et al. 2015 (C) Zanini, 2013 Warshaw et al. 2015 (C) Zanini, 2013 Warshaw et al. 2015 (G) Tan et al. 2010 (B) Tan et al. 2010 (A) Romero Aguilera et al. 2014 (A) Romero Aguilera et al. 2014 (A) Romero Aguilera et al. 2014 (B) Muir et al. 2017 Gabel et al. 2021 Gabel et al. 2017 Warshaw et al. 2015 (F) Athieri et al. 2017 (C) Warshaw et al. 2015 (F) Athieri et al. 2017 (C) Warshaw et al. 2015 (C) Zahieri et al. 2017 (C) Warshaw et al. 2015 (C) Marshaw et al. 2015 (C) Catter et al. 2017 (C) Warshaw et al. 2015 (G) Warshaw et al. 2015 (J) Catter et al. 2017 (B) Catter et al. 2017 (B) Catter et al. 2017 (B) Catter et al. 2017 Marchell et al. 2017 Gerhardt et al. 2017 Gerhardt et al. 2017 Marchell et al. 2017 Gerhardt et al. 2017 Marchell et al. 2017 Marchell et al. 2017 Marchell et al. 2017 Marchell et al. 2017 Barcaui et al. 2017 Barcaui et al. 2017 Barcaui et al. 2017 Marchell et al. 2017 Barcaui et al. 2017 Barcaui et al. 2017 Marchell et al. 2017 Barcaui et al. 2017 Barcaui et al. 2017 Barcaui et al. 2017 Barcaui et al. 2017 Combined prevalence Heterogenety: <i>I</i> <sup>2</sup> = 00:334, Technology = Smartphone or ta Zink et al. 2017 Barcaui et al. 2014 Barbaieri et al. 2014 (A) Barbaieri et al. 2014 (A)	$\begin{array}{c} 499\\ 915\\ 912\\ 903\\ 825\\ 150\\ 912\\ 903\\ 826\\ 150\\ 150\\ 142\\ 488\\ 766\\ 570\\ 5566\\ 162\\ 283\\ 124\\ 488\\ 766\\ 162\\ 27\\ 331\\ 124\\ 488\\ 766\\ 162\\ 27\\ 331\\ 124\\ 488\\ 766\\ 162\\ 27\\ 3357\\ 93\\ 311\\ 5566\\ 162\\ 27\\ 3357\\ 93\\ 311\\ 27\\ 3367\\ 93\\ 311\\ 27\\ 3367\\ 93\\ 311\\ 27\\ 39\\ 336\\ 124\\ 488\\ 81\\ 330\\ 291\\ 124\\ 473\\ 301\\ 11\\ 194\\ 473\\ 301\\ 291\\ 124\\ 325\\ 77\\ 39\\ 81\\ 36\\ 301\\ 291\\ 124\\ 473\\ 301\\ 291\\ 124\\ 473\\ 301\\ 291\\ 124\\ 473\\ 301\\ 291\\ 124\\ 473\\ 301\\ 211\\ 124\\ 473\\ 301\\ 211\\ 124\\ 473\\ 301\\ 211\\ 124\\ 473\\ 301\\ 211\\ 124\\ 473\\ 301\\ 211\\ 124\\ 473\\ 301\\ 211\\ 124\\ 473\\ 301\\ 211\\ 124\\ 473\\ 301\\ 211\\ 124\\ 473\\ 301\\ 211\\ 124\\ 473\\ 301\\ 111\\ 124\\ 473\\ 301\\ 211\\ 124\\ 473\\ 301\\ 211\\ 124\\ 473\\ 301\\ 211\\ 124\\ 473\\ 301\\ 211\\ 124\\ 473\\ 301\\ 211\\ 124\\ 473\\ 301\\ 211\\ 124\\ 473\\ 301\\ 211\\ 124\\ 473\\ 301\\ 211\\ 124\\ 473\\ 301\\ 211\\ 124\\ 473\\ 301\\ 211\\ 124\\ 473\\ 301\\ 211\\ 124\\ 473\\ 301\\ 211\\ 124\\ 422\\ 372\\ 666\\ 311\\ 323\\ 444\\ 422\\ 372\\ 426\\ 426\\ 426\\ 426\\ 426\\ 426\\ 426\\ 42$	50 1000 1000 1000 368 170 130 1000 368 170 125 174 174 174 174 174 1752 219 385 170 173 1752 219 385 170 101 152 152 152 152 152 152 152 152 1020 1034 79 70	915 912 903 903 903 903 903 903 903 903 903 903	0 [87.12; 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47			Primary diagnosis agreeme	IIL-FZF VS. ID								

Study	Events	Total		Agreement Rate (%)	95% C.I.	Weight	BMJ Open	Study	Total		Kappa	95% C.I.	Weigh
Technology = Digital photogra Muir et al, 2011 (B)	49	50	_		[87.12; 99.72]			Technology = Digital photog Muir et al, 2011 (B)	60	-		[ 0.89; 0.96]	
Sola-Ortigosa et al, 2020 (D) Sola-Ortigosa et al, 2020 (E)		1000 1000	+		[89.60; 93.08] [89.28; 92.80]	1.8% 1.9%		Sola-Ortigosa et al, 2020 (D)	636	+		[0.90; 0.92]	2.39
Sola-Ortigosa et al, 2020 (F)	903		+		[88.30; 91.99]	1.9%		Sola-Ortigosa et al, 2020 (E) Sola-Ortigosa et al, 2020 (C)	636 636			[0.88; 0.91]	2.37
Sola-Ortigosa et al, 2020 (C)	884	1000	-		[86.26; 90.24]	2.0%		Sola-Ortigosa et al, 2020 (F)	636	+		[0.87; 0.91]	2.39
Romero et al, 2010 (A) Romero Aguilera et al, 2014 (C)	325 150	368 170			[84.61; 91.22] [82.47; 92.28]	1.4% 0.9%		Sola-Ortigosa et al, 2020 (A)	636	+		[0.85; 0.89]	2.39
Rubegni et al, 2011	114	130	-		[80.85; 92.32]	0.8%		Rubegni et al, 2011 Senel, et al, 2013 (D)	130 150			[0.81; 0.90]	2.29
Sola-Ortigosa et al, 2020 (A)	875			87.50	[85.30; 89.41]	2.0%		Senel, et al, 2013 (C)	150			[0.80; 0.89]	2.29
Romero et al, 2010 (B)	314 835	368 1000			[81.33; 88.59] [81.07: 85.67]	1.6% 2.1%		Sola-Ortigosa et al, 2020 (B)	636			[ 0.80; 0.85]	2.39
Sola-Ortigosa et al, 2020 (B) Rios-Yuil, 2012	25	30			[65.68; 92.89]	0.3%		Ribas et al, 2010 Senel, et al, 2013 (A)	174 150			[0.74; 0.85]	2.29
Gatica, 2015	103	125	-	82.40	[74.71; 88.12]	1.0%		Senel, et al, 2013 (A)	150			[0.67; 0.83]	2.2
Ribas et al, 2010 Saleh et al, 2017	142 488	174 600			[75.15; 86.69] [78.01; 84.25]	1.2% 1.9%		Piccoli, et al, 2014	184	-		[0.61; 0.76]	
Warshaw et al, 2015 (C)	548	684			[76.96; 82.94]	2.0%		Rios-Yuil, 2012 Warshaw et al, 2015 (C)	30 2152			[0.38; 0.82]	1.99 2.39
Zanini, 2013	76	100	-		[66.68; 83.36]	1.0%		Clarke et al, 2021	206			[0.50; 0.68]	2.2
Warshaw et al, 2015 (A) Warshaw et al, 2015 (B)	570 566	753 752			[72.50; 78.63] [72.06; 78.22]	2.1% 2.1%		Altieri et al, 2017 (C)	232			[ 0.48; 0.65]	2.39
Tan et al, 2010 (B)	162	219		73.97	[67.76; 79.35]	1.5%		Warshaw et al, 2015 (A) Warshaw et al, 2015 (B)	2152 2152			[0.53; 0.59] [0.53; 0.59]	2.39
Tan et al, 2010 (A)	283	385	=	73.51	[68.87; 77.68]	1.8%		Saleh et al, 2017	600	-		[0.46; 0.58]	2.3
Romero Aguilera et al, 2014 (A) Romero Aguilera et al, 2014 (B)	124 123	170 170			[65.77; 79.08] [65.16; 78.55]	1.4% 1.4%		Warshaw et al, 2015 (F)	2152		0.52	[0.49; 0.55]	2.39
Muir et al, 2011 (A)	43	60			[59.06; 81.60]	0.7%		Altieri et al, 2017 (A) Altieri et al, 2017 (B)	232 232			[0.41; 0.60] [0.41; 0.60]	2.3° 2.3°
Vano-Galvan et al, 2011	1381	2000	+		[66.99; 71.04]	2.4%		Warshaw et al, 2015 (E)	2152			[0.41, 0.60]	
Clarke et al, 2021 Gabel et al, 2021	205 27	308 41		66.56 65.85	[61.10; 71.61] [50.28; 78.62]	1.8% 0.6%		Warshaw et al, 2015 (D)	2152		0.44	[0.41; 0.47]	2.3
Warshaw et al, 2015 (F)	357	595	-	60.00	[56.01; 63.86]	2.1%		Muir et al, 2011 (A)	60			[0.19; 0.61]	2.19
Altieri et al, 2017 (A)	93	160			[50.35; 65.52]	1.4%		Warshaw et al, 2015 (G) Warshaw et al, 2015 (H)	2152 2152			[0.34; 0.42]	2.39
Patro et al, 2015 Warshaw et al, 2015 (E)	115 348	206 652			[48.98; 62.46] [49.53; 57.18]	1.6% 2.2%		Warshaw et al, 2015 (J)	2152	<b>—</b>	0.37	[0.33; 0.41]	2.39
Altieri et al, 2017 (B)	81	152			[45.34; 61.07]	1.4%		Gabel et al, 2021	41 -			[0.02; 0.58]	2.09
Warshaw et al, 2015 (D)	344	651			[49.00; 56.65]	2.2%		Warshaw et al, 2015 (I) Random effects model	2152 28117			[0.28; 0.36]	2.39
Altieri et al, 2017 (C) Warshaw et al, 2015 (G)	80 300	152 583			[44.69; 60.44] [47.40; 55.50]	1.4% 2.1%		Heterogeneity: $I^2 = 99\%$ , $\tau^2 = 0.1$					
Warshaw et al, 2015 (B) Warshaw et al, 2015 (H)	291	579			[46.19; 54.32]	2.1%		To show the second black Manufacture					
Warshaw et al, 2015 (J)	511	1020			[47.03; 53.16]	2.3%		Technology = Not Mentione Gonzalez-Coloma, 2019	326		0.50	[0.41; 0.58]	2.3
Chen et al, 2010 Warshaw et al, 2015 (I)	194 473	405 1034			[43.07; 52.77] [42.73; 48.79]	2.0% 2.3%		Random effects model	326	-		[ 0.41; 0.58]	
Carter et al, 2017 (B)	30	79	_ <b>_</b>		[27.99; 49.09]	1.0%		Heterogeneity: not applicable					
Carter et al, 2017 (A)	11		-		[7.88; 23.42]	0.6%		Technology = Smartphone of	or tablet				
Combined prevalence Heterogeneity: $I^2 = 98\%$ , $\tau^2 = 0.033$	14370 :	20004	*	71.72	[70.25; 73.14]	64.4%		Goulart-Silveira, et al, 2019	39			[0.92; 0.98]	2.09
Theterogeneity: 7 = 50 %, 1 = 0.000	τ, <i>p</i> = 0							Nami et al, 2015	391			[0.89; 0.92]	2.39
Technology = Not Mentioned			_	70.04				Giavina-Bianchi et al, Oct 2020 Lamel et al, 2012	86			[0.74; 0.75]	2.39
Marchell et al, 2017 Marchell et al, 2017	77 162				[66.99; 83.53] [69.87; 81.31]	1.0% 1.4%		Azfar et al, 2014 (B)	76	<b>_</b> _		[0.32; 0.66]	2.19
Gerhardt et al, 2021	609	809	-	75.28	[72.19; 78.13]	2.1%		Borve et al, 2013 (B)	62 62			[0.26; 0.65]	2.19
Marchell et al, 2017	81	112			[63.33; 79.81]	1.1%		Borve et al, 2013 (A) Keller et al, 2020 (B)	100			[0.25; 0.64]	2.19
Batalla, 2016 Combined prevalence	36 965	65 1300	•		[43.22; 66.94] [68.10; 76.97]	0.9% 6.5%		Azfar et al, 2014 (C)	76		0.43	[0.23; 0.60]	2.19
Heterogeneity: $I^2 = 68\%$ , $\tau^2 = 0.033$					[00110, 10101]			Azfar et al, 2014 (A)	76			[0.20; 0.58]	2.19
Taskaslama Creatiskana an	- blat							Keller et al, 2020 (A) Giavina-Bianchi et al, Nov 2020	100	+		[0.22; 0.55] [0.20; 0.23]	2.29
Technology = Smartphone or Zink et al, 2017, Sept (B)	24	26		92.31	[73.93; 98.07]	0.1%		Random effects model	42511			[ 0.38; 0.78]	
Nami et al, 2015	356	391		91.05	[87.79; 93.50]	1.3%		Heterogeneity: $I^2 = 100\%$ , $\tau^2 = 0$ .	2307, p = 0				
Barcaui et al, 2018 Giavina-Bianchi et al, Oct 2020	37 576	41 739			[76.73; 96.29] [74.81; 80.79]	0.3% 2.1%		Random effects model	70954	-	0.67	[ 0.60; 0.74]	100.09
Borve et al, 2012 (A)	31	40			[62.12; 87.86]	0.5%		Heterogeneity: $I^2 = 100\%$ , $\tau^2 = 0$ .			Т	- / -	
Borve et al, 2012 (B)	31	40			[62.12; 87.86]	0.5%				0.2 0.4 0.6 0.8 nosis agreement - F2F	1 ve TD		
Tran et al, 2011 Duong et al, 2014 (A)	23 44	30 68		76.67 64.71	[58.50; 88.45] [52.72; 75.09]	0.4% 0.9%			r ninary diag	nosis agreement - 1 zi	V3. 1D		
Barbieri et al, 2014 (A)	32	50			[49.95; 76.00]	0.7%							
Vestergaard et al, 2020 (A)	372		<b>=</b>		[58.05; 65.80]	2.1%							
Lamel et al, 2012 Giavina-Bianchi et al, Nov 2020	66 490	107 803			[52.16; 70.39] [57.60; 64.34]	1.2% 2.2%							
Vestergaard et al, 2020 (B)	361	600			[56.19; 64.01]	2.2%							
Zink et al, 2017, July (A)	115	195	-	58.97	[51.94; 65.66]	1.6%							
Azfar et al, 2014 (B) Bonio et al. 2013 (B)	77	136			[48.18; 64.69]	1.3%							
Borve et al, 2013 (B) Barbieri et al, 2014 (B)	39 28	69 50			[44.68; 67.66] [42.13; 68.99]	0.9% 0.7%							
Borve et al, 2013 (A)	38	69		55.07	[43.27; 66.33]	0.9%							
Okita et al, 2016	54	100			[44.20; 63.50]	1.2%							
Keller et al, 2020 (B) Azfar et al, 2014 (C)	28 66	53 136			[39.51; 65.76] [40.25; 56.89]	0.8% 1.4%							
Azfar et al, 2014 (C)	63	136	-		[38.12; 54.73]	1.4%							
Keller et al, 2020 (A)	24	53	_	45.28	[32.52; 58.70]	0.8%							
1 1 0 0 0 1	183 12	528 37			[30.72; 38.82] [19.43; 48.86]	2.0% 0.5%							
Jones et al, 2021 Costello et al. 2020		110			[19.43, 40.00] [22.99; 40.13]	1.1%							
Costello et al, 2020	34	110											
Costello et al, 2020 Duong et al, 2014 (B) Combined prevalence	3204	5207	•		[57.19; 62.30]	29.0%							
Costello et al, 2020 Duong et al, 2014 (B)	3204	5207	•		[57.19; 62.30]	29.0%							

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# **Supplementary Online Content**

Title: Diagnostic Reliability in Teledermatology: A Systematic Review and Meta-Analysis

### Authors

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# Supplementary eMethods

## Search Strategy

The search strategy was written for Ovid Medline and translated using each database's syntax, controlled vocabulary, and search fields. MeSH terms, Emtree terms, and free text words were used for teledermatology and skin conditions such as melanoma and related synonyms. To identify additional articles not captured through the aforementioned search, a manual search was conducted via reference search of the included studies.

All database records were downloaded to EndNote X9 (Clarivate) and uploaded to web-based software for deduplication, screening, and full-text evaluation (Covidence; Veritas Health Innovation). We contacted three study authors to gain access to their published work.<sup>1-3</sup> The search strategy is available below.

## **Ovid MEDLINE Search**

Ovid MEDLINE(R) and Epub Ahead of Print, In-Process, In-Data-Review & Other Non-Indexed Citations and Daily <1946 to 2022 May 02>

17	36	<194	6 to 2022 May 02>
18	37		
19	38	1	e consult*.mp. 322
20	39	2	econsult*.mp. 218
21	40	3	electronic consult*.mp. 366
22	41	4	e health.mp. 4095
23	42	5	ehealth.mp. 6823
24	43	6	e visit*.mp. 88
25	44	7	evisit*.mp. 26
26	45	8	home video visit*.mp. 4
20	46	9	internet/ or internet-based intervention/ 82046
	47	10	internet.mp. 128675
28	48	11	offsite care.mp. 4
29	49	12	off site care.mp. 9
30	50	13	ontario telemedicine network.mp. 19
31	51	14	Remote Consultation/ 5689
32	52	15	remote consultation*.mp. 6406
33	53	16	remote visit*.mp. 95
34	54	17	tele care.mp. 40
35	55	18	telecare.mp. 945
36	56	19	offsite care.mp. 4 off site care.mp. 9 ontario telemedicine network.mp. 19 Remote Consultation/ 5689 remote consultation*.mp. 6406 remote visit*.mp. 95 tele care.mp. 40 telecare.mp. 945 tele consult*.mp. 208 teleconsult*.mp. 2208
37	57	20	teleconsult*.mp. 2208
38	58	21	remote visit*.mp. 95 tele care.mp. 40 telecare.mp. 945 tele consult*.mp. 208 teleconsult*.mp. 2208 tele diagnos*.mp. 46 telehealth.mp. 13222 tele health.mp. 287 telemedicine/36763 telemedicine.mp. 47751 tele medicine.mp. 197
39	59	22	telehealth.mp. 13222
40	60	23	tele health.mp. 287
41	61	24	telemedicine/36763
42	62	25	telemedicine.mp. 47751
43	63	26	tele medicine.mp. 197
44	64	27	telemonitor*.mp. 2380
45	65	28	tele monitor*.mp. 209
46	66	29	Telepathology/ 918
47	67	30	telepatholog*.mp. 1223
48	68	31	tele patholog*.mp. 25
49	69	32	telepractice*.mp. 276
50	70	33	tele practice*.mp. 16
51	71	34	Therapy, Computer-Assisted/ 6969
	72	35	video consult*.mp. 827
52	73	36	videoconsult*.mp. 41
53	74	37	virtual care.mp. 1177
54	75	38	web based.mp. 42402
55	76	39	Telepathology/ 918
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3	77	
	77	40 or/1-39 216985
4	78	41 Dermatology/21077
5	79	42 dermatolog*.mp. 110593
6	80	43 dermatopatholog*.mp. 2990
7	81	44 exp Skin Diseases/di [Diagnosis] 196739
8	82	45 exp Skin Neoplasms/ 142454
9	83	46 skin.mp. 880457
10	84	47 exp Skin Abnormalities/ 34228
	85	48 burns/ or burns, chemical/ or burns, electric/ or sunburn/ 59533
11	86	49 burn*.mp. 141877
12	80 87	1
13		50 wound healing/ or cicatrix/ 127484
14	88	51 wound*.mp. 446154
15	89	52 or/41-51 1580012
16	90	53 40 and 52 7160
17	91	54 teledermatolog*.mp. 1273
18	92	55 tele dermatolog*.mp. 35
19	93	56 54 or 55 1298
	94	57 53 or 56 7448
20	95	58 limit 57 to dt=20100101-20220501 [January 1st, 2010 to May 1st, 2022] 4972
21	96	
22	97	
23	98	Embase Search
24	99	Embase Classic+Embase <1947 to 2021 July 15>
25	100	1 computer assisted therapy/ 4772
26	100	2 e consult*.mp. 411
27	101	
28	102	3 econsult*.mp. 283
		4 electronic consult*.mp. 461
29	104	5 e health.mp. 4440
30	105	6 ehealth.mp. 5099
31	106	7 e visit*.mp. 83
32	107	8 evisit*.mp. 30
33	108	9 home video visit*.mp. 10
34	109	10 internet/ or web-based intervention/ 114861
35	110	11 internet.mp. 143810
36	111	12 offsite care.mp. 5
37	112	13 off site care.mp. 12
38	113	14 ontario telemedicine network.mp. 36
39	114	
	115	<ul> <li>15 remote consultation*.mp. 808</li> <li>16 remote visit*.mp. 79</li> <li>17 tele care.mp. 55</li> <li>18 telecare.mp. 983</li> <li>10 teleconsultation/ 11686</li> </ul>
40	116	17 tele care.mp. 55
41	117	18 telecare.mp. 983
42	118	19 teleconsultation/ 11686
43	119	20 tele consult*.mp. 243
44	120	20 tele consult*.mp. 243 21 teleconsult*.mp. 12352
45	120	21 tele diagnos*.mp. 53
46	121	e i
47		23 telehealth.mp. 15276
48	123	24 tele health.mp. 389
49	124	25 telemedicine/ 31867
	125	26 telemedicine.mp. 38951
50	126	27 tele medicine.mp. 333
51	127	28 telemonitor*.mp. 4838
52	128	29 tele monitor*.mp. 344
53	129	30 Telepathology/ 869
54	130	31 telepatholog*.mp. 1265
55	131	32 tele patholog*.mp. 41
56	132	33 telepractice*.mp. 162
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tele practice\*.mp. 9 video consult\*.mp. 751 videoconsult\*.mp. 54 virtual care.mp. 496 web based.mp. 49157 or/1-38 240118 dermatology/ or cosmetic dermatology/ or pediatric dermatology/ or psychodermatology/ 51419 dermatolog\*.mp. 161210 dermatopatholog\*.mp. 3737 burn/ or burn contracture/ or electric burn/ or face burn/ or hand burn/ or ionizing radiation burn/ or scald/ or sunburn/ 74890 burn\*.mp. 189010 exp skin disease/di [Diagnosis] 209136 exp skin tumor/ 213775 skin\*.mp. 1294867 or/40-47 1665263 39 and 48 7063 teledermatology/ 1295 tele dermatolog\*.mp. 42 teledermatolog\*.mp. 1798 50 or 51 or 52 1812 49 or 53 8004 limit 54 to (books or chapter or conference abstract or conference paper or "conference review") 1828 54 not 55 6176 limit 56 to yr="2010 -Current" 4505 **Cochrane Search** EBM Reviews - Cochrane Database of Systematic Reviews <2005 to July 14, 2021> EBM Reviews - ACP Journal Club <1991 to June 2021> EBM Reviews - Database of Abstracts of Reviews of Effects <1st Quarter 2016> EBM Reviews - Cochrane Clinical Answers < June 2021> EBM Reviews - Cochrane Central Register of Controlled Trials <June 2021> EBM Reviews - Cochrane Methodology Register <3rd Quarter 2012> EBM Reviews - Health Technology Assessment <4th Quarter 2016> EBM Reviews - NHS Economic Evaluation Database <1st Quarter 2016> e consult\*.mp. 44 econsult\*.mp. 22 electronic consult\*.mp. 29 e health.mp. 617 ehealth.mp. 766 e visit\*.mp. 14 evisit\*.mp. 1 home video visit\*.mp. 3 internet/ or internet-based intervention/ 4,275 10 internet.mp. 15,059 offsite care.mp. 2 off site care.mp. 2 ontario telemedicine network.mp. 7 Remote Consultation/ 460 remote consultation\*.mp. 551 remote visit\*.mp. 17 tele care.mp. 34 telecare.mp. 249 tele consult\*.mp. 59 teleconsult\*.mp. 822 tele diagnos\*.mp. 4 telehealth.mp. 2,308 tele health.mp. 128 

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3	189	24 telemedicine/ 2,617
4	190	25 telemedicine.mp. 4,819
5	191	26 tele medicine.mp. 57
6	192	27 telemonitor*.mp. 1,236
7	193	28 tele monitor*.mp. 115
8	194	29 Telepathology/ 8
9	195	30 telepatholog*.mp. 22
10	196	31 tele patholog*.mp. 2
11	197	32 telepractice*.mp. 37
12	198	33 tele practice*.mp. 0
13	199 200	<ul> <li>34 Therapy, Computer-Assisted/ 1,391</li> <li>35 video consult*.mp. 117</li> </ul>
14	200	36 videoconsult*.mp. 8
15	201	37 virtual care.mp. 31
16	202	38 web based.mp. 9,110
17	204	39 Telepathology/ 8
18	205	40 or/1-39 29,268
19 20	206	41 Dermatology/ 124
20 21	207	42 dermatolog*.mp. 10,838
21	208	43 dermatopatholog*.mp. 80
22	209	44 exp Skin Diseases/di [Diagnosis] 630
23	210	45 exp Skin Neoplasms/ 1,738
25	211	46 skin.mp. 67,534
26	212 213	47 exp Skin Abnormalities/ 269
27	213	<ul> <li>48 burns/ or burns, chemical/ or burns, electric/ or sunburn/ 1,779</li> <li>49 burn*.mp. 12,780</li> </ul>
28	214	50 wound healing/ or cicatrix/ 5,677
29	216	50       wound healing/ or cicatrix/ 5,677         51       wound*.mp. 35,982         52       or/41-51 110,390         53       40 and 52 1,622         54       teledermatolog*.mp. 149         55       tele dermatolog*.mp. 20         56       54 or 55 151         57       53 or 56 1,684         58       limit 57 to yr="2010 -Current" 1,377
30	217	52 or/41-51 110,390
31	218	53 40 and 52 1,622
32	219	54 teledermatolog*.mp. 149
33	220	55 tele dermatolog*.mp. 20
34	221	56 54 or 55 151
35	222	57 53 or 56 1,684
36	223	58 limit 57 to yr="2010 -Current" 1,377
37	224	
38	225 226	CINAHL Search
39	220 227	Searched keyword teledermatology and set limit to yr="2010-Current" 357
40	228	MedRxiv Search
41	229	Searched keyword teledermatology and set limit to yr="2010-Current" 13
42	$\bar{2}\bar{3}\bar{0}$	Searched Rey word terederinatorogy and set mint to yr 2010 Carron 15
43	231	Eligibility Criteria
44	232	Inclusion and exclusion criteria are summarized in eTable 2.
45	233	
46	234	Data Selection and Extraction
47 48	235	Information extracted from full-text articles is summarized in eTable 3.
48 49	236	
49 50	237 238	Data Analysis and Synthesis
50	238 239	In this study, a letter was assigned to each unique study grouping as explained in <b>eTable 4</b> . For both the percentage of agreement and kappa values, forest plots, the I <sup>2</sup> index, and the $\tau^2$ statistic were used in combination to investigate
52	239 240	statistical heterogeneity.
53	240	suusiou noorogonony.
54	242	Cohen's kappa values for diagnostic concordance between teledermatology and F2F physicians were interpreted based
55	243	on the following criteria. <sup>4</sup> Values between 0–.20 indicate no agreement, .21–.39 minimal agreement, .40–.59 weak
56	244	agreement, .6079 moderate agreement, .8090 strong agreement, and above .90 almost perfect agreement.
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60		For peer review only - http://bmiopen.bmi.com/site/about/auidelines.xhtml

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245 246 Sub-group analysis included different skin conditions, specialization of the F2F physician, whether staff were trained 247 on image acquisition, the technology used for image acquisition, the use of teledermoscopy, studies conducted pre- or 248 post-pandemic, and the risk of bias. Confounding factors, such as technology type, year of publication, and training 249 of study raters, were controlled using meta-regression. 250

251 Proportions meta-analysis looked at weighted averages, and 95% confidence intervals were reported. Publication bias 252 was not statistically pursued due to the substantial heterogeneity observed, in addition to the authors' decision to pursue 253 a meta-analysis of proportions.

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### 254 Supplementary eResults

Our analysis incorporated forty-four relevant studies. Key study and participant details are summarized in eTable 1,
 with a concise overview provided in the main text. Articles excluded based on our criteria are listed in eTable 5.

## 259 Diagnostic reliability of teledermatology when compared to F2F (specialist and non-specialists) evaluation

260 Of the 40 studies that reported diagnostic agreement rates there were 72 unique comparisons made between F2F and 261 teledermatology.<sup>5-44</sup> **eFigure 1A** shows that the mean percentage agreement of 68.9% (CI 64.4%-73.1%) ranged from 262 14% to 98%, where 35/72 had percentage agreement above 70% and 7 studies had over 90% agreement. The studies 263 were heterogeneous (I^2=98%, p <0).

Of the 21 studies that reported concordance values, there were 45 unique comparisons made.  ${}^{5\,6\,11\,14\,17\,20-25\,28\,29\,32-34\,45-}$   ${}^{49}$  **eFigure 1B** shows that the mean diagnostic concordance of 0.67 (CI 0.60 to 0.74) ranged from 0.213 (CI 0.20 to 0.23) to 0.96 (CI 0.92 to 0.98), with 21 studies (47%) having moderate agreement (k=0.6 and above), and 13 (29%) studies having strong agreement. The studies were heterogeneous (I^2=100%, p <0.001).

# Diagnostic agreement between teledermatologist and teledermatologist, F2F and F2F, and teledermatology and histopathology

Of the ten studies that reported diagnostic agreement rates between telermatologists, there were 17 unique comparisons made between F2F and teledermatology consults. **eFigure 2A** shows the mean percentage agreement of 76.4% (CI 69% to 82.5%) ranged from 37% to 91.5%, with 10/17 having percentage agreement above 70% and two studies having over 90% agreement. The studies were heterogeneous (I^2=97%, p <0.001).

From four studies that reported diagnostic agreement rates between F2F dermatologists there were 6 unique comparisons. **eFigure 2B** shows that the mean percentage agreement 82.4% (CI 76.7%-87.0%) ranged from 75.5% to 91%. The studies were heterogeneous (I^2=68%, p <0.001).

Five studies compared teledermatology to histopathology data, and there were six unique comparisons. **eFigure 2C** shows that the mean percentage agreement of 55.7% (CI 53% to 58.4%) ranged from 53.8% to 65.4%. The mean agreement rate between histopathology and teledermatology was 55.7% (CI 53.0 to 58.4). The studies were homogeneous (I^2=0%, p = 0.49).

### Subgroup analyses

### 288 Diagnostic reliability of teledermatology vs F2F specialist and non-specialist

Within the same modality, eFigure 3A shows that teledermatologists had a diagnostic agreement rate of 70.96% (CI 69.8% to 72.1%) with F2F dermatologists, while the agreement rate with F2F non-specialists was 44.1% (CI 39.9% to 48.4%). Comparing telermatologists to non-specialists showed significantly lower agreement among non-specialists  $(p < 0.001, heterogeneity: I^2 = 98\%)$ . Among 35 studies reporting diagnostic agreement rates, 44 out of 64 comparisons between teledermatology and F2F dermatologists had a percentage agreement above 60%, with seven studies reporting over 90% agreement. The mean kappa concordance value for diagnostic agreement between teledermatology and F2F dermatologists shown in eFigure 3B was 0.69 (CI 0.60 to 0.75). Additionally, telermatologists had a mean concordance value of 0.52 (CI 0.25 to 0.71) when compared to non-specialists. Non-specialists showed significantly lower diagnostic concordance compared to dermatologists for F2F vs. teledermatology (p = 0.031, heterogeneity: I<sup>2</sup> = 100%). Moreover, studies comparing teledermatologists to F2F and teledermatology to histopathology showed a range of agreement rates, with heterogeneity observed in the former  $(I^2)$ = 97%, p < 0.001) and homogeneity in the latter (I^2 = 0\%, p = 0.49). 

# 303 Diagnostic reliability of teledermatology vs F2F by the inclusion of teledermoscopy in both teledermatology 304 and F2F assessments

Overall, twelve studies with 22 unique comparisons used teledermoscopy for diagnosing suspicious lesions.<sup>8</sup> <sup>11</sup> <sup>15</sup> <sup>29</sup> <sup>32</sup>
 Overall, twelve studies with 22 unique comparisons used teledermoscopy for diagnosing suspicious lesions.<sup>8</sup> <sup>11</sup> <sup>15</sup> <sup>29</sup> <sup>32</sup>
 <sup>34</sup> <sup>38</sup> <sup>39</sup> <sup>42</sup> <sup>44</sup> eFigure 4A shows that with teledermoscopy, the mean diagnostic agreement rates was 69.1% (CI 66.8% to
 71.4%), and this percentage ranged between from 31.6% to 92.3%. Without the use of teledermoscopy, the mean agreement rate was 68.3% (CI 66.8% to 69.8%). The means were not significantly different between the two groups and the studies were heterogeneous (I<sup>2</sup>=97%, p<0.001). eFigure 4B shows concordance values of seven studies that</li>

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310 adapted teledermoscopy had a mean of 0.71 (CI 0.58 to 0.80).<sup>11 29 32 34 39 47 48</sup> Without teledermoscopy, the mean was 311 0.65 (CI 0.54 to 0.74). This difference was not statistically significant, and the studies were heterogeneous (I^2=100%, 312 p<0.001).

### 314 Diagnostic reliability of teledermatology vs F2F by the inclusion of lesion category

Twenty-six studies with 39 unique comparisons reporting percentage agreement rates that were inclusive to all lesion types as shown in e**Figure 5A.**<sup>5-10</sup> 15-19 22 24-26 28-33 36 37 40 41 43</sup> The mean percentage agreement was 69.9% (CI 67.9% to 71.7%) and ranged from 30.9% to 98%, with the majority (26/39) having percentage agreement above 60% and 4 studies having over 90%. Eleven studies only looked at suspicious lesions,<sup>11</sup> 12 14 20 23 34 35 38 39 42 44 and the mean percentage agreement was 68.1% (CI 66.3% to 69.8%). Three studies excluded skin cancers<sup>13</sup> 21 27</sup> and the mean percentage agreement was 62.2% (CI 56.2% to 67.8%). No statistical significance could be identified between the three lesion groups and the studies were heterogeneous (I^2=98%, p<0.001).

Concordance values for studies inclusive to all lesions seen in **eFigure 5B** were reported in ten studies with a mean of 0.62 (CI 0.48 to 0.74).<sup>5 6 17 22 24 25 28 29 32 33</sup> Six studies that looked at cancerous skin lesions only reported a mean of 0.70 (CI 0.59 to 0.78).<sup>11 14 20 23 34 39</sup> Only one study that looked at all lesions except cancerous ones reported a concordance value.<sup>22</sup> No statistical significance could be identified between the three lesion groups and the studies were heterogeneous (I^2=100%, p<0.001).

### Diagnostic reliability of teledermatology vs F2F by pre- and post-pandemic timelines

When comparing telermatologists to all F2F physicians, the average agreement rate was 65.5% (CI 64.0-66.9) for prepandemic studies, and 75.3% (CI 73.4% to 77.2%) for studies published after January 2020. When the percentage agreements were compared between the two groups, they were not statistically significant (p = 0.421) and also heterogeneous (I^2=98%, p<0.001). eTable not included.

### Risk of bias and quality assessment

The QUADAS-2 framework was utilized to evaluate bias and applicability across four essential domains, ensuring that our conclusions are both accurate and applicable to real-life clinical situations. eTable 6A summarizes the QUADAS-2 criteria tailored to this study.

The results of quality assessment for risk of bias and applicability in individual studies are displayed in. **eTable 6B**-**E.** Six of the studies had low risk of bias, nine had moderate risk, and 29 had high-risk of bias. There were no systematic differences between the results of studies that attempted to reduce risk of bias, compared with those with higher risk of bias. The mean diagnostic agreement rate between F2F and teledermatology was 66.4% (CI 62.4% to 70.1%) for low risk, and 69.1% (CI 67.6% to 70.6%) for high risk (p = 0.932). When the percentage agreements were compared between groups, they were heterogeneous (I^ 2=98%, p<0.001). eTable not included.

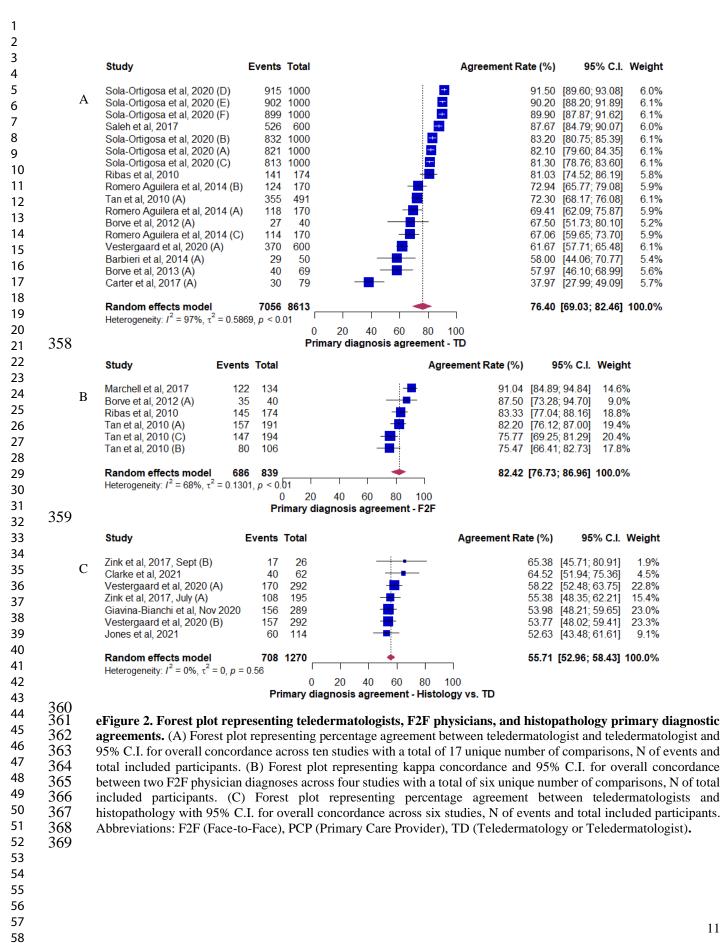
		Study	Events	Total		Agreement Rate (%)	95% C.I.	Weigh
		Muir et al, 2011 (B)	49	50	i —	98.00	[87.12; 99.72]	0.6%
	A	Zink et al, 2017, Sept (B)	24	26	<b>_</b>	92.31	[73.93; 98.07]	0.8%
		Sola-Ortigosa et al, 2020 (D)	915 912	1000 1000	+		[89.60; 93.08]	1.5%
		Sola-Ortigosa et al, 2020 (E) Nami et al, 2015	356	391			[89.28; 92.80] [87.79: 93.50]	1.5% 1.4%
		Sola-Ortigosa et al, 2020 (F)	903	1000	<b>—</b>	90.30		1.59
		Barcaui et al, 2018	37	41			[76.73; 96.29]	1.19
		Sola-Ortigosa et al, 2020 (C) Romero et al, 2010 (A)	884 325	1000 368		88.40 88.32	[86.26; 90.24] [84.61; 91.22]	1.5% 1.4%
		Romero Aguilera et al, 2014 (C)	150	170			[82.47; 92.28]	1.49
		Rubegni et al, 2011	114	130		87.69		1.49
		Sola-Ortigosa et al, 2020 (A) Romero et al, 2010 (B)	875 314	1000 368			[85.30; 89.41] [81.33; 88.59]	1.5% 1.4%
		Sola-Ortigosa et al, 2020 (B)	835	1000			[81.07; 85.67]	1.47
		Rios-Yuil, 2012	25	30			[65.68; 92.89]	1.19
		Gatica, 2015	103	125			[74.71; 88.12]	1.49
		Ribas et al, 2010 Saleh et al, 2017	142 488	174 600			[75.15; 86.69] [78.01; 84.25]	1.49 1.59
		Warshaw et al, 2015 (C)	548	684	<b>—</b>		[76.96; 82.94]	1.5%
		Giavina-Bianchi et al, Oct 2020	576	739			[74.81; 80.79]	1.5%
		Borve et al, 2012 (A) Borve et al, 2012 (B)	31 31	40 40			[62.12; 87.86] [62.12; 87.86]	1.2% 1.2%
		Tran et al, 2011	23	30			[58.50; 88.45]	1.29
		Marchell et al, 2017	77	101			[66.99; 83.53]	1.49
		Marchell et al, 2017	162	213			[69.87; 81.31]	1.49
		Zanini, 2013 Warshaw et al, 2015 (A)	76 570	100 753			[66.68; 83.36] [72.50; 78.63]	1.49 1.59
		Gerhardt et al, 2021	609	809			[72.19; 78.13]	1.5%
		Warshaw et al, 2015 (B)	566	752	<b>—</b>		[72.06; 78.22]	1.5%
		Tan et al, 2010 (B) Tan et al, 2010 (A)	162 283	219 385			[67.76; 79.35] [68.87; 77.68]	1.49 1.59
		Romero Aguilera et al, 2014 (A)	124	170			[65.77; 79.08]	1.49
		Romero Aguilera et al, 2014 (B)	123	170		72.35	[65.16; 78.55]	1.49
		Marchell et al, 2017	81	112			[63.33; 79.81]	1.49
		Muir et al, 2011 (A) Vano-Galvan et al, 2011	43 1381	60 2000			[59.06; 81.60] [66.99; 71.04]	1.39 1.59
		Clarke et al, 2021	205	308			[61.10; 71.61]	1.5%
		Gabel et al, 2021	27	41			[50.28; 78.62]	1.3%
		Duong et al, 2014 (A) Barbieri et al, 2014 (A)	44 32	68 50			[52.72; 75.09] [49.95; 76.00]	1.4% 1.3%
		Vestergaard et al, 2020 (A)	372	600			[58.05; 65.80]	1.5%
		Lamel et al, 2012	66	107			[52.16; 70.39]	1.4%
		Giavina-Bianchi et al, Nov 2020 Vestergaard et al, 2020 (B)	490 361	803 600	<b></b>		[57.60; 64.34] [56.19; 64.01]	1.5% 1.5%
		Warshaw et al, 2015 (F)	357	595			[56.01; 63.86]	1.5%
		Zink et al, 2017, July (A)	115	195	-	58.97	[51.94; 65.66]	1.49
		Altieri et al, 2017 (A) Azfar et al, 2014 (B)	93 77	160 136			[50.35; 65.52] [48.18; 64.69]	1.4% 1.4%
		Borve et al, 2013 (B)	39	69			[44.68; 67.66]	1.49
		Barbieri et al, 2014 (B)	28	50			[42.13; 68.99]	1.39
		Patro et al, 2015	115	206			[48.98; 62.46]	1.49
		Batalla, 2016 Borve et al, 2013 (A)	36 38	65 69			[43.22; 66.94] [43.27; 66.33]	1.49 1.49
		Okita et al, 2016	54	100	_ <b>_</b>		[44.20; 63.50]	1.49
		Warshaw et al, 2015 (E)	348	652			[49.53; 57.18]	1.5%
		Altieri et al, 2017 (B) Warshaw et al, 2015 (D)	81 344	152 651			[45.34; 61.07] [49.00; 56.65]	1.4% 1.5%
		Keller et al, 2020 (B)	28	53	<b>-</b>		[39.51; 65.76]	1.39
		Altieri et al, 2017 (C)	80	152			[44.69; 60.44]	1.49
		Warshaw et al, 2015 (G) Warshaw et al, 2015 (H)	300 291	583 579			[47.40; 55.50] [46.19; 54.32]	1.59 1.59
		Warshaw et al, 2015 (J)	511	1020	-		[47.03; 53.16]	1.59
		Azfar et al, 2014 (C)	66	136	_ <b>_</b>	48.53	[40.25; 56.89]	1.49
		Chen et al, 2010	194	405	<b>**</b>		[43.07; 52.77]	1.5%
		Azfar et al, 2014 (A) Warshaw et al, 2015 (I)	63 473	136 1034			[38.12; 54.73] [42.73; 48.79]	1.4% 1.5%
		Keller et al, 2020 (A)	24	53	_ <b>_</b>		[32.52; 58.70]	1.3%
		Carter et al, 2017 (B)	30	79	<b></b>	37.97	[27.99; 49.09]	1.4%
		Jones et al, 2021	183	528			[30.72; 38.82]	1.5%
		Costello et al, 2020 Duong et al, 2014 (B)	12 34	37 - 110	<b>-</b>		[19.43; 48.86] [22.99; 40.13]	1.3% 1.4%
		Carter et al, 2017 (A)	11	79 -			[7.88; 23.42]	1.3%
		Random effects model Heterogeneity: $I^2 = 98\%$ , $\tau^2 = 0.719$	<b>18539</b>	26511		68.87	[64.36; 73.05]	100.0%
		neterogeneity. 1 - 96%, τ = 0.719	a, p - 0	0 2	0 40 60 80 10	0		
					nosis agreement - F2F			

2								
3								
4		Study	Total		Kappa	95% C.I.	Weight	
5		Coulart Silvaira, et al. 2010	39		0.06	10 02: 0 091	2.00/	
6	В	Goulart-Silveira, et al, 2019 Muir et al, 2011 (B)	59 60			[0.92; 0.98] [0.89; 0.96]	2.0% 2.1%	
7		Sola-Ortigosa et al, 2020 (D)	636			[0.90; 0.90]	2.3%	
8		Nami et al, 2015	391	+		[0.89; 0.92]	2.3%	
9		Sola-Ortigosa et al, 2020 (E)	636	-		[0.88; 0.91]	2.3%	
		Sola-Ortigosa et al, 2020 (C)	636	-		[0.87; 0.91]	2.3%	
10		Sola-Ortigosa et al, 2020 (F)	636	+		[0.87; 0.91]	2.3%	
11		Sola-Ortigosa et al, 2020 (A)	636	+	0.87	[0.85; 0.89]	2.3%	
12		Rubegni et al, 2011	130		0.86	[0.81; 0.90]	2.2%	
13		Senel, et al, 2013 (D)	150		0.86	[0.81; 0.90]	2.2%	
14		Senel, et al, 2013 (C)	150	<b></b>		[0.80; 0.89]	2.2%	
15		Sola-Ortigosa et al, 2020 (B)	636			[0.80; 0.85]	2.3%	
		Ribas et al, 2010	174	· · · · · · · · · · · · · · · · · · ·		[0.74; 0.85]	2.2%	
16		Senel, et al, 2013 (A)	150			[0.70; 0.83]	2.2%	
17		Senel, et al, 2013 (B)	150			[0.67; 0.81]	2.2%	
18		Giavina-Bianchi et al, Oct 2020				[0.74; 0.75]	2.3% 2.2%	
19		Piccoli, et al, 2014 Rios-Yuil, 2012	184 30			[0.38; 0.82]	1.9%	
20		Warshaw et al, 2015 (C)	2152			[0.59; 0.65]	2.3%	
21		Clarke et al, 2021	206			[0.50; 0.68]	2.2%	
22		Lamel et al, 2012	86	│ <mark>_</mark>		[0.44; 0.72]	2.2%	
		Altieri et al, 2017 (C)	232			[0.48; 0.65]	2.3%	
23		Warshaw et al, 2015 (A)	2152	<b>—</b>	0.56	[0.53; 0.59]	2.3%	
24		Warshaw et al, 2015 (B)	2152	<b>—</b>	0.56	[0.53; 0.59]	2.3%	
25		Saleh et al, 2017	600			[0.46; 0.58]	2.3%	
26		Warshaw et al, 2015 (F)	2152			[0.49; 0.55]	2.3%	
27		Altieri et al, 2017 (A)	232			[0.41; 0.60]	2.3%	
28		Altieri et al, 2017 (B)	232			[0.41; 0.60]	2.3%	
29		Azfar et al, 2014 (B)	76			[0.32; 0.66] [0.41; 0.58]	2.1%	
		Gonzalez-Coloma, 2019 Borve et al, 2013 (B)	326 62			[0.41, 0.56]	2.3% 2.1%	
30		Borve et al, 2013 (A)	62			[0.25; 0.64]	2.1%	
31		Keller et al, 2020 (B)	100	<b>_</b> !		[0.28; 0.59]	2.2%	
32		Warshaw et al, 2015 (E)	2152			[0.42; 0.48]	2.3%	
33		Warshaw et al, 2015 (D)	2152	<b>—</b>		[0.41; 0.47]	2.3%	
34		Azfar et al, 2014 (C)	76	—— <b>—</b>	0.43	[0.23; 0.60]	2.1%	
35		Muir et al, 2011 (A)	60	<b>_</b>	0.42	[0.19; 0.61]	2.1%	
36		Azfar et al, 2014 (A)	76			[0.20; 0.58]	2.1%	
		Keller et al, 2020 (A)	100			[0.22; 0.55]	2.2%	
37		Warshaw et al, 2015 (G)	2152			[0.34; 0.42]	2.3%	
38		Warshaw et al, 2015 (H)	2152			[0.34; 0.42]	2.3%	
39		Warshaw et al, 2015 (J)	2152			[0.33; 0.41]	2.3%	
40		Gabel et al, 2021 Warshaw et al, 2015 (l)	41 2152			[0.02; 0.58] [0.28; 0.36]	2.0% 2.3%	
41		Giavina-Bianchi et al, Nov 2020				[0.20; 0.30]	2.3%	
42		Glavina-Dialicii et al, 100 2020	11233	-	0.21	[0.20, 0.25]	2.070	
43		Random effects model	70954		0.67	[0.60; 0.74]	100.0%	
		Heterogeneity: $I^2 = 100\%$ , $\tau^2 = 0$ .		0 1 1 1 1		,		
44	350 351	/	(	0 0.2 0.4 0.6 0.8 1				
45								
46	352	eFigure 1. Forest plot repr	esenting	g F2F and teledermatology	prima	ry diagnos	tic agree	m

eFigure 1. Forest plot representing F2F and teledermatology primary diagnostic agreement. (A) Forest plot representing percentage agreement and 95% C.I. for overall concordance across 40 studies with a total of 72 unique number of comparisons, N of events and total included participants. (B) Forest plot representing kappa concordance and 95% C.I. for overall concordance across 21 studies with a total of 45 unique number of comparisons, N of total included participants. Abbreviations: F2F (Face-to-Face), PCP (Primary Care Provider), TD (Teledermatology or Teledermatologist).

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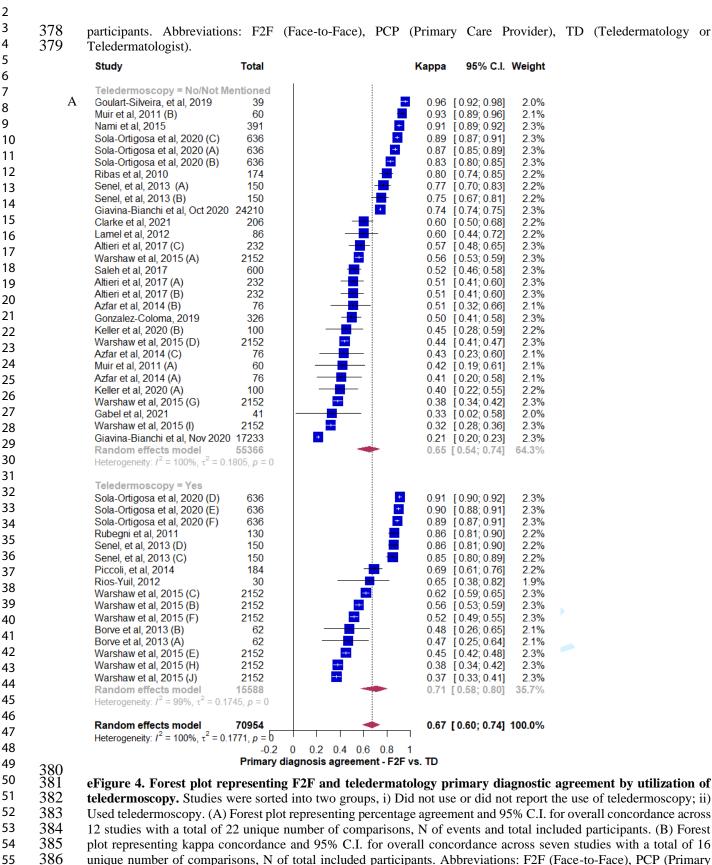


Stad     Deter Total     Agementation     Openation of the second seco							
Muir et al. 2011 (B)       49       50       98.00       187.12.98.72       011%         Sola Orngosa et al. 2020 (D)       915       1000       91.00 <th>Study</th> <th>Events</th> <th>Total</th> <th></th> <th>Agreement Rate (%)</th> <th>95% C.I.</th> <th>Weight</th>	Study	Events	Total		Agreement Rate (%)	95% C.I.	Weight
Sola-Origona et al. 2020 (D) 915 1000 916 1000 916 916 916 917 92 30 917 917 917 917 917 917 917 917 917 917			50		► <u>98.00</u>	[87.12; 99.72]	0.1%
Sola Origona et al, 2020 (c) 912 (1000 Sola Origona et al, 2020 (c) 903 (c) 903 (c) 903 (c) 919 (c) 903 (c) 919 (c) 903 (c) 919 (c) 9	Zink et al, 2017, Sept (B)						
Sola Origona et al, 2020 (F)       003       1000       90.30       183.00       90.30       183.00       90.30       199.50       202.47       767.59       22.90       88.40       186.20       92.20       767.50       22.90       88.40       186.20       92.20       767.50       89.22       199.50       202.47       176.75       92.20       767.50       183.02       186.10       199.50       199.50       22.90       88.40       186.20       199.22       176.75       199.20       176.75       199.20       176.75       180.20       199.50       199.22       177.50       159.50       199.50 <td>Sola-Ortigosa et al, 2020 (E)</td> <td>912</td> <td>1000</td> <td>+</td> <td>91.20</td> <td>[89.28; 92.80]</td> <td>1.9%</td>	Sola-Ortigosa et al, 2020 (E)	912	1000	+	91.20	[89.28; 92.80]	1.9%
Barcau et al, 2016 37 41 922 (76.73, 96.25) 0.3% Barcau et al, 2010 (A) 225 388 832 (84.61, 91.22) 1.4% Romero at al, 2010 (A) 225 388 842 (82.47, 92.22) 0.9% Romero at al, 2011 (D) 114 1500 97 Romero at al, 2010 (A) 225 300 98 832 (84.61, 91.22) 1.4% Romero at al, 2010 (B) 335 1000 98 850 91.5% Sola-Ongoas et al, 2010 (B) 335 1000 98 850 91.5% Sola-Ongoas et al, 2020 (B) 335 1000 98 850 91.5% Sola-Ongoas et al, 2020 (C) 835 1000 98 850 91.5% Sola-Ongoas et al, 2020 (B) 335 1000 98 850 91.5% Sola-Ongoas et al, 2020 (B) 335 1000 98 850 91.5% Sola-Ongoas et al, 2020 (B) 335 1000 98 850 91.5% Sola-Ongoas et al, 2020 (B) 335 1000 98 850 91.5% Sola-Ongoas et al, 2020 (B) 335 1000 98 850 91.5% Sola-Ongoas et al, 2020 (B) 335 1000 98 850 91.5% Sola-Ongoas et al, 2020 (B) 335 1000 98 850 91.5% Sola-Ongoas et al, 2015 142 174 98 8600 98 81.33 [76.04.82 92.90 0.3% Saleh et al, 2017 77 101 98 867 92.2% Narshave et al, 2017 77 101 98 868 98 91.2% Marchel et al, 2017 162 213 76.06 [98.78, 13] 1.4% Zaning, 2013 76 00 69.68 83.30 99.5% Marchel et al, 2017 77 753 99 99 77.50 [75.29 76.83 22.4% Marchel et al, 2017 162 213 76.06 [98.78, 13] 1.4% Zaning, 2013 76 00 69.68 83.30 99.5% Marchel et al, 2017 (A) 124 170 77.27 [75.07 76.83 22.4% Canine d al, 2016 (B) 52 29 76 77.29 [77.79 80] 1.3% Romero Aguilers et al, 2014 (A) 124 170 77.27 [25.07 76.83 22.4% Canine d al, 2015 (B) 52 29 76 50 13.5% Marchel et al, 2017 80 112 70 77.27 [75.07 77.98 [1.3% Romero Aguilers et al, 2014 (A) 124 170 77.27 [25.07 76.58 13.5% Marchel et al, 2017 (B) 53 99 90 97 [27.97 70.98 [1.3% Romero Aguilers et al, 2014 (A) 124 170 77.72 [25.07 76.58 [1.3% Romero Aguilers et al, 2014 (A) 124 170 77.72 [25.07 76.58 [1.3% Romero Aguilers et al, 2014 (A) 124 170 77.72 [25.07 76.58 [1.3% Romero Aguilers et al, 2014 (A) 124 170 77.72 [25.07 76.58 [1.3% Romero Aguilers et al, 2014 (A) 124 170 77.72 [25.07 76.58 [1.3% Romero Aguilers et al, 2014 (A) 124 170 77.72 [25.07 76.58 [1.3% Romero Aguilers et al, 2014 (A) 132 90 99 77.7							
Romero of al. (2010 (A)         325         386         882         (4 41)         412         441         412         441         412         441         412         441         412         441         412         441         412         441         412         441         412         412         441         412         441         412         441         412         441         412         441         412         441         412         441 </td <td>Barcaui et al, 2018</td> <td></td> <td></td> <td></td> <td></td> <td>[76.73; 96.29]</td> <td></td>	Barcaui et al, 2018					[76.73; 96.29]	
Rubegner ei al. 2011 114 130 675 1000 675 0005 6	Romero et al, 2010 (A)	325	368	-			1.4%
Sola-Öngosa et al, 2020 (A)       875 1000       875 0 (65.30, 89.41)       20%         Sola-Öngosa et al, 2020 (B)       835 1000       835 0 (81.07, 85.7)       22%         Sola-Öngosa et al, 2020 (B)       835 1000       833 0 (85.68, 92.89)       0.3%         Sala-Öngosa et al, 2020 (B)       835 1000       833 0 (85.68, 92.89)       0.3%         Sala-Öngosa et al, 2020 (B)       835 1000       833 0 (85.68, 92.89)       0.3%         Sala-Öngosa et al, 2020 (B)       835 1000       816 11 (75.15, 80.69)       12%         Sala-Öngosa et al, 2012 (B)       134 40       90 (77.50)       127.65 (82.94)       20%         Salama-Bianch et al, 2012 (B)       31 40       97.75 10 (72.16, 78.60)       5%         Borne et al, 2012 (B)       31 40       97.75 10 (72.16, 78.60)       5%         Sanna, 2013 (B)       77.50 (72.12, 87.86)       0.5%       20%         Sanna, 2013 (C)       100 (C)       77.50 (72.12, 87.86)       0.5%         Marchel et al, 2017 (C)       102 (C)       77.50 (72.12, 87.86)       0.5%         Marchel et al, 2017 (B)       102 (C)       77.50 (72.17, 78.30)       14.83         Marchel et al, 2017 (B)       168 (S)       77.50 (72.17, 78.30)       14.83         Marchel et al, 2016 (D)       168 (S)       14				-			
Sola-Ongoas et al, 2020 (B)       835 (D)       835 (D)       833 (D)       933 (D)       94 (D)       775 (D)	Sola-Ortigosa et al, 2020 (A)	875	1000		87.50	[85.30; 89.41]	2.0%
Calica, 2015       103       125							
Bibs et al, 2010       142       174 <ul> <li>Bibs et al, 2017</li> <li>He al, 2015 (C)</li> <li>Sahet et al, 2015 (C)</li> <li>Sahet et al, 2017</li> <li>He al, 2015 (C)</li> <li>Sahet et al, 2017</li> <li>He al, 2016</li> <li>He al, 2017</li> <li>He al, 2017</li> <li>He al, 2016</li> <li>He al, 2016</li> <li>He al, 2017</li> <li< td=""><td>Rios-Yuil, 2012</td><td>25</td><td>30</td><td></td><td>83.33</td><td>[65.68; 92.89]</td><td>0.3%</td></li<></ul>	Rios-Yuil, 2012	25	30		83.33	[65.68; 92.89]	0.3%
Warshaw et al, 2015 (C)       548       684       80.12 [70.96; 22.94]       20.5         Borve et al, 2012 (A)       31       40       77.50 [82.12; 87.86]       0.5%         Borve et al, 2012 (A)       31       40       77.50 [82.12; 87.86]       0.5%         Marchel et al, 2017       77       101       76.67 [85.09; 84.50]       0.9%         Marchel et al, 2017       77       101       76.67 [85.09; 84.50]       0.9%         Warshaw et al, 2015 (A)       77       700       75.70 [72.50; 78.31]       1.4%         Central et al, 2010 (A)       75.70       77.79 [78.31]       1.4%         Marchel et al, 2017 (A)       76       77.79 [78.81]       1.5%         Tan et al, 2010 (A)       124       170       72.35 [85.16, 75.79 [85.31]       1.5%         Cafter et al, 2014 (A)       124       170       72.35 [85.16, 75.79 [85.31]       1.3%         Romero Aguiters et al, 2014 (A)       124       170       72.35 [85.16, 75.79 [85.31]       1.3%         Romero Aguiters et al, 2014 (A)       124       170       72.35 [85.16, 75.85 [1.3%       1.3%         Vanchel et al, 2021 (A)       250       66.65 [85.96 [1.10, 71.61 [1.2%       1.3%         Cafter et al, 2014 (A)       27       400       66.65	Ribas et al, 2010	142	174	-	81.61	[75.15; 86.69]	1.2%
Giavina Blanchi et al, O212 (A) 31 40 Borve et al, 2012 (A) 31 40 Tran et al, 2011 23 30 Marcheli et al, 2017 77 101 Tran et al, 2017 (A) 70 753 Central et al, 2017 (B) 70 753 Tran et al, 2016 (B) 70 753 Tran et al, 2016 (B) 70 753 Tran et al, 2010 (A) 223 385 Tran et al, 2010 (A) 223 385 Tran et al, 2010 (A) 224 Tran et al, 2014 (A) 22 Tran et al, 2010 (B) 23 Tran et al, 2010 (B) 23 Tran et al, 2014 (A) 22 Tran et al, 2010 (B) 23 Tran et al, 2010 (B) 23 Tran et al, 2017 78 Tran et al, 2010 (B) 23 Tran et al, 2014 (A) 22 Tran et al, 2014 (A) 32 Tran et al, 2010 (B) 36 Tran et al, 2014 (A) 32 Tran et al, 2010 (B) 37 Combined provalence Tran et al, 2014 (A) 32 Tran et al, 2010 (B) 36 Tran et al, 2017 (C) 36 Tran et al, 2017 (C) 36 Tran et al, 2016 (B) 37 Tran et al, 2017 (C) 36 Tran et al, 2017 (C) 36 Tran et al, 2016 (B) 37 Tran et al, 2017 (C) 36 Tran et al, 2017 (C) 36 Tran et al, 2017 (C) 37 Tran et al, 2016 (C) 37 Tran et al, 2016 (C) 37 Tran et al, 2017 (C) 37 Tran et al, 2016 (C) 37 Tran et al, 2016 (C) 37 Tran et al, 2016 (C) 37 Tran et al, 2017 (C) 37 Tran et al, 2016 (C) 37 Tran et al, 2017 (C) 37 Tran et al, 201							
Borve et al. 2012 (B) 31 40 Tran et al. 2017 77 101 Marchell et al. 2017 77 101 Warshew et al. 2015 (A) 570 753 Certard et al. 2017 (B) 123 170 Warshew et al. 2015 (A) 128 2385 Tan et al. 2010 (A) 128 3385 Tan et al. 2011 (A) 128 1200 Te color (B) 665 6 (B) 17, 719 08 13% Marchel et al. 2021 (A) 32 50 Cakee et al. 2021 (A) 32 50 Cakee et al. 2022 (B) 308 Barbieri et al. 2021 (A) 32 50 Cakee et al. 2022 (B) 381 600 Eacher et al. 2022 (B) 381 600 Eacher et al. 2022 (C) 381 600 Eacher et al. 2022 (C) 381 600 Eacher et al. 2021 (C) 381 600 Eacher et al. 2022 (C) 381 600 Eacher et al. 2021 (C) 381 600 Eacher et al. 2021 (C) 381 600 Eacher et al. 2021 (C) 381 600 Eacher et al. 2015 (C) 384 665 Eacher et al. 2017 (A) 38 69 Eacher et al. 2017 (A) 38 69 Eacher et al. 2013 (A) 38 69 Eacher et al. 2013 (A) 38 69 Eacher et al. 2015 (C) 344 655 Eacher et al	Giavina-Bianchi et al, Oct 2020	576	739		77.94	[74.81; 80.79]	2.1%
Tran et al, 2011 23 30 Marchell et al, 2017 77 101 Fe 67 E86 50, 88.45, 0.4% Marchell et al, 2017 162 213 Fe 67 E86 50, 88.45, 0.4% Marchell et al, 2017 162 213 Fe 67 E86 50, 88.45, 0.4% Marchell et al, 2016 (h) 570 753 Fe 70 [7207 R3] 22% Warshaw et al, 2016 (h) 566 752 Fan et al, 2010 (h) 162 219 Fan et al, 2010 (h) 123 170 Fan et al, 2011 (h) 124 170 Far et al, 2011 (h) 124 170 Far et al, 2012 205 306 Garden et al, 2014 (h) 123 170 Far et al, 2012 205 306 Garden et al, 2014 (h) 123 170 Far et al, 2012 205 306 Garden et al, 2020 (h) 372 600 Fastella 2014 (h) 32 50 Far et al, 2012 (h) 367 595 Far et al, 2020 (h) 372 600 Far et al, 2012 (h) 381 600 Far et al, 2017 (h) 393 160 Far et al, 2017 (h) 39 160 Far et al, 2016 (h) 36 65 Far et al, 2017 (h) 38 169 Far et al, 2016 (h) 48 652 Far et al, 2017 (h) 38 169 Far et al, 2017 (h) 38 169 Far et al, 2017 (h) 38 1652 Far et al, 2017 (h) 38 152 Far et al, 2017 (h) 38 152 Far et al, 2017 (h) 39 160 Far et al, 2017 (h) 38 135 Far et al, 2017 (h) 39 175 Far et al, 2017 (h) 39 1		31					0.5%
$\begin{aligned} \text{Marchell et al}, 2017 & 162 & 213 & 76 & 600 & 666 & 83.6 & 0.9\% \\ \text{Warshaw et al}, 2015 (h) & 570 & 753 & 750 & 7250 & 7550 & 7550 & 7550 & 7550 & 7550 & 7500 & 7500 & 7$							
Warshaw et al. 2015 (A)       570       753       75.70       75.81       2.2%         Gerhardt et al. 2021       609       75.26       72.90       78.21       2.2%         Warshaw et al. 2016 (B)       166       75.20       78.21       2.2%         Tan et al. 2010 (A)       283       385       73.51       15%       79.26       78.22       2.2%         Tan et al. 2010 (A)       128       385       73.51       15%       79.26       17.97       17.97       18.77	Marchell et al, 2017	162	213	-	76.06	[69.87; 81.31]	1.4%
Gerhardt et al. 2021       609       809       75.28       72.29       78.13       2.2%         Yanshaw et al. 2010 (B)       162       219       73.97       178.07       78.351       1.5%         Tan et al. 2010 (A)       283       385       73.57       188.67       77.081       1.3%         Romero Aguilera et al. 2014 (A)       124       170       72.24       165.57       79.081       1.3%         Marchell et al. 2017       81       112       72.35       168.67       77.681       1.8%         Canke et al. 2021       205       308       66.56       10.161       1.8%       1.3%         Gabel et al. 2021       205       308       66.36       10.161       1.8%       1.11       1.66.55       1.3%         Gabel et al. 2021       20       6107       61.86       52.67.000       0.7%       1.11       66.56       10.0%       1.8%       52.66       1.0%       1.11       1.8%       1.8%       1.11       1.8%       1.66.05       1.06.10       1.8%       1.0%       1.0%       1.0%       1.0%       1.0%       1.0%       1.0%       1.0%       1.1%       1.0%       1.0%       1.0%       1.0%       1.0%       1.0%							
Tan et al 2010 (A) 283 385 77 67 (F 76, 77 56) 1.5% Romero Aguiera et al 2014 (A) 124 170 72 54 (65.77, 76.69 1.3% Marchell et al 2017 (A) 81 112 72 52 (63.33, 79.81) 1.1% Yano-Galvan et al 2011 1381 2000 6905 (66.99, 71.04) 2.5% Gabel et al 2021 205 308 6656 (61.0, 71.61) 1.8% Gabel et al 2021 205 308 6656 (61.0, 71.61) 1.8% Gabel et al 2021 205 308 6656 (61.0, 71.61) 1.8% Gabel et al 2021 205 308 6656 (61.0, 71.61) 1.8% Gabel et al 2021 205 308 6656 (61.0, 71.61) 1.8% Gabel et al 2021 206 107 66168 (52.16, 70.39) 1.1% Gabel et al 2020 (A) 372 600 600 600 600 (50.01, 63.86) 2.2% Vestergaard et al 2020 (A) 372 600 600 601 76.61 (85.67, 73.98) 1.1% Giavna-Bianchi et al, Nov 2020 490 803 610 60 601 76.61 (85.67, 73.99) 1.1% Giavna-Bianchi et al, 2020 (A) 115 195 660 610 76.61 (85.61, 70.39) 1.1% Giavna et al 2015 (F) 357 595 600 (56.01, 63.86) 2.2% Varishave et al, 2014 (A) 193 160 60 601 75.61 (93.86) 2.2% Varishave et al, 2014 (B) 39 69 655 (56.00 (94.41, 2.3% Gabel et al, 2021 (B) 39 69 655 (56.00 (94.41, 2.3%) Gabel et al, 2014 (B) 28 50 50 (50.01, 63.86) 2.2% Varishave et al, 2015 (C) 348 652 650 (55.01, 43.86 49) 0.7% Batala, 2016 560 (42.13, 66.99) 7.5% Batala, 2016 560 (42.23, 66.99) 0.7% Batala, 2016 560 (42.03, 66.59) 1.1% Varishave et al, 2015 (D) 344 651 652 64 (48.67.66) 0.9% Varishave et al, 2015 (D) 344 651 652 64 (49.00, 66.51 2.2% Varishave et al, 2015 (D) 344 651 652 64 (49.60, 60.61) 2.2% Varishave et al, 2015 (D) 348 652 67 (42.73, 46.79) 2.4% Varishave et al, 2015 (D) 348 652 67 (42.73, 45.79) 2.4% Varishave et al, 2015 (D) 473 1034 67 (42.73, 45.79) 2.4% Varishave et al, 2015 (D) 473 1034 463 60 0.7% Varishave et al, 2014 (A) 42 63 50 Combined prevalence 17279 24965 Pato et al, 2014 (A) 42 63 Combined prevalence 17279 24965 Pato et al, 2014 (A) 43 60 Combined prevalence 160 1546 Pato et al, 2014 (A) 43 60	Gerhardt et al, 2021	609	809		75.28	[72.19; 78.13]	2.2%
Romero Aguilera et al. 2014 (A) 124 170 72.4 170 72.4 165.77, 79.08 1.3% Marchell et al. 2017 (B) 123 170 72.5 (65.16.78.55) 1.3% Marchell et al. 2011 1381 2000 69.05 (66.99, 71.04) 2.5% Gabel et al. 2021 205 308 60.5 (66.99, 71.04) 2.5% Gabel et al. 2021 205 308 60.5 (66.9, 71.04) 2.5% Gabel et al. 2021 205 308 60.5 (66.9, 71.04) 2.5% Gabel et al. 2021 205 308 60.5 (65.00, 71.64) 2.5% Gabel et al. 2020 (A) 372 600 60.0 (69.05, 67.60) 0.7% Vestergaard et al. 2020 (A) 372 600 60.0 (69.05, 67.60) 0.7% Vestergaard et al. 2020 (A) 372 600 60.0 (60.01, 75.61, 70.39) 1.1% Giavina-Bianchi et al. Nov 2020 490 803 61.02 (57.00, 64.34) 2.3% For et al. 2015 (F) 357 595 60.0 (56.01, 63.66) 2.2% Vestergaard et al. 2020 (A) 115 195 60.0 (56.01, 63.66) 2.2% Varshaw et al. 2015 (F) 357 595 60.0 (56.01, 63.66) 2.2% Varshaw et al. 2017 (A) 93 160 60.0 (56.01, 63.66) 2.2% Varshaw et al. 2014 (B) 77 136 50.5 (44.16, 64.66) 1.3% Gabel et al. 2020 (B) 77 136 50.5 (44.16, 67.66) 0.9% Barbien et al. 2014 (B) 77 136 50.5 (44.16, 67.66) 0.9% Barbien et al. 2014 (B) 28 50 50 60.0 (42.13, 68.99) 0.7% Harlar 2.016 52 44.66 (57.66) 0.9% Barbien et al. 2016 54 100 65.5 (34.43.2, 26.69.4) 0.9% Borve et al. 2015 (B) 348 69 65.5 (34.43.2, 26.69.4) 0.9% Barbien et al. 2016 (5.53.84 (32.2, 66.94) 0.9% Barbien et al. 2017 (B) 30 79 20.5 (40.12, 37.79, 29.9) 0.00 (41.13, 68.99) 0.7% Alter et al. 2017 (B) 30 79 20.5 (40.12, 27.60.33) 0.9% Charbien et al. 2015 (B) 348 652 60.5 (42.13, 66.99) 0.9% Charbien et al. 2015 (B) 348 652 60.5 (42.13, 66.99) 0.9% Charbien et al. 2015 (B) 348 652 60.5 (42.13, 46.99) 0.9% Charbien et al. 2015 (B) 348 652 60.5 (42.13, 46.99) 0.9% Charbien et al. 2015 (B) 348 652 60.5 (42.13, 46.99) 0.9% Charbien et al. 2015 (B) 30 79 30 79 70.7 (27.99, 40.99) 0.9% Charbien et al. 2015 (B) 30 79 30 79 70.7 (27.99, 40.99) 0.9% Charbien et al. 2016 (1.44.68 652 60.6 (47.14.57) 1.2% Varshaw							
Romero Aquilera et al. 2014 (B)       123       170       72.32 (B3.37881)       113         Vanc-Galvan et al. 2011       1381       2000       60.65 (B4.99, 71.04)       2.5%         Clarke et al. 2021       205       306       60.65 (B4.99, 71.04)       2.5%         Clarke et al. 2021       205       306       60.65 (B4.99, 71.04)       2.5%         Galvan et al. 2021 (A)       325       60.01 (F1.61)       1.8%         Galvan et al. 2020 (A)       372       60.01       60.05 (F8.09, 22.%)         Lamel et al. 2020 (B)       361       60.01       60.01 (F5.16) (F8.56)       2.2%         Lamel et al. 2020 (B)       361       60.01       60.01 (F6.01, 63.86)       2.2%         Zink et al. 2017 (A)       93       160       61.10 (F3.86)       2.2%         Zink et al. 2017 (A)       93       160       65.21 (F4.68, 67.66)       1.6%         Borve et al. 2013 (B)       36       65       55.01 (F3.25, 65.21 (F3.98, 71.10)       2.2%         Barbien et al. 2014 (B)       28       50       50.01 (F3.86) (F3.68, 72.14%       2.2%         Marine et al. 2013 (A)       36       65       55.01 (F3.25, 76.21 (F3.98, 71.10)       2.2%         Barbien et al. 2016 (B)       54       100       5				-			
Vano-Galvan et al, 2021       1381       2000       Image: Clarke et al, 2021       205       308       Image: Clarke et al, 2021       205       308       Image: Clarke et al, 2021       27       41       Image: Clarke et al, 2021       0       Image: Clarke et al, 2021       Image: Clarke	Romero Aguilera et al, 2014 (B	, ) 123	170		72.35	[65.16; 78.55]	1.3%
Carte et al. 2021 205 308 6656 [61 10; 71.61] 18% 6656 [50 27.86 00 07% 6656 [50 27% 60 0] 07% 6656 [50 27% 60 0] 07% 6656 [50 27% 60 0] 07% 6656 [50 27% 60 0] 07% 6656 [50 27% 60 0] 07% 6656 [50 27% 60 0] 07% 677 100 00 100 00 00 00 00 00 00 00 00 00 0							
Barbieri et al. 2014 (A) 32 50 Vestergaard et al. 2020 (A) 372 600 Lamel et al. 2012 (A) 372 600 Lamel et al. 2012 (B) 361 600 Vestergaard et al. 2020 (B) 361 600 Varshaw et al. 2015 (F) 357 595 Source et al. 2017 (A) 93 160 Atteri et al. 2017 (A) 93 160 Source et al. 2014 (B) 77 136 Borve et al. 2013 (B) 39 69 Borve et al. 2013 (B) 39 69 Borve et al. 2013 (A) 38 69 Source et al. 2016 56 55 Stall al. 2016 56 55 Stall al. 2016 56 55 Varshaw et al. 2015 (E) 348 652 Varshaw et al. 2015 (B) 39 69 Source et al. 2017 (C) 80 152 Varshaw et al. 2015 (B) 39 69 Source et al. 2017 (C) 80 152 Varshaw et al. 2015 (G) 300 563 Varshaw et al. 2015 (G) 300 79 Combined prevalence Varshaw et	Clarke et al, 2021	205	308		66.56	[61.10; 71.61]	1.8%
Vestergaard et al, 2020 (A)       372       600       62.00       [58.05; 65.80]       2.2%         Lamel et al, 2012       66       107       61.68       [52.16; 70.39]       1.1%         Giawina-Bianchi et al, Nov 2020       490       803       61.02       [57.60; 64.44]       2.3%         Vestergaard et al, 2020 (B)       361       600       60.17       [56.19; 63.86]       2.2%         Varshaw et al, 2017 (A)       93       115       155       60.00       56.97       [51.9; 64.01]       2.2%         Zink et al, 2017 (A)       93       160       61.88       [52.35, 22.1 4.4%       65.52       1.4%         Borve et al, 2014 (B)       28       50       60.00       56.52       [44.86; 67.66]       0.9%         Batalien et al, 2016       36       65       55.38       [43.27; 68.99]       0.7%         Borve et al, 2013 (A)       38       69       65.00       [45.36; 70.17]       1.4%         Warshaw et al, 2015 (D)       344       651       53.37       [49.35; 57.18]       2.2%         Atter et al, 2017 (B)       81       152       60.01       1.4%       52.83       [49.00; 56.65]       2.4%         Varshaw et al, 2015 (D)       344       651 <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>							
Glavina-Bianchi et al, 2020 (B) 361 600 Warshaw et al, 2015 (F) 357 595 Glavina-Bianchi et al, 2020 (B) 361 600 Warshaw et al, 2017 (A) 93 160 Atter et al, 2017 (A) 93 160 Atter et al, 2017 (A) 93 160 Barbieri et al, 2014 (B) 77 136 Borve et al, 2013 (A) 38 69 Gove et al, 2015 (E) 348 652 Gove et al, 2017 (B) 81 152 Gove et al, 2017 (B) 81 152 Gove et al, 2017 (C) 80 152 Gove et al, 2015 (G) 28 Atter et al, 2017 (C) 80 152 Gove et al, 2015 (G) 300 S83 Gove et al, 2015 (G) 300 Gove et al, 2014 (C) 66 136 Gove et al, 2017 (B) 81 1020 Gove et al, 2015 (G) 300 Gove et al, 2015 (G) 300 Gove et al, 2015 (G) 300 Gove et al, 2015 (G) 307 Gove et al, 2014 (G) 66 136 Gove et al, 2017 (B) 81 1020 Gove et al, 2014 (C) 66 136 Gove et al, 2017 (B) 79 Gove et al, 2017 (A) 79 Gove et al, 2017 (A) 79 Gove et al, 2017 (B) 79 Gove et al, 2017 (B) 79 Gove et al, 2020 (A) 24 Gove et al, 2020 (B) 34 Gove et al, 2020 (B) 3							
Warshaw et al, 2015 (F)       357       595       60.00       66.01       63.86]       2.2%         Atleri et al, 2017 (A)       93       160       58.97       [51.94]       56.62       [44.68]       76.66       1.6%         Atleri et al, 2013 (B)       39       69       66.00       65.52       1.4%       56.52       [44.68]       76.66       1.6%         Barbieri et al, 2014 (B)       28       50       56.00       [42.13]       68.99       0.9%         Barbieri et al, 2017 (A)       38       69       55.07       [43.27]       60.30       0.9%         Barbieri et al, 2014 (B)       28       50       56.00       [42.13]       68.99       0.9%         Borve et al, 2013 (A)       38       69       55.07       [43.27]       60.30       0.9%         Varshaw et al, 2015 (C)       348       652       65.00       [44.69]       1.1%         Warshaw et al, 2015 (C)       344       651       52.84       [49.00]       56.65       2.2%         Warshaw et al, 2015 (C)       30       759       52.63       [44.69]       0.44       1.4%         Warshaw et al, 2015 (C)       661       36       64       45.32       2.2%	Giavina-Bianchi et al, Nov 2020	490	803	-	61.02	[57.60; 64.34]	2.3%
Zink et al, 2017, July (Å)       115       195        58.97       [51.94] (56.66]       1.6%         Altieri et al, 2017 (Å)       93       160        58.13       [50.35] (55.22]       1.4%         Aztar et al, 2014 (B)       77       136        58.13       [50.35] (55.52]       1.4%         Barbieri et al, 2014 (B)       28       50        56.02       [44.68] (7.66]       0.9%         Batalia, 2016       36       65        55.38       [43.22] (6.94]       0.9%         Borve et al, 2017 (B)       81       152        53.37       [49.53] (57.18]       2.2%         Altier et al, 2017 (C)       80       152        52.63       [46.9] (0.44)       1.4%         Warshaw et al, 2015 (C)       344       651        52.63       [39.51] (5.76]       0.7%         Varshaw et al, 2015 (C)       344       651        52.63       [46.9] (0.44)       1.4%         Warshaw et al, 2015 (J)       511       1020        52.63       [46.9] (0.41)       1.4%         Warshaw et al, 2015 (J)       511       1020        52.63       [46.39] (0.7%       50.10       [47							
Azfar et al, 2014 (B)77136Borve et al, 2013 (B)3969Barbieri et al, 2014 (B)2850Batalla, 20163665Cotta et al, 2014 (B)3869Borve et al, 2013 (A)3869Borve et al, 2016 (E)348652Alteri et al, 2017 (B)81152Atteri et al, 2017 (C)80152Varshaw et al, 2015 (D)344651Varshaw et al, 2015 (C)300583Atteri et al, 2017 (C)80152Varshaw et al, 2015 (G)300583Varshaw et al, 2015 (G)300583Varshaw et al, 2015 (G)300583Varshaw et al, 2015 (G)300583Varshaw et al, 2015 (J)5111020Varshaw et al, 2015 (J)5010Varshaw et al, 2015 (J)5111020Varshaw et al, 2015 (J)3079Contined prevalence17879Z496570.96Heterogeneity: l <sup>2</sup> = 97%, r <sup>2</sup> = 0.0291, $p = 0$ F2F physician = Non-specialistMuir et al, 2011 (A)43Muir et al, 2014 (A)44Muir et al, 2015115Jones et al, 202012Jones et al, 202012Jones et al, 202012	Zink et al, 2017, July (A)	115	195		58.97	[51.94; 65.66]	1.6%
Barbieri et al, 2014 (B) 28 50 Batalla, 2016 36 65 Borve et al, 2013 (A) 38 69 Okita et al, 2016 54 100 Warshaw et al, 2015 (E) 348 652 Keller et al, 2017 (B) 81 152 Keller et al, 2017 (C) 80 152 Warshaw et al, 2015 (C) 344 651 Keller et al, 2017 (C) 80 152 Warshaw et al, 2015 (G) 300 583 Warshaw et al, 2015 (G) 300 583 S136 44.69 60.44] 1.4% Warshaw et al, 2015 (G) 300 583 Warshaw et al, 2015 (G) 300 583 S146 147 40, 55.50] 2.2% Warshaw et al, 2015 (J) 511 1020 Warshaw et al, 2015 (J) 511 1020 S0.26 (46.19, 54.32] 2.2% Warshaw et al, 2015 (J) 511 1020 S0.26 (46.19, 54.32] 2.2% Warshaw et al, 2015 (J) 511 1020 S0.26 (46.19, 54.32] 2.2% Warshaw et al, 2015 (J) 511 1020 S0.26 (46.19, 54.32] 2.2% Warshaw et al, 2015 (J) 511 1020 S0.10 147.03, 53.16] 2.4% Azfar et al, 2014 (A) 63 136 Azfar et al, 2017 (B) 30 79 Combined prevalence 17879 24965 Patro et al, 2015 (J) 511 15 206 Chen et al, 2010 194 405 S0.83 (48.98, 62.46] 1.6% Chen et al, 2010 194 405 S0.83 (48.98, 62.46] 1.6% Costello et al, 2020 (A) 24 53 Jones et al, 2021 1 183 528 Costello et al, 2020 (A) 24 53 Jones et al, 2021 (A) 43 60 Duong et al, 2021 (A) 43 60 Duong et al, 2021 (A) 43 60 Duong et al, 2021 (A) 43 528 Costello et al, 2020 (A) 24 53 Jones et al, 2021 (A) 14 79 Combined prevalence 660 1546 Heterogeneity: $I^2 = 91\%$ , $r^2 = 0.0291$ , $p < 0.01$ Combined prevalence 18539 26511 Combined prevalence 18539 26511 Combined prevalence 18539 26511 Jones et al, 2021 (A) 14 79 Combined prevalence 18539 26511 Combined prevalence 185							
Batalla, 2016 36 65 55.38 [43.22; 66.94] 0.9% Borve et al, 2013 (A) 38 69 55.07 [43.27; 66.33] 0.9% Oktia et al, 2015 (E) 348 652 53.37 [49.53; 57.18] 2.2% Altieri et al, 2017 (B) 81 152 53.29 [45.34; 61.07] 1.4% Warshaw et al, 2015 (D) 344 661 52.44 (49.06; 66.55] 2.2% Keller et al, 2020 (B) 28 53 52.83 [39.51; 65.76] 0.7% Altieri et al, 2017 (C) 80 152 52.83 [44.69; 60.44] 1.4% Warshaw et al, 2015 (G) 300 583 51.44 (47.40; 55.50] 2.2% Warshaw et al, 2015 (G) 300 583 51.44 (47.40; 55.50] 2.2% Warshaw et al, 2015 (G) 300 583 51.44 (47.40; 55.50] 2.2% Warshaw et al, 2015 (J) 5111 1020 50.10 [47.03; 53.16] 2.4% Azfar et al, 2014 (A) 63 136 44 (48.53 [40.22; 56.89] 1.3% Warshaw et al, 2015 (I) 47.3 10.34 54 (45.23; 52.77; 2.2% Warshaw et al, 2015 (I) 47.3 10.34 54 (45.74; 142.73; 48.79] 2.4% Carter et al, 2017 (B) 30 79 50.66 [69.76; 72.14] 89.8% Heterogeneity: $l^2 = 97\%$ , $r^2 = 0.0291$ , $p = 0$ <b>F2F physician = Non-specialist</b> Muir et al, 2010 194 405 44 53 (45.24) 1.6% Chen et al, 2010 194 405 44 53 (45.24) 1.6% Chen et al, 2010 194 405 44 53 (45.24) 1.6% Chen et al, 2021 183 528 44 (45.06; 30.72; 38.82) 2.1% Costello et al, 2020 (A) 2.4 53 Jones et al, 2021 183 528 44.54 (51.07; 52.97] 2.0% Keller et al, 2017 (A) 2.1 179 44.54 (A) 2.2 (A)							
Okita et al, 2016       54       100       54.00 $[44.20; 63.50]$ 1.1%         Warshaw et al, 2015 (E)       348       652       53.37 $[49.53; 57.18]$ 2.2%         Atteri et al, 2017 (B)       81       152       53.37 $[49.53; 57.18]$ 2.2%         Keller et al, 2017 (C)       80       152       52.83 $[39.51; 65.76]$ 0.7%         Atteri et al, 2017 (C)       80       152       52.83 $[39.51; 65.76]$ 0.7%         Warshaw et al, 2015 (G)       300       583       51.46 $[47.40; 55.50]$ 2.2%         Warshaw et al, 2015 (J)       511       1020       50.10 $[44.20; 63.80]$ 1.4%         Azfar et al, 2014 (A)       63       136        48.53 $[40.25; 56.89]$ 1.3%         Varshaw et al, 2015 (I)       473       1034        46.32 $[38.12; 54.73]$ 1.3%         Varshaw et al, 2015 (I)       473       1034        45.74 $[42.73; 48.79]$ $2.4\%$ Carter et al, 2017 (B)       30       79        70.56 $[69.76; 72.14]$ $89.8\%$ Patro et al, 2015       115       206	Batalla, 2016	36	65	<b>—</b>	55.38	[43.22; 66.94]	0.9%
Warshaw et al, 2015 (E)       348       652       53.37 $[49.53; 57.18]$ 2.2%         Altieri et al, 2017 (B)       81       152       53.29 $[45.34; 61.07]$ 1.4%         Warshaw et al, 2015 (D)       344       651       52.84 $[49.05; 65.65]$ 2.2%         Keller et al, 2017 (C)       80       152       52.83 $[39.51; 65.76]$ 0.7%         Altieri et al, 2017 (C)       80       152       52.83 $[39.51; 65.76]$ 0.7%         Marshaw et al, 2015 (G)       300       583       52.83 $[40.55, 50]$ 2.2%         Warshaw et al, 2015 (J)       511       102       50.10 $[47.03; 53.16]$ 2.4%         Azfar et al, 2014 (C)       66       136       48.53 $[40.25; 56.89]$ 1.3%         Warshaw et al, 2015 (I)       473       1034       44.574       42.73; 48.79       2.4%         Combined prevalence       17879       24965       70.96       [69.76; 72.14]       89.8%         Heterogeneity: $l^2 = 97\%, r^2 = 0.0291, p = 0$ 71.67       [59.06; 81.60]       0.7%         Schan et al, 2010       194       405       45.28       [32.52; 58.70]       0.8%         Gene et al, 2020							
Warshaw et al, 2015 (D) $344$ $651$ $5284$ $49.00$ ; $56.65$ $2.2\%$ Keller et al, 2017 (C) $80$ $152$ $52.83$ $39.51$ ; $65.76$ $0.7\%$ Marshaw et al, 2015 (G) $300$ $583$ $51.46$ $47.40$ ; $55.50$ $2.2\%$ Warshaw et al, 2015 (G) $300$ $583$ $51.46$ $47.40$ ; $55.50$ $2.2\%$ Warshaw et al, 2015 (J) $5111$ $1020$ $50.10$ $47.33$ ; $163.2$ $2.4\%$ Azfar et al, 2014 (A) $63$ $136$ $$ $48.53$ $40.25$ ; $56.89$ $1.3\%$ Varshaw et al, 2015 (I) $473$ $1034$ $$ $46.32$ $18.27, 24.73$ $1.3\%$ Varshaw et al, 2017 (B) $30$ $79$ $$ $70.96$ $69.76$ ; $72.14$ $89.8\%$ Carter et al, 2017 (B) $30$ $79$ $$ $71.67$ $59.06$ ; $81.60$ $0.7\%$ Patro et al, 2015 $115$ $206$ $$ $71.67$ $59.06$ ; $81.60$ $0.7\%$ Sold et al, 2010 $194$ $405$ $$ $42.273$ $42.273$ $44.273$				<b>H</b>			
Altieri et al, 2017 (C)       80       152        52.63       [44.69, 60.44]       1.4%         Warshaw et al, 2015 (G)       300       583       51.46       [47.40, 55.50]       2.2%         Warshaw et al, 2015 (H)       291       579       50.26       [44.69, 60.44]       1.4%         Azfar et al, 2015 (J)       511       1020        48.53       [40.25, 56.89]       1.3%         Azfar et al, 2014 (A)       63       136        48.53       [40.25, 56.89]       1.3%         Warshaw et al, 2015 (I)       473       1034        46.74       [42.73, 48.79]       2.4%         Carter et al, 2017 (B)       30       79        37.97       [27.99, 49.09]       0.9%         Heterogeneity: $l^2 = 97\%$ , $t^2 = 0.0291$ , $p = 0$ 70.96       [69.76; 72.14]       89.8%         F2F physician = Non-specialist          71.67       [59.06; 81.60]       0.7%         Muir et al, 2010       194       405         45.28       [32.52; 58.70]       0.7%         Jones et al, 2020       12       37         32.43       [19.43, 48.86]       0.5%	Warshaw et al, 2015 (D)	344	651	-	52.84	[49.00; 56.65]	2.2%
Warshaw et al, 2015 (G)       300       583       51.46 $(47.40; 55.50]$ 2.2%         Warshaw et al, 2015 (H)       291       579       50.26 $(46.19; 54.32]$ 2.2%         Warshaw et al, 2015 (J)       5111       1020       50.16 $(47.40; 55.50]$ 2.2%         Azfar et al, 2014 (C)       66       136        48.53 $(40.25; 56.89]$ 1.3%         Azfar et al, 2015 (I)       473       1034        48.53 $(40.25; 56.89]$ 1.3%         Azfar et al, 2017 (B)       30       79        37.97       [27.99; 49.09]       0.9%         Combined prevalence       17879       24965        70.56       [59.76; 72.14]       89.8%         Heterogenety: $l^2 = 97\%$ , $r^2 = 0.0291$ , $p = 0$ 71.67       [59.06; 81.60]       0.7%         Feller et al, 2010       194       405        47.50       [43.07; 25.77]       2.0%         Keller et al, 2021       183       528        32.43       [19.43; 48.86]       0.5%         Duong et al, 2021       12       37        32.43       [19.43; 48.86]       0.5%         Duong et al, 2020       12 <t< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td></t<>							
Warshaw et al, 2015 (J)       511       1020 $\blacksquare$ Azfar et al, 2014 (C)       66       136 $\blacksquare$ 48.53       [40.25, 56.89]       1.3%         Azfar et al, 2014 (C)       66       136 $\blacksquare$ 48.53       [40.25, 56.89]       1.3%         Warshaw et al, 2015 (I)       473       1034 $\blacksquare$ 46.74       [42.73, 48.79]       2.4%         Carter et al, 2017 (B)       30       79 $\blacksquare$ 37.97       [27.99, 49.09]       0.9%         Heterogeneity: $I^2 = 97\%$ , $t^2 = 0.0291$ , $p = 0$ $\blacksquare$ $=$ $71.67$ [59.06, 81.60]       0.7%         Patro et al, 2015       115       206 $\blacksquare$ $\blacksquare$ $45.27.27, 75.09$ 0.8%         Patro et al, 2010       194       405 $\blacksquare$ $45.28$ [32.52, 58.70]       0.7%         Jones et al, 2021       183       528 $\blacksquare$ $=$ $32.62, 62.46$ 1.6%         Constello et al, 2017       (A) $34$ $\bullet$ $32.52, 58.70$ 0.7%         Jones et al, 2020       12 $37$ $=$ $32.43$ [19.43, 48.86]       0.5%         Duong et al, 2014 (B)       34       110 $=$ <	Warshaw et al, 2015 (G)	300	583	<b>_</b>	51.46	[47.40; 55.50]	2.2%
Azfar et al, 2014 (Å)       63       136        46.32 $[38, 12, 54, 73]$ 1.3%         Warshaw et al, 2015 (l)       473       1034        45.74 $[42, 73, 48, 79]$ 2.4%         Carter et al, 2017 (B)       30       79        37.97       2.4%       90.90       0.9%         Combined prevalence       17879       24965        70.96       [69.76; 72.14]       89.8%         Heterogeneity: $l^2 = 97\%$ , $t^2 = 0.0291$ , $p = 0$ 71.67       [59.06; 81.60]       0.7%         Patro et al, 2014 (A)       44       68         64.71       [52.77; 75.09]       0.8%         Patro et al, 2010       194       405         45.28       [32.52; 58.70]       0.7%         Keller et al, 2020 (A)       24       53         32.43       [19.43; 48.86]       0.5%         Duong et al, 2017 (A)       11       79         32.43       [19.43; 48.86]       0.5%         Duong et al, 2017 (A)       11       79         30.91       [2.29, 40.37]       1.1%         Costello et al, 2020 12 <td< td=""><td>Warshaw et al, 2015 (J)</td><td></td><td></td><td></td><td></td><td></td><td></td></td<>	Warshaw et al, 2015 (J)						
Warshaw et al, 2015 (i)       473       1034       45.74 $42.73; 48.79$ 2.4%         Carter et al, 2017 (B)       30       79       37.97 $27.99; 49.09$ 0.9%         Heterogeneity: $I^2 = 97\%, t^2 = 0.0291, p = 0$ 70.96       [69.76; 72.14]       89.8%         F2F physician = Non-specialist       71.67       [59.06; 81.60]       0.7%         Muir et al, 2011 (A)       43       60       64.71       [52.72; 75.09]       0.8%         Patro et al, 2010       194       405       47.90       [43.07; 52.77]       2.0%         Keller et al, 2020 (A)       24       53       45.28       [32.52; 58.70]       0.7%         Jones et al, 2021       183       528       45.28       32.62; 58.70]       0.7%         Costello et al, 2017 (A)       11       79       32.43       [19.43; 48.86]       0.5%         Duong et al, 2017 (A)       11       79       44.10       [39.92; 48.37]       10.2%         Heterogeneity: $I^2 = 91\%, t^2 = 0.0291, p < 0.01$ 68.54       [67.34; 69.71]       100.0%							
Combined prevalence       17879       24965       70.96 [69.76; 72.14]       89.8%         Heterogeneity: $I^2 = 97\%$ , $t^2 = 0.0291$ , $p = 0$ 71.67 [59.06; 81.60]       0.7%         F2F physician = Non-specialist       71.67 [59.06; 81.60]       0.7%         Muir et al, 2011 (A)       43       60       71.67 [59.06; 81.60]       0.7%         Patro et al, 2015       115       206       64.71 [52.72; 75.09]       0.8%         Patro et al, 2010       194       405       47.90 [43.07; 52.77]       2.0%         Keller et al, 2020 (A)       24       53       45.28 [32.52; 58.70]       0.7%         Jones et al, 2021       183       52.8       34.66 [30.72; 38.82]       2.1%         Costello et al, 2017 (A)       11       79       32.43 [19.43; 48.86]       0.5%         Duong et al, 2014 (B)       34       110       -       30.91 [22.99; 40.13]       1.1%         Combined prevalence       660       1546       44.10 [39.92; 48.37]       10.2%         Heterogeneity: $I^2 = 91\%$ , $r^2 = 0.0291$ , $p < 0.01$ 68.54 [67.34; 69.71]       100.0%	Warshaw et al, 2015 (I)	473	1034	_ <b>=</b>	45.74	[42.73; 48.79]	2.4%
F2F physician = Non-specialist         Muir et al, 2011 (A)       43       60         Duong et al, 2014 (A)       44       68         Patro et al, 2015       115       206         Chen et al, 2010       194       405         Keller et al, 2020 (A)       24       53         Jones et al, 2021       183       528         Costello et al, 2020 (A)       12       37         Jones et al, 2014 (B)       34       110         Costello et al, 2020 (A)       11       79         Combined prevalence       660       1546         Heterogeneity: $l^2 = 91\%$ , $r^2 = 0.0291$ , $p < 0.01$ 68.54       [67.34; 69.71]	Combined prevalence	17879		•			
Duong et al, 2014 (A)       44       68       64.71 $[52.72, 75.09]$ 0.8%         Patro et al, 2015       115       206       55.83 $[48.98, 62.46]$ 1.6%         Chen et al, 2010       194       405       405       47.90 $[43.07, 28.27]$ 2.0%         Keller et al, 2020 (A)       24       53       45.28 $[32.52, 58.70]$ 0.7%         Jones et al, 2021       12       37       32.43 $[19.43, 48.86]$ 0.5%         Duong et al, 2014 (B)       34       110       -       30.91       [22.99, 40.13]       1.1%         Carter et al, 2017 (A)       11       79       -       -       30.91       [22.99, 40.13]       1.1%         Combined prevalence       660       1546       -       44.10       [39.92; 48.37]       10.2%         Heterogeneity: $J^2 = 91\%$ , $\tau^2 = 0.0291$ , $p < 0.01$ -       68.54       [67.34; 69.71]       100.0%							
Patro et al, 2015       115       206 $\blacksquare$ 55.83       [48.98; 62.46]       1.6%         Chen et al, 2010       194       405 $\blacksquare$ 47.90       [43.07; 52.77]       2.0%         Keller et al, 2020 (A)       24       53 $\blacksquare$ 34.66       [30.72; 38.82]       2.1%         Costello et al, 2020       12       37 $\blacksquare$ 32.43       [19.43; 48.86]       0.5%         Duong et al, 2017 (A)       11       79 $\blacksquare$ 30.91       [22.99; 40.13]       1.1%         Carter et al, 2017 (A)       11       79 $\blacksquare$ 13.92       [7.88; 23.42]       0.6%         Heterogeneity: $I^2 = 91\%$ , $\tau^2 = 0.0291$ , $p < 0.01$ $\bullet$ $\bullet$ $\bullet$ $\bullet$ $\bullet$ Combined prevalence       18539       26511 $\bullet$ $\bullet$ $\bullet$ $\bullet$ $\bullet$ Combined prevalence       18539       26511 $\bullet$ $\bullet$ $\bullet$ $\bullet$ $\bullet$ $\bullet$							
Keller et al, 2020 (A)       24       53       45.28       [32.52; 58.70]       0.7%         Jones et al, 2021       183       528       34.66       [30.72; 38.82]       2.1%         Costello et al, 2020       12       37       32.43       [19.43; 48.86]       0.5%         Duong et al, 2014 (B)       34       110 $\rightarrow$ 30.91       [22.99; 40.13]       1.1%         Carter et al, 2017 (A)       11       79 $\rightarrow$ 13.92       [7.88; 23.42]       0.6%         Combined prevalence       660       1546 $\rightarrow$ 44.10       [39.92; 48.37]       10.2%         Heterogeneity: $l^2 = 91\%$ , $\tau^2 = 0.0291$ , $p < 0.01$ 68.54       [67.34; 69.71]       100.0%	Patro et al, 2015	115	206		55.83	[48.98; 62.46]	1.6%
Jones et al, 2021       183       528       34.66 $[30.72; 38.82]$ 2.1%         Costello et al, 2020       12       37       32.43 $[19.43; 48.86]$ 0.5%         Duong et al, 2014 (B)       34       110 $\blacksquare$ 30.91 $[22.99; 40.13]$ 1.1%         Carter et al, 2017 (A)       11       79 $\blacksquare$ 13.92 $[7.88; 23.42]$ 0.6%         Combined prevalence       660       1546 $44.10$ $[39.92; 48.37]$ 10.2%         Heterogeneity: $I^2 = 91\%$ , $\tau^2 = 0.0291$ , $p < 0.01$ <b>68.54 69.71] 100.0%</b>				<b>_</b> _			
Duong et al, 2014 (B) $34$ $110$ $$ $30.91$ $[22.99; 40.13]$ $1.1\%$ Carter et al, 2017 (A) $11$ $79$ $$ $13.92$ $[7.88; 23.42]$ $0.6\%$ Combined prevalence $660$ $1546$ $44.10$ $[39.92; 48.37]$ $10.2\%$ Heterogeneity: $l^2 = 91\%$ , $\tau^2 = 0.0291$ , $p < 0.01$ <b>68.54 67.34; 69.71]</b> $100.0\%$	Jones et al, 2021	183	528	-	34.66	[30.72; 38.82]	2.1%
Combined prevalence         660         1546         44.10         [39.92; 48.37]         10.2%           Heterogeneity: $I^2 = 91\%, \tau^2 = 0.0291, p < 0.01$ 68.54         [67.34; 69.71]         100.0%	Duong et al, 2014 (B)	34	110	-	30.91	[22.99; 40.13]	1.1%
Heterogeneity: $l^2 = 91\%$ , $\tau^2 = 0.0291$ , $p < 0.01$ <b>Combined prevalence</b> 18539 26511 68.54 [67.34; 69.71] 100.0%				•			
	Heterogeneity: $I^2 = 91\%$ , $\tau^2 = 0.03$	291, p < 0.0	)1	-			
Residual heterogeneity: $J^2 = NA$ , $p = NA$ 0 20 40 60 80 100	Heterogeneity: $I^2 = 98\%$ , $\tau^2 = 0.02$	291, <i>p</i> = 0	í	· · · · ·	1	[67.34; 69.71]	100.0%

1								
2								
3		В						
4		D						
5			Study	Total		Kappa	95% C.I.	Weight
6								
7			F2F physician = Dermatolog		_	0.00	10.00.000	0.00/
8			Goulart-Silveira, et al, 2019 Muir et al. 2011 (B)	39 60			[0.92; 0.98] [0.89; 0.96]	
9			Muir et al, 2011 (B) Sola-Ortigosa et al, 2020 (D)	636	+		[0.89, 0.90]	
			Nami et al, 2015	391	+		[0.89; 0.92]	
10			Sola-Ortigosa et al, 2020 (E)	636	· · · · · · · · · · · · · · · · · · ·		[ 0.88; 0.91]	
11			Sola-Ortigosa et al, 2020 (C)	636	<u>+</u>		[0.87; 0.91]	
12			Sola-Ortigosa et al, 2020 (F) Sola-Ortigosa et al, 2020 (A)	636 636	+		[ 0.87; 0.91] [ 0.85; 0.89]	
13			Rubegni et al, 2011	130			[0.81; 0.90]	
14			Senel, et al, 2013 (D)	150	-		[0.81; 0.90]	2.2%
15			Senel, et al, 2013 (C)	150	-		[ 0.80; 0.89]	
16			Sola-Ortigosa et al, 2020 (B) Bibas et al. 2010	636 174			[0.80; 0.85]	
17			Ribas et al, 2010 Senel, et al, 2013 (A)	150	-		[0.74; 0.85] [0.70; 0.83]	
18			Senel, et al, 2013 (B)	150			[ 0.67; 0.81]	
19			Giavina-Bianchi et al, Oct 202		•		[ 0.74; 0.75]	
20			Rios-Yuil, 2012	30			[0.38; 0.82]	
			Warshaw et al, 2015 (C) Clarke et al, 2021	2152 206			[0.59; 0.65] [0.50; 0.68]	
21			Lamel et al, 2012	86	<mark>_</mark>		[0.44; 0.72]	
22			Altieri et al, 2017 (C)	232	- <b>-</b>		[ 0.48; 0.65]	
23			Warshaw et al, 2015 (A)	2152	-		[0.53; 0.59]	
24			Warshaw et al, 2015 (B)	2152 600			[0.53; 0.59]	
25			Saleh et al, 2017 Warshaw et al, 2015 (F)	2152			[0.46; 0.58] [0.49; 0.55]	
26			Altieri et al, 2017 (A)	232			[0.41; 0.60]	
27			Altieri et al, 2017 (B)	232			[ 0.41; 0.60]	
28			Azfar et al, 2014 (B)	76			[0.32; 0.66]	
29			Borve et al, 2013 (B) Borve et al, 2013 (A)	62 62			[0.26; 0.65] [0.25; 0.64]	
30			Keller et al, 2020 (B)	100			[0.28; 0.59]	
31			Warshaw et al, 2015 (E)	2152	<u></u>		[0.42; 0.48]	
32			Warshaw et al, 2015 (D)	2152	<u></u>		[0.41; 0.47]	
			Azfar et al, 2014 (C) Azfar et al, 2014 (A)	76 76			[0.23; 0.60] [0.20; 0.58]	
33			Warshaw et al, 2015 (G)	2152	<b></b>		[0.20, 0.30]	
34			Warshaw et al, 2015 (H)	2152	<b>—</b>		[ 0.34; 0.42]	
35			Warshaw et al, 2015 (J)	2152			[ 0.33; 0.41]	
36			Gabel et al, 2021	41 2152			[0.02; 0.58]	
37			Warshaw et al, 2015 (l) Giavina-Bianchi et al, Nov 202				[0.28; 0.36] [0.20; 0.23]	
38			Random effects model	70284	- 🔶		[ 0.60; 0.75]	
39			Heterogeneity: $I^2 = 100\%$ , $\tau^2 = 0$	0.1863, <i>p</i> = 0				
40			E2E physisian = Non arceit	aliet				
41			F2F physician = Non-specia Piccoli, et al, 2014	alist 184		0.69	[0.61; 0.76]	2.2%
42			Gonzalez-Coloma, 2019	326			[0.41; 0.58]	
43			Muir et al, 2011 (A)	60		0.42	[ 0.19; 0.61]	2.1%
44			Keller et al, 2020 (A)	100			[0.22; 0.55]	
44			<b>Random effects model</b> Heterogeneity: $I^2 = 82\%$ , $\tau^2 = 0.1$	670 0314 ρ < 0.01		0.52	[ 0.26; 0.71]	8.8%
				0011, p - 0.01				
46			Random effects model	70954	<b>│</b>	0.67	[ 0.60; 0.74]	100.0%
47			Heterogeneity: $I^2 = 100\%$ , $\tau^2 = 0$			4		
48				-0.2 ( Primary dia	0 0.2 0.4 0.6 0.8 or 0.8 or 0.2 0.4 0.6 0.8 or 0.2 0.4 0.6 0.8 or			
49	371			-				
50	372		Forest plot representing F2					
51	373		e F2F physician. Studies w					
52	374	dermatologi	st; b) F2F diagnosis complet	ed by a non-s	pecialist (e.g., general	practiti	oner). (A)	Forest plot represent
53	375	percentage a	agreement and 95% C.I. for	overall conc	ordance across 40 stu	idies wi	th a total of	of 72 unique numbe
54	376		s, N of events and total inclusion					
	377	-	rall concordance across 21 s		· · · ·	-		

number of 376 377 comparisons, N of events and total included participants. (B) Forest plot representing kappa concordance and 95% C.I. for overall concordance across 21 studies with a total of 45 unique number of comparisons, N of total included

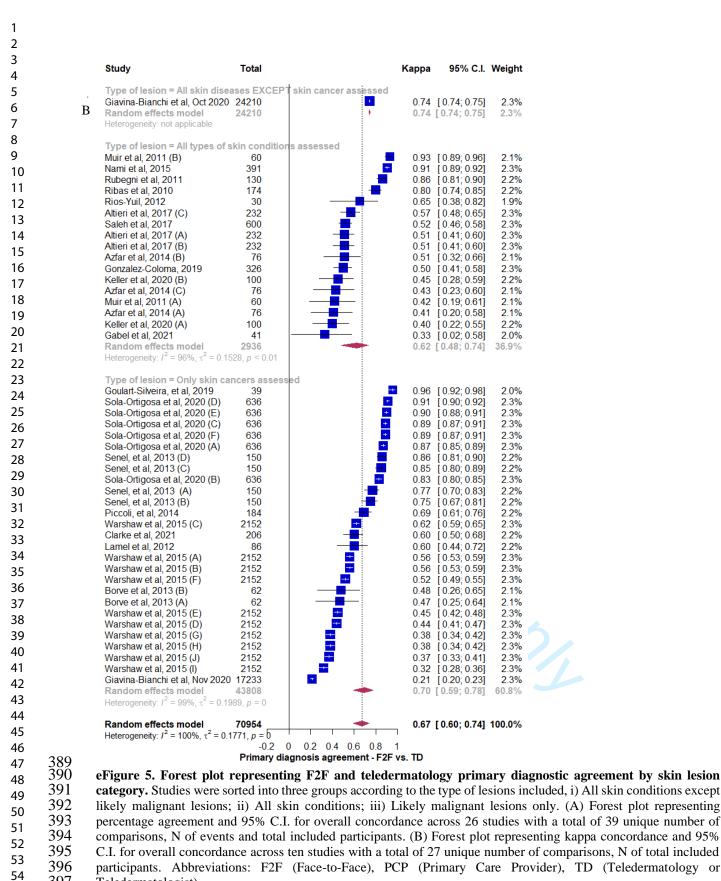
55 56 57



- 387 Care Provider), TD (Teledermatology or Teledermatologist).

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2								
3		Study	Events	Total		Agreement Rate (%)	95% C.I.	Weight
4		Type of lesion = All skin diseas	See EXC	EPT skin cano	hessessed			-
5		Giavina-Bianchi et al, Oct 2020	576	739			[74.81; 80.79]	2.0%
6		Patro et al, 2015 Chen et al, 2010	115 194	206 405	- <b>-</b>		[48.98; 62.46] [43.07; 52.77]	1.6% 2.0%
7		Combined prevalence	885	1350	-		[56.24; 67.82]	5.6%
8		Heterogeneity: $I^2 = 98\%$ , $\tau^2 = 0.035$	8, p < 0.0	71				
9		Type of lesion = All types of sk Muir et al, 2011 (B)	in condi 49	itions assesse 50	d		[87.12; 99.72]	0.1%
10		Nami et al, 2015	356	391		91.05	[87.79; 93.50]	1.3%
11		Barcaui et al, 2018 Romero et al, 2010 (A)	37 325	41 368		_	[76.73; 96.29] [84.61; 91.22]	0.3% 1.4%
12		Romero Aguilera et al, 2014 (C) Rubegni et al, 2011	150 114	170 130			[82.47; 92.28] [80.85; 92.32]	1.0% 0.8%
13		Romero et al, 2010 (B)	314	368			[81.33; 88.59]	1.6%
14		Rios-Yuil, 2012 Gatica, 2015	25 103	30 125	-		[65.68; 92.89] [74.71; 88.12]	0.3% 1.0%
15		Ribas et al, 2010	142	174		81.61	[75.15; 86.69]	1.2%
16		Saleh et al, 2017 Borve et al, 2012 (A)	488 31	600 40			[78.01; 84.25] [62.12; 87.86]	1.9% 0.5%
17		Borve et al, 2012 (B)	31	40		77.50	[62.12; 87.86]	0.5%
18		Tran et al, 2011 Marchell et al, 2017	23 77	30 101			[58.50; 88.45] [66.99; 83.53]	0.4% 1.0%
19		Marchell et al, 2017 Zanini, 2013	162 76	213 100			[69.87; 81.31] [66.68; 83.36]	1.5% 1.0%
		Gerhardt et al, 2021	609	809		75.28	[72.19; 78.13]	2.1%
20		Romero Aguilera et al, 2014 (A) Romero Aguilera et al, 2014 (B)	124 123	170 170			[65.77; 79.08] [65.16; 78.55]	1.4% 1.4%
21		Marchell et al, 2017	81	112		- 72.32	[63.33; 79.81]	1.1%
22		Muir et al, 2011 (A) Vano-Galvan et al, 2011	43 1381	60 2000		69.05	[59.06; 81.60] [66.99; 71.04]	0.8% 2.3%
23		Gabel et al, 2021 Duong et al, 2014 (A)	27 44	41 68			[50.28; 78.62] [52.72; 75.09]	0.6% 0.9%
24		Barbieri et al, 2014 (Á)	32	50		64.00	[49.95; 76.00]	0.7%
25		Zink et al, 2017, July (A) Altieri et al, 2017 (A)	115 93	195 160			[51.94; 65.66] [50.35; 65.52]	1.6% 1.5%
26		Azfar et al, 2014 (B)	77	136		56.62	[48.18; 64.69]	1.4%
27		Barbieri et al, 2014 (B) Batalla, 2016	28 36	50 65			[42.13; 68.99] [43.22; 66.94]	0.8% 0.9%
28		Okita et al, 2016 Altieri et al, 2017 (B)	54 81	100 152			[44.20; 63.50] [45.34; 61.07]	1.2% 1.4%
29		Keller et al, 2020 (B)	28	53			[39.51; 65.76]	0.8%
30		Altieri et al, 2017 (C) Azfar et al, 2014 (C)	80 66	152 136			[44.69; 60.44] [40.25; 56.89]	1.4% 1.4%
31		Azfar et al, 2014 (A)	63	136	- <b>-</b> -	46.32	[38.12; 54.73]	1.4%
32		Keller et al, 2020 (A) Costello et al, 2020	24 12	53 37 -			[32.52; 58.70] [19.43; 48.86]	0.8% 0.6%
33		Duong et al, 2014 (B)	34	110 7986	-	30.91	[22.99; 40.13]	1.1%
34		<b>Combined prevalence</b> Heterogeneity: $I^2 = 93\%$ , $\tau^2 = 0.035$	<b>5758</b> 8, p < 0.0			09.85	[67.94; 71.70]	43.2%
35		Type of lesion = Only skin can	cers ass	essed				
36			0010 000	26		92.31		0.00/
37		Zink et al, 2017, Sept (B)	24		-		[73.93; 98.07]	0.2%
38		Zink et al, 2017, Sept (B) Sola-Ortigosa et al, 2020 (D) Sola-Ortigosa et al, 2020 (E)	24 915 912	1000 1000	-	<del>•</del> 91.50	[73.93; 98.07] [89.60; 93.08] [89.28; 92.80]	0.2% 1.8% 1.9%
		Sola-Ortigosa et al, 2020 (D) Sola-Ortigosa et al, 2020 (E) Sola-Ortigosa et al, 2020 (F)	915 912 903	1000 1000 1000	-	+     91.50       +     91.20       +     90.30	[89.60; 93.08] [89.28; 92.80] [88.30; 91.99]	1.8% 1.9% 1.9%
		Sola-Ortigosa et al, 2020 (D) Sola-Ortigosa et al, 2020 (E)	915 912 903	1000 1000 1000 1000 1000	-	+ 91.50 + 91.20 + 90.30 + 88.40 + 87.50	[89.60; 93.08] [89.28; 92.80]	1.8% 1.9%
39		Sola-Ortigosa et al, 2020 (D) Sola-Ortigosa et al, 2020 (E) Sola-Ortigosa et al, 2020 (F) Sola-Ortigosa et al, 2020 (C) Sola-Ortigosa et al, 2020 (A) Sola-Ortigosa et al, 2020 (B)	915 912 903 884 875 835	1000 1000 1000 1000 1000 1000	-	■ 91.50 ■ 91.20 ■ 90.30 ■ 88.40 ■ 87.50 ■ 83.50	[89.60; 93.08] [89.28; 92.80] [88.30; 91.99] [86.26; 90.24] [85.30; 89.41] [81.07; 85.67]	1.8% 1.9% 2.0% 2.0% 2.1%
39 40		Sola-Ortigosa et al, 2020 (D) Sola-Ortigosa et al, 2020 (E) Sola-Ortigosa et al, 2020 (F) Sola-Ortigosa et al, 2020 (C) Sola-Ortigosa et al, 2020 (A) Sola-Ortigosa et al, 2020 (A) Warshaw et al, 2015 (C) Warshaw et al, 2015 (A)	915 912 903 884 875 835 548 570	1000 1000 1000 1000 1000 1000 684 753		91.50 91.20 90.30 88.40 87.50 83.50 80.12 75.70	[89.60, 93.08] [89.28, 92.80] [88.30, 91.99] [86.26, 90.24] [85.30, 89.41] [81.07, 85.67] [76.96, 82.94] [72.50, 78.63]	1.8% 1.9% 2.0% 2.0% 2.1% 2.0% 2.1%
39 40 41		Sola-Ortigosa et al, 2020 (D) Sola-Ortigosa et al, 2020 (E) Sola-Ortigosa et al, 2020 (F) Sola-Ortigosa et al, 2020 (C) Sola-Ortigosa et al, 2020 (A) Sola-Ortigosa et al, 2020 (B) Warshaw et al, 2015 (C)	915 912 903 884 875 835 548	1000 1000 1000 1000 1000 1000 684	-	91.50 91.20 88.40 87.50 83.50 80.12 75.70 75.27	[89.60; 93.08] [89.28; 92.80] [88.30; 91.99] [86.26; 90.24] [85.30; 89.41] [81.07; 85.67] [76.96; 82.94]	1.8% 1.9% 2.0% 2.0% 2.1% 2.0%
39 40 41 42		Sola-Ortigosa et al, 2020 (D) Sola-Ortigosa et al, 2020 (E) Sola-Ortigosa et al, 2020 (F) Sola-Ortigosa et al, 2020 (C) Sola-Ortigosa et al, 2020 (A) Sola-Ortigosa et al, 2020 (A) Warshaw et al, 2015 (C) Warshaw et al, 2015 (A) Warshaw et al, 2015 (B) Tan et al, 2010 (B) Tan et al, 2010 (A)	915 912 903 884 875 835 548 570 566 162 283	1000 1000 1000 1000 1000 684 753 752 219 385		91.50 91.20 90.30 88.40 87.50 83.50 80.12 75.70 75.27 73.97 73.51	[89.60, 93.08]           [89.28, 92.80]           [83.30, 91.99]           [86.26, 90.24]           [85.30, 88.41]           [81.07, 85.67]           [76.96, 82.94]           [72.06, 78.63]           [72.06, 78.22]           [67.76, 79.35]           [68.87, 77.68]	1.8% 1.9% 2.0% 2.0% 2.1% 2.1% 2.1% 2.1% 2.1% 1.5%
39 40 41 42 43		Sola-Ortigosa et al, 2020 (D) Sola-Ortigosa et al, 2020 (E) Sola-Ortigosa et al, 2020 (F) Sola-Ortigosa et al, 2020 (C) Sola-Ortigosa et al, 2020 (A) Sola-Ortigosa et al, 2020 (A) Warshaw et al, 2015 (C) Warshaw et al, 2015 (A) Warshaw et al, 2015 (A) Warshaw et al, 2015 (B) Tan et al, 2010 (B) Tan et al, 2010 (A) Clarke et al, 2021 Vestergaard et al, 2020 (A)	915 912 903 884 875 835 548 570 566 162 283 205 372	1000 1000 1000 1000 1000 684 753 752 219 385 308 600		91.50 91.20 90.30 90.500	$\begin{matrix} [89.60, 93.08]\\ [82.28, 92.80]\\ [83.30, 91.99]\\ [86.26, 90.24]\\ [85.30, 89.41]\\ [85.30, 89.41]\\ [81.07, 85.67]\\ [72.50, 78.63]\\ [72.06, 78.63]\\ [72.06, 78.63]\\ [72.06, 78.63]\\ [72.06, 77.68]\\ [61.10, 71.61]\\ [58.05, 65.80] \end{matrix}$	1.8% 1.9% 2.0% 2.0% 2.1% 2.1% 2.1% 2.1% 1.5% 1.8% 1.8% 2.1%
<ol> <li>39</li> <li>40</li> <li>41</li> <li>42</li> <li>43</li> <li>44</li> </ol>		Sola-Ortigosa et al, 2020 (D) Sola-Ortigosa et al, 2020 (E) Sola-Ortigosa et al, 2020 (F) Sola-Ortigosa et al, 2020 (C) Sola-Ortigosa et al, 2020 (A) Sola-Ortigosa et al, 2020 (B) Warshaw et al, 2015 (C) Warshaw et al, 2015 (A) Warshaw et al, 2015 (A) Warshaw et al, 2015 (B) Tan et al, 2010 (B) Tan et al, 2010 (A) Clarke et al, 2021 Vestergaard et al, 2020 (A) Lamel et al, 2012	915 912 903 884 875 835 548 570 566 162 283 205 372 66	1000 1000 1000 1000 1000 684 753 752 219 385 308 600 107		91.50 91.20 90.30 88.40 87.50 83.50 80.12 75.70 75.27 73.97 73.51 66.56 62.00 61.68	$\begin{matrix} [89,60,93,08]\\ [89,28,92,80]\\ [83,30,91,99]\\ [86,26,90,24]\\ [85,30,89,41]\\ [81,07,85,67]\\ [76,96,82,94]\\ [72,50,78,63]\\ [7$	1.8% 1.9% 2.0% 2.0% 2.1% 2.1% 2.1% 1.5% 1.8% 2.1% 1.8% 2.1% 1.8% 2.1%
<ol> <li>39</li> <li>40</li> <li>41</li> <li>42</li> <li>43</li> <li>44</li> <li>45</li> </ol>		Sola-Ortigosa et al, 2020 (D) Sola-Ortigosa et al, 2020 (E) Sola-Ortigosa et al, 2020 (F) Sola-Ortigosa et al, 2020 (C) Sola-Ortigosa et al, 2020 (C) Sola-Ortigosa et al, 2020 (A) Warshaw et al, 2015 (C) Warshaw et al, 2015 (A) Warshaw et al, 2015 (B) Tan et al, 2010 (B) Tan et al, 2010 (B) Tan et al, 2010 (A) Clarke et al, 2021 Vestergaard et al, 2020 (A) Lamel et al, 2012 Giavina-Bianchi et al, Nov 2020 Vestergaard et al, 2020 (B)	915 912 903 884 875 548 570 566 162 283 205 372 66 490 361	1000 1000 1000 1000 1000 684 753 752 219 385 308 600 107 803 600		91.50 91.20 90.30 90.500	$\begin{matrix} [89.60, 93.08]\\ [89.28, 92.80]\\ [88.30, 91.99]\\ [86.26, 90.24]\\ [85.30, 89.41]\\ [85.30, 89.41]\\ [76.96, 82.94]\\ [72.50, 78.63]\\ [72.60, 78.63]\\ [72.60, 78.63]\\ [72.60, 78.63]\\ [72.60, 78.63]\\ [72.60, 78.63]\\ [68.77, 76.8]\\ [68.77, 76.8]\\ [61.10, 71.61]\\ [58.05, 65.80]\\ [52.16, 70.39]\\ [57.60, 64.34]\\ [56.19, 64.01]\end{matrix}$	1.8% 1.9% 2.0% 2.0% 2.0% 2.1% 2.1% 2.1% 1.8% 2.1% 1.8% 2.1% 2.2% 2.2% 2.1%
<ol> <li>39</li> <li>40</li> <li>41</li> <li>42</li> <li>43</li> <li>44</li> <li>45</li> <li>46</li> </ol>		Sola-Ortigosa et al, 2020 (D) Sola-Ortigosa et al, 2020 (E) Sola-Ortigosa et al, 2020 (F) Sola-Ortigosa et al, 2020 (C) Sola-Ortigosa et al, 2020 (C) Sola-Ortigosa et al, 2020 (A) Sola-Ortigosa et al, 2020 (B) Warshaw et al, 2015 (C) Warshaw et al, 2015 (C) Warshaw et al, 2015 (B) Tan et al, 2010 (B) Tan et al, 2010 (B) Tan et al, 2010 (A) Clarke et al, 2021 Vestergaard et al, 2020 (A) Lamel et al, 2012	915 912 903 884 875 835 548 570 566 162 283 205 372 66 490	1000 1000 1000 1000 1000 1000 684 753 752 219 385 385 308 600 107 803		91.50 91.20 90.30 88.40 87.50 83.50 80.12 75.70 75.27 75.27 73.97 73.51 66.56 62.00 61.68 61.02 60.17 60.00	$\begin{matrix} [89.60, 93.08]\\ [89.28, 92.80]\\ [86.26, 90.24]\\ [85.30, 89.41]\\ [85.30, 89.41]\\ [85.30, 89.41]\\ [72.50, 78.63]\\ [72.50, 78.63]\\ [72.50, 78.63]\\ [72.50, 78.63]\\ [61.77, 76.8]\\ [61.10, 71.61]\\ [58.87, 77.68]\\ [61.10, 71.61]\\ [52.16, 70.39]\\ [57.60, 64.34] \end{matrix}$	1.8% 1.9% 2.0% 2.0% 2.0% 2.1% 2.1% 2.1% 1.5% 1.8% 1.8% 2.1% 1.2% 2.2%
<ol> <li>39</li> <li>40</li> <li>41</li> <li>42</li> <li>43</li> <li>44</li> <li>45</li> <li>46</li> <li>47</li> </ol>		Sola-Ortigosa et al, 2020 (D) Sola-Ortigosa et al, 2020 (E) Sola-Ortigosa et al, 2020 (F) Sola-Ortigosa et al, 2020 (C) Sola-Ortigosa et al, 2020 (C) Sola-Ortigosa et al, 2020 (A) Sola-Ortigosa et al, 2020 (B) Warshaw et al, 2015 (C) Warshaw et al, 2015 (C) Warshaw et al, 2015 (B) Tan et al, 2010 (B) Tan et al, 2010 (B) Tan et al, 2010 (A) Clarke et al, 2021 Vestergaard et al, 2020 (A) Lamel et al, 2012 Giavina-Bianchi et al, Nov 2020 Vestergaard et al, 2020 (B) Warshaw et al, 2015 (F) Borve et al, 2013 (A)	915 912 903 884 875 835 548 570 566 162 283 205 372 66 490 361 357 379 38	1000 1000 1000 1000 1000 684 753 752 219 385 308 600 107 803 600 595 69 69		91.50 91.20 90.30 88.40 87.50 83.50 80.12 75.70 75.27 73.97 73.51 66.56 62.00 61.68 61.02 60.17 60.00 56.52 55.07	$\begin{matrix} [89.60, 93.08]\\ [89.28, 92.80]\\ [88.30, 91.99]\\ [86.26, 90.24]\\ [85.30, 89.41]\\ [85.30, 89.41]\\ [85.30, 89.41]\\ [72.50, 78.63]\\ [72.50, 78.63]\\ [72.50, 78.63]\\ [72.50, 78.63]\\ [72.60, 78.22]\\ [67.76, 79.36]\\ [68.87, 77.68]\\ [61.10, 71.61]\\ [58.05, 65.80]\\ [52.16, 70.39]\\ [57.60, 64.34]\\ [56.19, 64.01]\\ [56.10, 63.34]\\ [56.36, 76.63]\end{matrix}$	1.8% 1.9% 2.0% 2.0% 2.0% 2.1% 2.1% 2.1% 1.5% 1.8% 2.1% 1.8% 2.1% 2.2% 2.1% 2.1% 0.9% 0.9%
<ol> <li>39</li> <li>40</li> <li>41</li> <li>42</li> <li>43</li> <li>44</li> <li>45</li> <li>46</li> <li>47</li> <li>48</li> </ol>		Sola-Ortigosa et al, 2020 (D) Sola-Ortigosa et al, 2020 (E) Sola-Ortigosa et al, 2020 (F) Sola-Ortigosa et al, 2020 (C) Sola-Ortigosa et al, 2020 (C) Sola-Ortigosa et al, 2020 (B) Warshaw et al, 2015 (C) Warshaw et al, 2015 (C) Warshaw et al, 2015 (B) Tan et al, 2010 (B) Tan et al, 2010 (A) Clarke et al, 2021 Vestergaard et al, 2020 (A) Lamel et al, 2012 Giavina-Bianchi et al, Nov 2020 Vestergaard et al, 2020 (B) Warshaw et al, 2015 (F) Borve et al, 2013 (A) Warshaw et al, 2015 (E) Warshaw et al, 2015 (E) Warshaw et al, 2015 (E)	915 912 903 884 875 835 548 570 566 162 283 372 66 490 361 357 39 388 348 344	$\begin{array}{c} 1000\\ 1000\\ 1000\\ 1000\\ 1000\\ 1000\\ 684\\ 753\\ 752\\ 219\\ 385\\ 308\\ 600\\ 107\\ 803\\ 600\\ 595\\ 69\\ 69\\ 652\\ 651 \end{array}$		91.50 91.20 90.30 88.40 87.50 83.50 80.12 75.70 75.27 73.97 73.51 66.56 62.00 61.68 61.02 60.17 60.00 56.52 55.07 53.37 52.84	$\begin{matrix} [89,60,93,08]\\ [89,28,92,80]\\ [83,30,91,99]\\ [86,26,90,24]\\ [85,30,89,41]\\ [81,07,85,67]\\ [76,96,82,94]\\ [72,50,78,63]\\ [72,50,78,63]\\ [72,50,78,63]\\ [72,50,78,63]\\ [61,76,79,35]\\ [68,87,77,68]\\ [61,10,71,61]\\ [58,05,65,80]\\ [57,60,64,34]\\ [56,19,64,01]\\ [56,01,63,86]\\ [44,68,67,66]\\ [43,27,66,33]\\ [49,53,57,18]\\ [49,00,56,65]\end{matrix}$	1.8% 1.9% 2.0% 2.0% 2.1% 2.1% 2.1% 1.5% 1.8% 1.8% 2.1% 2.2% 2.1% 2.2% 2.1% 0.9% 0.9% 0.9% 2.1%
<ol> <li>39</li> <li>40</li> <li>41</li> <li>42</li> <li>43</li> <li>44</li> <li>45</li> <li>46</li> <li>47</li> <li>48</li> <li>49</li> </ol>		Sola-Ortigosa et al, 2020 (D) Sola-Ortigosa et al, 2020 (E) Sola-Ortigosa et al, 2020 (F) Sola-Ortigosa et al, 2020 (C) Sola-Ortigosa et al, 2020 (C) Sola-Ortigosa et al, 2020 (A) Sola-Ortigosa et al, 2020 (A) Warshaw et al, 2015 (C) Warshaw et al, 2015 (B) Tan et al, 2010 (B) Tan et al, 2010 (B) Tan et al, 2010 (B) Clarke et al, 2021 Vestergaard et al, 2020 (A) Lamel et al, 2012 Giavina-Bianchi et al, Nov 2020 Vestergaard et al, 2020 (B) Warshaw et al, 2015 (F) Borve et al, 2013 (B) Borve et al, 2013 (B) Warshaw et al, 2015 (C) Warshaw et al, 2015 (D) Warshaw et al, 2015 (D) Warshaw et al, 2015 (D)	915 912 903 884 875 548 570 566 162 283 205 372 66 490 361 357 39 38 348 348 344 300	1000 1000 1000 1000 1000 1000 684 753 752 219 385 308 600 107 803 600 595 69 69 69 651 583		91.50 91.20 90.30 88.40 87.50 83.50 83.50 75.70 75.77 73.97 73.97 73.51 66.56 62.00 61.68 61.02 60.17 60.00 56.52 55.07 53.37 52.84 51.46	$\begin{matrix} [89,60,93,08]\\ [89,28,92,80]\\ [88,30,91,99]\\ [86,26,90,24]\\ [85,30,89,41]\\ [81,07,85,67]\\ [70,96,82,94]\\ [72,50,78,63]\\ [72,50,78,63]\\ [72,50,78,63]\\ [72,50,78,63]\\ [72,50,78,63]\\ [72,50,78,63]\\ [72,50,78,63]\\ [61,10,71,61]\\ [58,87,77,68]\\ [61,10,71,63]\\ [61,10,71,63]\\ [61,10,71,63]\\ [61,10,71,63]\\ [51,16,70,39]\\ [57,60,64,34]\\ [56,19,64,01]\\ [56,01,63,86]\\ [44,68,67,66]\\ [43,27,66,33]\\ [49,00,56,65]\\ [47,40,55,50]\end{matrix}\end{matrix}$	1.8% 1.9% 2.0% 2.0% 2.1% 2.1% 2.1% 1.5% 1.8% 1.8% 2.1% 2.2% 2.1% 2.2% 2.1% 2.1% 2.1% 2.1
<ol> <li>39</li> <li>40</li> <li>41</li> <li>42</li> <li>43</li> <li>44</li> <li>45</li> <li>46</li> <li>47</li> <li>48</li> <li>49</li> <li>50</li> </ol>		Sola-Ortigosa et al, 2020 (D) Sola-Ortigosa et al, 2020 (E) Sola-Ortigosa et al, 2020 (F) Sola-Ortigosa et al, 2020 (C) Sola-Ortigosa et al, 2020 (G) Sola-Ortigosa et al, 2020 (B) Warshaw et al, 2015 (C) Warshaw et al, 2015 (C) Warshaw et al, 2015 (B) Tan et al, 2010 (B) Tan et al, 2010 (A) Clarke et al, 2021 Vestergaard et al, 2020 (A) Lamel et al, 2021 Vestergaard et al, 2020 (A) Lamel et al, 2012 Giavina-Bianchi et al, Nov 2020 Vestergaard et al, 2020 (B) Warshaw et al, 2015 (F) Borve et al, 2015 (F) Warshaw et al, 2015 (C) Warshaw et al, 2015 (C) Warshaw et al, 2015 (G) Warshaw et al, 2015 (G) Warshaw et al, 2015 (H) Warshaw et al, 2015 (J)	915 912 903 884 875 835 548 570 566 162 283 205 372 66 490 361 357 39 38 348 344 300 291	1000 1000 1000 1000 1000 684 753 752 219 385 308 600 107 803 600 595 69 69 69 69 652 651 583 579 1020		91.50 91.20 90.30 88.40 75.70 75.70 75.70 73.97 73.51 66.56 62.00 61.68 61.02 60.17 60.00 56.52 55.07 53.37 52.84 51.46 50.26 50.10	$\begin{matrix} [89,60,93,08]\\ [89,28,92,80]\\ [83,30,91,99]\\ [86,26,90,24]\\ [85,30,89,41]\\ [81,07,85,67]\\ [76,96,82,94]\\ [72,50,78,63]\\ [72,50,78,63]\\ [72,50,78,63]\\ [72,50,78,63]\\ [61,76,79,35]\\ [68,87,77,68]\\ [61,10,71,61]\\ [56,10,63,77,63]\\ [56,10,64,34]\\ [56,19,64,01]\\ [56,11,63,86]\\ [44,68,67,66,33]\\ [44,68,67,66,33]\\ [49,53,57,18]\\ [49,00,56,65]\\ [47,40,55,50]\\ [46,19,54,32]\\ [47,03,53,16]\end{matrix}$	1.8% 1.9% 2.0% 2.0% 2.1% 2.1% 2.1% 1.5% 1.8% 1.8% 2.1% 2.2% 2.1% 2.1% 2.1% 0.9% 0.9% 2.1% 2.1% 2.1% 2.1% 2.1% 2.1% 2.1%
<ol> <li>39</li> <li>40</li> <li>41</li> <li>42</li> <li>43</li> <li>44</li> <li>45</li> <li>46</li> <li>47</li> <li>48</li> <li>49</li> <li>50</li> <li>51</li> </ol>		Sola-Ortigosa et al, 2020 (D) Sola-Ortigosa et al, 2020 (E) Sola-Ortigosa et al, 2020 (F) Sola-Ortigosa et al, 2020 (F) Sola-Ortigosa et al, 2020 (G) Sola-Ortigosa et al, 2020 (B) Warshaw et al, 2015 (C) Warshaw et al, 2015 (A) Warshaw et al, 2015 (B) Tan et al, 2010 (B) Tan et al, 2010 (A) Clarke et al, 2021 Vestergaard et al, 2020 (A) Lamel et al, 2012 Giavina-Bianchi et al, Nov 2020 Vestergaard et al, 2020 (B) Warshaw et al, 2015 (F) Borve et al, 2013 (A) Warshaw et al, 2015 (E) Warshaw et al, 2015 (D) Warshaw et al, 2015 (G) Warshaw et al, 2015 (H)	915 912 903 884 875 835 548 570 566 162 283 205 372 66 490 361 357 39 38 348 348 344 300 291	1000 1000 1000 1000 1000 684 753 752 219 385 308 600 107 803 600 107 803 600 595 69 69 652 651 583 579		91.50 91.20 90.30 88.40 87.50 80.12 75.70 75.27 73.97 73.51 66.56 62.00 61.68 61.02 60.10 60.00 56.52 55.07 53.37 52.84 51.46 50.26 50.10 45.74	$\begin{matrix} [89,60,93,08]\\ [89,28,92,80]\\ [83,30,91,99]\\ [86,26,90,24]\\ [85,30,89,41]\\ [81,07,85,67]\\ [76,96,82,94]\\ [72,06,78,62]\\ [72,06,78,62]\\ [72,06,78,62]\\ [61,76,79,35]\\ [68,87,77,68]\\ [61,10,71,61]\\ [56,05,65,80]\\ [52,16,70,39]\\ [57,60,64,34]\\ [56,19,64,01]\\ [56,01,63,86]\\ [44,68,67,66]\\ [44,68,67,66]\\ [44,327,66,33]\\ [49,53,57,18]\\ [49,00,56,65]\\ [47,40,55,50]\\ [47,40,55,50]\\ [47,40,55,50]\\ [46,19,54,32]\end{matrix}$	1.8% 1.9% 2.0% 2.0% 2.1% 2.1% 2.1% 2.1% 1.5% 1.8% 1.8% 2.1% 2.1% 2.1% 2.1% 0.9% 0.9% 2.1% 2.1% 2.1% 2.1%
<ol> <li>39</li> <li>40</li> <li>41</li> <li>42</li> <li>43</li> <li>44</li> <li>45</li> <li>46</li> <li>47</li> <li>48</li> <li>49</li> <li>50</li> <li>51</li> <li>52</li> </ol>		Sola-Ortigosa et al, 2020 (D) Sola-Ortigosa et al, 2020 (E) Sola-Ortigosa et al, 2020 (F) Sola-Ortigosa et al, 2020 (C) Sola-Ortigosa et al, 2020 (C) Sola-Ortigosa et al, 2020 (B) Warshaw et al, 2015 (C) Warshaw et al, 2015 (C) Warshaw et al, 2015 (B) Tan et al, 2010 (A) Clarke et al, 2021 Vestergaard et al, 2020 (A) Lamel et al, 2021 Vestergaard et al, 2020 (A) Lamel et al, 2012 Warshaw et al, 2015 (F) Borve et al, 2015 (F) Borve et al, 2015 (F) Warshaw et al, 2015 (C) Warshaw et al, 2015 (C) Warshaw et al, 2015 (C) Warshaw et al, 2015 (G) Warshaw et al, 2015 (G) Warshaw et al, 2015 (G) Warshaw et al, 2015 (G) Warshaw et al, 2015 (J) Warshaw et al, 2015 (J)	915 912 903 884 875 8355 548 570 566 162 283 205 372 66 490 361 357 39 38 348 344 300 291 511 473 30 83 83 83 83 83 83 83 83 83 83 83 83 83	1000 1000 1000 1000 1000 684 753 752 219 385 308 600 107 803 600 595 69 69 69 652 651 583 579 1020 1034 79 528		91.50 91.20 90.30 88.40 75.70 75.70 75.70 75.70 75.70 75.70 73.97 73.51 68.56 62.00 61.68 61.02 60.17 60.17 60.00 56.52 55.07 53.37 52.84 51.46 50.26 50.10 45.74 37.97 34.66	$\begin{matrix} [89,60,93,08]\\ [89,28,92,80]\\ [83,30,91,99]\\ [86,26,90,24]\\ [85,30,89,41]\\ [81,07,85,67]\\ [76,96,82,94]\\ [72,50,78,63]\\ [72,00,78,63]\\ [72,00,78,23]\\ [68,87,77,68]\\ [61,10,71,61]\\ [58,05,65,80]\\ [52,16,70,39]\\ [56,19,64,01]\\ [56,19,64,01]\\ [56,11,63,86]\\ [44,86,77,66]\\ [43,27,66,33]\\ [49,53,57,18]\\ [49,53,57,18]\\ [49,53,57,18]\\ [49,53,57,18]\\ [49,53,57,18]\\ [49,53,57,18]\\ [49,53,57,18]\\ [49,53,57,18]\\ [49,53,57,18]\\ [49,53,57,18]\\ [49,53,57,18]\\ [49,53,57,18]\\ [49,53,57,18]\\ [40,55,50]\\ [47,4$	1.8% 1.9% 2.0% 2.0% 2.1% 2.1% 2.1% 1.5% 1.8% 2.1% 1.2% 2.1% 2.1% 2.1% 2.1% 2.1% 2.1
<ol> <li>39</li> <li>40</li> <li>41</li> <li>42</li> <li>43</li> <li>44</li> <li>45</li> <li>46</li> <li>47</li> <li>48</li> <li>49</li> <li>50</li> <li>51</li> <li>52</li> <li>53</li> </ol>		Sola-Ortigosa et al, 2020 (D) Sola-Ortigosa et al, 2020 (E) Sola-Ortigosa et al, 2020 (F) Sola-Ortigosa et al, 2020 (C) Sola-Ortigosa et al, 2020 (C) Sola-Ortigosa et al, 2020 (C) Sola-Ortigosa et al, 2020 (A) Sola-Ortigosa et al, 2020 (B) Warshaw et al, 2015 (C) Warshaw et al, 2015 (B) Tan et al, 2010 (B) Tan et al, 2010 (B) Tan et al, 2010 (A) Clarke et al, 2012 (A) Uestergaard et al, 2020 (A) Lamel et al, 2012 Giavina-Bianchi et al, Nov 2020 Vestergaard et al, 2020 (B) Warshaw et al, 2015 (F) Borve et al, 2013 (B) Borve et al, 2013 (B) Borve et al, 2015 (C) Warshaw et al, 2015 (C) Warshaw et al, 2015 (D) Warshaw et al, 2015 (D) Carter et al, 2017 (B) Jones et al, 2017 (A) Combined prevalence	915 912 903 884 875 548 570 566 162 283 205 372 66 6490 361 357 39 38 348 348 348 348 300 291 511 473 30 183 11 11896	1000 1000 1000 1000 1000 1000 684 753 752 219 385 308 600 107 803 600 107 803 600 595 69 69 69 69 69 651 583 579 1020 1034 79		91.50 91.20 90.30 88.40 75.70 75.70 75.70 73.97 73.51 66.56 62.00 61.68 61.02 60.17 60.00 56.52 55.07 53.37 52.84 51.46 50.26 50.10 45.74 37.97 34.66 50.20	$\begin{array}{c} [89.60, 93.08]\\ [89.28, 92.80]\\ [88.30, 91.99]\\ [86.26, 90.24]\\ [85.30, 89.41]\\ [85.30, 89.41]\\ [85.30, 89.41]\\ [72.50, 78.63]\\ [72.50, 78.63]\\ [72.50, 78.63]\\ [72.50, 78.63]\\ [72.50, 78.63]\\ [61.77, 79.35]\\ [68.87, 77.68]\\ [61.10, 71.61]\\ [58.87, 77.68]\\ [61.10, 71.61]\\ [58.67, 76.63]\\ [61.70, 59.50]\\ [57.60, 64.34]\\ [56.19, 64.01]\\ [56.10, 63.86]\\ [43.27, 66.33]\\ [49.53, 57.18]\\ [49.00, 56.65]\\ [43.27, 66.53]\\ [44.68, 67.66]\\ [43.27, 66.33]\\ [49.55.50]\\ [46.19, 54.32]\\ [47.03, 53.16]\\ [42.73, 48.79]\\ [27.99, 49.09] \end{array}$	1.8% 1.9% 2.0% 2.0% 2.1% 2.1% 2.1% 2.1% 1.8% 1.8% 2.1% 2.1% 2.1% 2.1% 2.1% 2.1% 2.1% 2.1
<ol> <li>39</li> <li>40</li> <li>41</li> <li>42</li> <li>43</li> <li>44</li> <li>45</li> <li>46</li> <li>47</li> <li>48</li> <li>49</li> <li>50</li> <li>51</li> <li>52</li> <li>53</li> <li>54</li> </ol>		Sola-Ortigosa et al, 2020 (D) Sola-Ortigosa et al, 2020 (E) Sola-Ortigosa et al, 2020 (F) Sola-Ortigosa et al, 2020 (C) Sola-Ortigosa et al, 2020 (C) Sola-Ortigosa et al, 2020 (B) Warshaw et al, 2015 (C) Warshaw et al, 2015 (C) Warshaw et al, 2015 (B) Tan et al, 2010 (B) Tan et al, 2010 (A) Clarke et al, 2021 Vestergaard et al, 2020 (A) Lamel et al, 2021 Giavina-Bianchi et al, Nov 2020 Vestergaard et al, 2020 (B) Warshaw et al, 2015 (F) Borve et al, 2013 (A) Warshaw et al, 2015 (F) Warshaw et al, 2015 (E) Warshaw et al, 2015 (C) Warshaw et al, 2015 (G) Warshaw et al, 2015 (G) Warshaw et al, 2015 (J) Warshaw et al, 2015 (J) Carter et al, 2017 (A)	915 912 903 884 875 548 570 566 162 283 205 372 66 6490 361 357 39 38 348 348 348 348 300 291 511 473 30 183 11 11896	1000 1000 1000 1000 1000 1000 684 753 752 219 385 308 600 107 803 600 595 69 69 69 652 651 583 579 1020 1034 79 528 79 		91.50 91.20 90.30 88.40 75.70 75.70 75.70 73.97 73.51 66.56 62.00 61.68 61.02 60.17 60.00 56.52 55.07 53.37 52.84 51.46 50.26 50.10 45.74 37.97 34.66 50.20	$\begin{matrix} [89,60,93,08]\\ [89,28,92,80]\\ [83,30,91,99]\\ [86,26,90,24]\\ [85,30,89,41]\\ [81,07,85,67]\\ [76,96,82,94]\\ [72,50,78,63]\\ [72,50,78,63]\\ [72,50,78,63]\\ [72,50,78,63]\\ [61,10,71,61]\\ [58,05,65,80]\\ [57,60,64,34]\\ [56,17,63,86]\\ [44,68,67,66]\\ [43,27,66,33]\\ [49,03,57,18]\\ [49,03,56,65]\\ [47,40,55,50]\\ [47,40,55,53,16]\\ [47,30,35,16]\\ [42,73,48,79]\\ [27,99,49,09]\\ [27,99,49,09]\\ [30,72,38,82]\\ [7,88,23,42]\\ [7,88,23,42]\end{matrix}$	1.8% 1.9% 2.0% 2.0% 2.1% 2.1% 2.1% 1.5% 1.8% 1.8% 2.1% 2.2% 2.1% 2.2% 2.1% 2.2% 2.1% 2.1
<ol> <li>39</li> <li>40</li> <li>41</li> <li>42</li> <li>43</li> <li>44</li> <li>45</li> <li>46</li> <li>47</li> <li>48</li> <li>49</li> <li>50</li> <li>51</li> <li>52</li> <li>53</li> </ol>		Sola-Ortigosa et al, 2020 (D) Sola-Ortigosa et al, 2020 (E) Sola-Ortigosa et al, 2020 (F) Sola-Ortigosa et al, 2020 (C) Sola-Ortigosa et al, 2020 (C) Sola-Ortigosa et al, 2020 (C) Sola-Ortigosa et al, 2020 (C) Warshaw et al, 2015 (C) Warshaw et al, 2015 (C) Warshaw et al, 2015 (B) Tan et al, 2010 (B) Tan et al, 2010 (A) Clarke et al, 2021 Vestergaard et al, 2020 (A) Lamel et al, 2012 Giavina-Bianchi et al, Nov 2020 Vestergaard et al, 2020 (A) Borve et al, 2013 (F) Borve et al, 2013 (B) Borve et al, 2013 (C) Warshaw et al, 2015 (C) Warshaw et al, 2015 (C) Warshaw et al, 2015 (G) Warshaw et al, 2015 (I) Warshaw et al, 2015 (I) Carter et al, 2017 (B) Jones et al, 2017 (A) Combined prevalence Heterogeneity: $I^2 = 99\%$ , $\tau^2 = 0.035$	915 912 903 884 875 835 548 570 566 162 283 205 372 66 490 361 357 39 38 344 300 291 511 473 30 131 473 30 131 11896 8, $\rho = 0$ 18539	1000 1000 1000 1000 1000 1000 684 753 752 219 385 308 600 107 803 600 595 69 69 69 69 652 651 583 579 1020 1020 1034 79 528 79 1775		91.50 91.20 90.30 88.40 77.50 75.70 75.70 73.97 73.51 66.56 62.00 61.68 61.02 60.17 60.00 56.52 55.07 53.37 52.84 51.46 50.26 50.10 45.74 37.92 50.26 50.10 45.74 31.92 68.07	$\begin{matrix} [89,60,93,08]\\ [89,28,92,80]\\ [83,30,91,99]\\ [86,26,90,24]\\ [85,30,89,41]\\ [81,07,85,67]\\ [76,96,82,94]\\ [72,50,78,63]\\ [72,50,78,63]\\ [72,50,78,63]\\ [72,50,78,63]\\ [61,10,71,61]\\ [58,05,65,80]\\ [57,60,64,34]\\ [56,17,63,86]\\ [44,68,67,66]\\ [43,27,66,33]\\ [49,03,57,18]\\ [49,03,56,65]\\ [47,40,55,50]\\ [47,40,55,53,16]\\ [47,30,35,16]\\ [42,73,48,79]\\ [27,99,49,09]\\ [27,99,49,09]\\ [30,72,38,82]\\ [7,88,23,42]\\ [7,88,23,42]\end{matrix}$	1.8% 1.9% 2.0% 2.0% 2.1% 2.1% 1.5% 1.8% 1.8% 2.1% 2.1% 2.1% 2.1% 2.1% 2.1% 2.1% 2.1
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Teledermatologist).

## Pagsupppermentary eTables

Author, Year	Study design	Country	Funding reported	Intervention	*Outcome	Patients (n)	Female (%)	Mean Age (y)	Lesions (N)	]
Altieri, et al, 2017	Prospective Cohort	USA	Y	TD vs F2F Dermatologist TD and F2F dermatologists via clinical images taken by digital photography	Diagnostic agreement rate, Concordance	232	N/A	NA	232	
Azfar, et al, 2014	Prospective Cohort	USA, Botswana	Ν	TD and F2F dermatologists via smartphone images	Diagnostic agreement rate, Concordance	76	57	39	159	
Barbieri, et al, 2014	Prospective Cohort	USA	Ν	TD and F2F dermatologists via smartphone images using the AccessDerm smartphone platform	Diagnostic agreement rate	50	64	55.2	50	
Barcaui, et al, 2018	Prospective Cohort	Brazil	Ν	TD and F2F consult by the same dermatologist via digital photography and dermoscopy images stored in WhatsApp	Diagnostic agreement rate	31	71	56.5	41	
Batalla, 2015	Retrospective Cohort	Spain	Ν	TD and F2F dermatologists by via clinical images	Diagnostic agreement rate	183	66	9	65	
Borve, et al, 2012	Prospective Cohort	Sweden	Y	TD and F2F consults by the same dermatologist via smartphone images stored in Tele-Dermis	Diagnostic agreement rate	40	57.5	49	40	
Gabel, et al, 2021	Prospective Cohort	USA	Y	TD and F2F dermatologists via clinical images taken by digital photography and tablets	Diagnostic agreement rate, Concordance	41	N/A	N/A	41	
Gatica, et al, 2015	Prospective Cohort	Chile	Ν	TD and F2F dermatologists via clinical images taken by digital photography	Diagnostic agreement rate	125	57.6	37.7	125	
Gerhardt, et al, 2021	Observational	USA	Y	TD and F2F dermatologists via clinical images	Diagnostic agreement rate	809	N/A	N/A	809	
Keller, et al, 2020	Prospective Cohort	USA	Y	TD and F2F dermatologists or hospitalists on clinical images taken by smartphones and tablets	Diagnostic agreement rate, Concordance	100	43.2	N/A	100	
Marchell, et al., 2017	Quasi RCT	USA	Y	TD and F2F dermatologists via digital photography, compressed and uncompressed video	Diagnostic agreement rate (SFTD, video)	216	N/A	N/A	216	
Muir, et al, 2011	Prospective Cohort	Australia	Ν	TD and F2F emergency derms and non-specialists via clinical images taken by digital photography	Diagnostic agreement rate, Concordance	50	65	47	50	All le
Nami, et al, 2015	Prospective Cohort	Italy and Austria	Y	TD and F2F dermatologists via smartphone images stored in MugDerma	Diagnostic agreement rate, Concordance	391	52.2	54	391	All lesions
Okita, et al, 2016	Prospective Cohort	Brazil	Ν	TD and F2F dermatologists via smartphone images	Diagnostic agreement rate	100	N/A	N/A	100	
Ribas, et al, 2010	Prospective Cohort	Brazil	Y	TD and F2F dermatologists via digital photography	Diagnostic agreement rate, Concordance	174	53.4	34.7	174	
Rios-Yuil, 2011	RCT	Panama	Ν	TD and F2F dermatologists via clinical images taken by digital photography for case conferences	Diagnostic agreement rate, Concordance	30	63.3	N/A	30	
Romero Aguilera, et al, 2014	Prospective Cohort	Spain	Y	TD and F2F dermatologists via clinical images taken by digital photography stored in DERMARED.Some patients were seen by the same derm for F2F and TD.	Diagnostic agreement rate	457	56%	36	170	
Romero, et al, 2010	RCT	Spain	Y	TD and F2F consults by the same dermatologist via digital photography and videoconferences via DERMARED software	Diagnostic agreement rate	328	56%	36	510	
Rubegni, et al, 2011	Prospective Cohort	Italy	Ν	TD and F2F dermatologists via digital photography and dermoscopy images stored in Dermo-image.	Diagnostic agreement rate, Concordance	130	53.9	80.6	130	
Saleh, et al, 2017	Prospective Cohort	Egypt	Y	TD and F2F dermatologists via clinical images taken by digital photography stored in Dropbox	Diagnostic agreement rate, Concordance	600	50.7	N/A	600	
Tran, et al, 2011	Prospective Cohort	Egypt	Y	TD and F2F dermatologists via smartphone images stored in ClickDoc	Diagnostic agreement rate	30	N/A	N/A	30	
Vano-Galvan, et al, 2010	Retrospective, Cross-sectional	Spain	Ν	TD and F2F dermatologists via clinical images taken by digital photography for case conferences	Diagnostic agreement rate, 100 patients each analyzed by 20 observers	100	N/A	N/A	100	
Zanini, 2013	Prospective Cohort	Brazil	Ν	TD and F2F dermatologists via clinical images taken by digital photography	Diagnostic agreement rate	100	N/A	N/A	100	
Zink, et al, 2017, July	Prospective Cohort	Germany	Y	TD and F2F dermatologists via smartphone images stored in the KLARA app	Diagnostic agreement rate	195	20.5	N/A	195	
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			i oi pe	er review only - http://binjopen.binj.com/site/about/	guidennes.xritiin					

Borve, et al, 2013	Prospective Cohort	Sweden	Y	TD and F2F consults by the sam <b>BManapeng</b> ist via smartphone and dermoscopy images stored in iDoc 24 app	Diagnostic agreement rate, Concordance	62	38.7	64	∂9age	50
Carter, et al, 2017	Prospective, retrospective cohort	USA	Y	TD and F2F dermatologists, as well as F2F PCP via clinical images stored using Epic EHR software	Diagnostic agreement rate	79	74	47	79	
Clarke, et al, 2021	Prospective Cohort	USA	Y	TD and F2F dermatologists via clinical images taken by digital photography stored in Research Electronic Data Capture	Diagnostic agreement rate, Concordance	206	49.5	56.9	308	
Giavina-Bianchi, et al, 2020 Nov	Retrospective Cohort	Brazil	Ν	TD and F2F dermatologists via smartphone images	Diagnostic agreement rate, Concordance	17,233	71.4	N/A	803	
Goulart-Silveira et al, 2019	Prospective Cohort	Brazil	Ν	TD and F2F dermatologists via smartphone images acquired and stored via Telederma app	Concordance	39	69	68	39	<i>v</i>
Lamel, et al, 2012	Prospective Cohort	USA	Ν	TD and F2F dermatologists via smartphone images stored in ClickDerm	Diagnostic agreement rate, Concordance	86	58.1	45.2	107	Skin ca
Senel, et al, 2013	Prospective Cohort	Turkey	Ν	TD and F2F dermatologists via digital photography and dermoscopy images	Concordance with and without dermoscopy	150	49	55	150	cancers
Sola-Ortigosa, et al, 2020	Prospective Cohort	Spain	Ν	TD and F2F consults by the same dermatologist via dermoscopy and clinical images taken by digital photography and tablets	Diagnostic agreement rate, Concordance	636	43.2	72.8	1,000	only
Tan, et al, 2010	Prospective Cohort	New Zealand	Y	TD and F2F consults by the same dermatologist via digital photography	Diagnostic agreement rate	200	63	N/A	491	
Vestergaard, et al, 2020	Prospective Cohort	Denmark	Ν	TD and F2F dermatologists via smartphone and dermoscopy images using FotoFinder Systems	Diagnostic agreement rate, Concordance	519	57	55	600	
Warshaw, et al, 2015	Prospective, Cross- sectional	USA	Ν	TD and F2F dermatologists via digital photography and dermoscopy images	Diagnostic agreement rate, Concordance	2,152	3.2	68	3,021	
2015	sectional			dermoseop) mages						
Zink, et al, 2017, Sept	Prospective Cohort	Germany	Y	TD and F2F dermatologists via smartphone and dermoscopy images using Handyfotos	Diagnostic agreement rate	26	N/A	N/A	26	
Zink, et al, 2017,		Germany Brazil	Y N	TD and F2F dermatologists via smartphone and dermoscopy		26 24,210	N/A 70	N/A N/A	26 739	В.
Zink, et al, 2017, Sept Giavina-Bianchi,	Prospective Cohort Retrospective	-		TD and F2F dermatologists via smartphone and dermoscopy images using Handyfotos TD and F2F dermatologists via smartphone images Intervention	Diagnostic agreement rate Diagnostic agreement rate,					В.
Zink, et al, 2017, Sept Giavina-Bianchi, et al, 2020 Oct	Prospective Cohort Retrospective Cohort	Brazil	N Funding	TD and F2F dermatologists via smartphone and dermoscopy images using Handyfotos TD and F2F dermatologists via smartphone images Intervention TD vs F2F Non-specialist	Diagnostic agreement rate Diagnostic agreement rate, Concordance	24,210 Patients	70 Female	N/A Mean	739 Lesions	D,
Zink, et al, 2017, Sept Giavina-Bianchi, et al, 2020 Oct	Prospective Cohort Retrospective Cohort	Brazil	N Funding	TD and F2F dermatologists via smartphone and dermoscopy images using Handyfotos TD and F2F dermatologists via smartphone images Intervention	Diagnostic agreement rate Diagnostic agreement rate, Concordance	24,210 Patients	70 Female	N/A Mean	739 Lesions	В.
Zink, et al, 2017, Sept Giavina-Bianchi, et al, 2020 Oct Author, Year Costello, et al,	Prospective Cohort Retrospective Cohort Study design Prospective Cross-	Brazil Country	N Funding reported	TD and F2F dermatologists via smartphone and dermoscopy images using Handyfotos TD and F2F dermatologists via smartphone images Intervention TD vs F2F Non-specialist TD and F2F PCP via smartphone and dermoscopy images using	Diagnostic agreement rate Diagnostic agreement rate, Concordance *Outcome	24,210 Patients (n)	70 Female (%)	N/A Mean Age (y)	739 Lesions (N)	. All
Zink, et al, 2017, Sept Giavina-Bianchi, et al, 2020 Oct Author, Year Costello, et al, 2019	Prospective Cohort Retrospective Cohort Study design Prospective Cross- sectional	Brazil Country USA	N Funding reported Y	TD and F2F dermatologists via smartphone and dermoscopy images using Handyfotos TD and F2F dermatologists via smartphone images Intervention TD vs F2F Non-specialist TD and F2F PCP via smartphone and dermoscopy images using the Photo Exam app TD and F2F emergency physicians via smartphone images and	Diagnostic agreement rate Diagnostic agreement rate, Concordance *Outcome Diagnostic agreement rate Diagnostic agreement rate	24,210 Patients (n) 37	70 Female (%) 65	N/A Mean Age (y) 47.9	739 Lesions (N) 37	All
Zink, et al, 2017, Sept Giavina-Bianchi, et al, 2020 Oct Author, Year Costello, et al, 2019 Duong, et al, 2014 Gonzalez-Coloma,	Prospective Cohort Retrospective Cohort Study design Prospective Cross- sectional Observational Prospective, Cross-	Brazil Country USA France	N Funding reported Y Y N N Y	TD and F2F dermatologists via smartphone and dermoscopy images using Handyfotos TD and F2F dermatologists via smartphone images Intervention TD vs F2F Non-specialist TD and F2F PCP via smartphone and dermoscopy images using the Photo Exam app TD and F2F emergency physicians via smartphone images and videoconferences TD and F2F PCP via clinical images TD and F2F dermatologists or hospitalists on clinical images taken by smartphones and tablets	Diagnostic agreement rate         Diagnostic agreement rate, Concordance         *Outcome         Diagnostic agreement rate         Diagnostic agreement rate         (SFTD, video)         Diagnostic agreement rate, Concordance	24,210 Patients (n) 37 194 326 100	70 Female (%) 65 N/A 59 43.2	N/A Mean Age (y) 47.9 N/A 35.8 N/A	739 Lesions (N) 37 178 326 100	. All
Zink, et al, 2017, Sept Giavina-Bianchi, et al, 2020 Oct Author, Year Costello, et al, 2019 Duong, et al, 2014 Gonzalez-Coloma, et al, 2019 Keller, et al, 2020 Muir, et al, 2011	Prospective Cohort Retrospective Cohort Study design Prospective Cross- sectional Observational Prospective, Cross- sectional	Brazil Country USA France Chile USA Australia	N Funding reported Y Y N Y N	TD and F2F dermatologists via smartphone and dermoscopy images using Handyfotos TD and F2F dermatologists via smartphone images Intervention TD vs F2F Non-specialist TD and F2F PCP via smartphone and dermoscopy images using the Photo Exam app TD and F2F emergency physicians via smartphone images and videoconferences TD and F2F PCP via clinical images TD and F2F dermatologists or hospitalists on clinical images taken by smartphones and tablets TD and F2F emergency physicians via clinical images taken by digital photography	Diagnostic agreement rate         Diagnostic agreement rate, Concordance         *Outcome         Diagnostic agreement rate         Diagnostic agreement rate         (SFTD, video)         Diagnostic agreement rate, (SFTD, video)         Diagnostic agreement rate, (SFTD, video)         Diagnostic agreement rate, Concordance         Diagnostic agreement rate, Concordance	24,210 Patients (n) 37 194 326 100 60	70 Female (%) 65 N/A 59 43.2 65	N/A Mean Age (y) 47.9 N/A 35.8 N/A 47	739 Lesions (N) 37 178 326 100 60	All
Zink, et al, 2017, Sept Giavina-Bianchi, et al, 2020 Oct Author, Year Costello, et al, 2019 Duong, et al, 2014 Gonzalez-Coloma, et al, 2019 Keller, et al, 2020	Prospective Cohort Retrospective Cohort Study design Prospective Cross- sectional Observational Prospective, Cross- sectional Prospective Cohort	Brazil Country USA France Chile USA	N Funding reported Y Y N Y N Y	TD and F2F dermatologists via smartphone and dermoscopy images using Handyfotos TD and F2F dermatologists via smartphone images Intervention TD and F2F PCP via smartphone and dermoscopy images using the Photo Exam app TD and F2F emergency physicians via smartphone images and videoconferences TD and F2F PCP via clinical images TD and F2F PCP via clinical images TD and F2F dermatologists or hospitalists on clinical images taken by smartphones and tablets TD and F2F emergency physicians via clinical images taken by digital photography TD and F2F dermatologists, as well as F2F PCP via clinical images stored using Epic EHR software	Diagnostic agreement rate         Diagnostic agreement rate, Concordance         *Outcome         Diagnostic agreement rate         Diagnostic agreement rate         (SFTD, video)         Diagnostic agreement rate, (SFTD, video)         Diagnostic agreement rate, (SFTD, video)         Diagnostic agreement rate, Concordance         Diagnostic agreement rate, Concordance	24,210 Patients (n) 37 194 326 100	70 Female (%) 65 N/A 59 43.2	N/A Mean Age (y) 47.9 N/A 35.8 N/A	739 Lesions (N) 37 178 326 100	All skin lesions
Zink, et al, 2017, Sept Giavina-Bianchi, et al, 2020 Oct Author, Year Costello, et al, 2019 Duong, et al, 2014 Gonzalez-Coloma, et al, 2019 Keller, et al, 2020 Muir, et al, 2011	Prospective Cohort Retrospective Cohort Study design Prospective Cross- sectional Observational Prospective, Cross- sectional Prospective Cohort Prospective Cohort Prospective, Cohort	Brazil Country USA France Chile USA Australia	N Funding reported Y Y N Y N	TD and F2F dermatologists via smartphone and dermoscopy images using Handyfotos TD and F2F dermatologists via smartphone images Intervention TD vs F2F Non-specialist TD and F2F PCP via smartphone and dermoscopy images using the Photo Exam app TD and F2F emergency physicians via smartphone images and videoconferences TD and F2F PCP via clinical images TD and F2F dermatologists or hospitalists on clinical images taken by smartphones and tablets TD and F2F emergency physicians via clinical images taken by digital photography TD and F2F dermatologists, as well as F2F PCP via clinical	Diagnostic agreement rate         Diagnostic agreement rate, Concordance         *Outcome         Diagnostic agreement rate         Diagnostic agreement rate         (SFTD, video)         Diagnostic agreement rate, (SFTD, video)         Diagnostic agreement rate, (SFTD, video)         Diagnostic agreement rate, Concordance         Diagnostic agreement rate, Concordance	24,210 Patients (n) 37 194 326 100 60	70 Female (%) 65 N/A 59 43.2 65	N/A Mean Age (y) 47.9 N/A 35.8 N/A 47	739 Lesions (N) 37 178 326 100 60	All skin lesions
Zink, et al, 2017, Sept Giavina-Bianchi, et al, 2020 Oct Author, Year Costello, et al, 2019 Duong, et al, 2014 Gonzalez-Coloma, et al, 2019 Keller, et al, 2020 Muir, et al, 2011 Carter, et al, 2017	Prospective Cohort Retrospective Cohort Study design Prospective Cross- sectional Observational Prospective, Cross- sectional Prospective Cohort Prospective Cohort Prospective, crost- sectional Prospective cohort Prospective, crost- Retrospective, crost- Retrospective	Brazil Country USA France Chile USA Australia USA New	N Funding reported Y Y N Y N Y	TD and F2F dermatologists via smartphone and dermoscopy images using Handyfotos TD and F2F dermatologists via smartphone images Intervention TD and F2F PCP via smartphone and dermoscopy images using the Photo Exam app TD and F2F emergency physicians via smartphone images and videoconferences TD and F2F PCP via clinical images TD and F2F PCP via clinical images TD and F2F dermatologists or hospitalists on clinical images taken by smartphones and tablets TD and F2F emergency physicians via clinical images taken by digital photography TD and F2F dermatologists, as well as F2F PCP via clinical images stored using Epic EHR software TD and F2F PCP via digital photography and dermoscopy	Diagnostic agreement rate         Diagnostic agreement rate, Concordance         *Outcome         Diagnostic agreement rate         Diagnostic agreement rate         (SFTD, video)         Diagnostic agreement rate, (SFTD, video)         Diagnostic agreement rate, (SFTD, video)         Diagnostic agreement rate, Concordance         Diagnostic agreement rate, Concordance         Diagnostic agreement rate, Concordance         Diagnostic agreement rate         SSC matched for age, sex, and ethnicity. Diagnostic	24,210 Patients (n) 37 194 326 100 60 79	70 Female (%) 65 N/A 59 43.2 65 74	N/A Mean Age (y) 47.9 N/A 35.8 N/A 47 47	739 Lesions (N) 37 178 326 100 60 79	B. All skin lesions skill calleets olly
Zink, et al, 2017, Sept Giavina-Bianchi, et al, 2020 Oct Author, Year Costello, et al, 2019 Duong, et al, 2014 Gonzalez-Coloma, et al, 2019 Keller, et al, 2020 Muir, et al, 2011 Carter, et al, 2017 Jones, et al, 2021	Prospective Cohort Retrospective Cohort Study design Prospective Cross- sectional Observational Prospective, Cross- sectional Prospective Cohort Prospective Cohort Prospective cohort Retrospective cohort Retrospective	Brazil Country USA France Chile USA Australia USA New Zealand	N Funding reported Y Y N Y N Y N Y Y	TD and F2F dermatologists via smartphone and dermoscopy images using Handyfotos TD and F2F dermatologists via smartphone images Intervention TD and F2F PCP via smartphone and dermoscopy images using the Photo Exam app TD and F2F emergency physicians via smartphone images and videoconferences TD and F2F PCP via clinical images TD and F2F PCP via clinical images TD and F2F dermatologists or hospitalists on clinical images taken by smartphones and tablets TD and F2F emergency physicians via clinical images taken by digital photography TD and F2F dermatologists, as well as F2F PCP via clinical images stored using Epic EHR software TD and F2F PCP via digital photography and dermoscopy images	Diagnostic agreement rate         Diagnostic agreement rate, Concordance         *Outcome         Diagnostic agreement rate         Diagnostic agreement rate         (SFTD, video)         Diagnostic agreement rate, (SFTD, video)         Diagnostic agreement rate, (SFTD, video)         Diagnostic agreement rate, Concordance         Diagnostic agreement rate, Concordance         Diagnostic agreement rate, Concordance         Diagnostic agreement rate         SSC matched for age, sex, and ethnicity. Diagnostic agreement rate	24,210 Patients (n) 37 194 326 100 60 79 481	70 Female (%) 65 N/A 59 43.2 65 74 64	N/A Mean Age (y) 47.9 N/A 35.8 N/A 47 47 47 N/A	739 Lesions (N) 37 178 326 100 60 79 528	All skin lesions

eTable 1. Study and patient characteristics for all included studies. The table is divided into two sections: one comparing teledermatology with Face-to-Face (F2F) dermatologists, and another comparing teledermatologists with F2F non-specialists. The studies are listed alphabetically and grouped by lesion type. \*See supplementary eTable 4 for agreement rates and 

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Pageone of date values. Abbreviations used in the table include B (Benign lesions onlow EDP(ED) mergency Department), EHR (Electronic Health Record), F2F (Face-to-Face), Histo (Histopathology), ICD10 (International Classification of Diseases, 10th Edition), N (No), N/A (Not available), PCP (Primary Care Provider), PLD (Polarized Light Dermoscopy), RCT (Randomized Controlled Trial), SFTD (Store-and-Forward Teledermatology), SSC (Specialized Skin Clinic), TD (Teledermatology or Teledermatologist), and Y (Yes). Patient characteristics for all 44 included studies are also provided, grouped by lesion type, with a column describing special inclusion and exclusion criteria.

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1				
2 3	398			
4	570	Inclusion criteria	Exclusion criteria	
5 6 7 8 9 10		Primary articles assessing diagnostic agreement where store-and-forward technology or live video conference consults were compared with a control group who attend in-person visits.	Survey articles, feasibility studies, studies regarding other forms of telemedicine unrelated to dermatology, cost-effectiveness studies, editorials, and review articles.	
11 12 13		Primarily comparing teledermatology to F2F, sometimes using histopathology as the reference standard.	Studies that clearly stated they used telermatologists as the gold- or reference standard.	
14 15 16			Studies that only compared dermatoscopic images in the absence of clinical images.	
17 18			Studies where patients captured their own photographs.	
19 20	399 400	eTable 2. Inclusion and exclusion criteria f	or screening of literature search results.	
21	401	F2F: Face-to-Face.		
22 23	402 403			
23	405			
25		Study characteristics		
26 27			antry of publication. Patient characteristics: total n ber of participants per study, mean age +/- SD, ag	
28		BMI and range, race/ethnicity, type of lesion		e range, gender, mean
29 30				
30 31		Methodology - teledermatology and F2F of Method of correspondence, platform used for	consults or the teledermatology consult, training on teleder	natology platform,
32		length of teledermatology and F2F consult,	experience of the teledermatologist and F2F physi	cian, location of the
33 34			gists and F2F physicians who made a diagnosis for ans in study, order of visits, wait time between tele	
35		consult, whether same specialist conducted	teledermatology and F2F visit, specialization of th	e F2F physician,
36		number of reviews; qualifications of the ind additional training on taking clinical photog	ividual who acquired the clinical photographs and raphs	whether they received
37 38			rupiis.	
39		Metrics and results Technology used for image acquisition and	for viewing images with, distance between camera	a and lesion, number of
40 41			noscopy, brand of dermatoscope, use of histopath	
42		accuracy values (if available) such as sensiti	differential diagnoses agreement and concordance avity, specificity, PPV and NPV.	rates, diagnostic
43 44	404	eTable 3. Data extraction form with details		
45	405	F2F: Face-to-Face, PPV: Positive Predictive	Value, NPV: Negative Predictive Value.	
46 47				
48				
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50 51				
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57 58				20
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Author and Year	Unique Study Grouping	Participants (n)	Lesions (N)	Primary Diagnosis Agreement F2F vs	Diagnosis Agreement (N) / Total Diagnoses (N)	Primary Diagnosis Agreement TD vs	Diagnosis Agreement (N) / Total Diagnoses (N)	Primary Diagnosis Agreement TD vs	Diagnosis Agreement (N) / Total Diagnoses (N)	Primary Diagnosis Agreement TD vs طنومی (۱۹۹۰) میں Diagnosis Agreement (N) / Total Diagnoses (N)	Primary Diagnosis Kappa Value TD vs F2F	Primary Diagnosis Kappa Value TD vs Histo
Altieri et al, 2017	F2F Derm vs TD1											
(A)		232	232					58	93/160		0.51	
Altieri et al, 2017 (B)	F2F Derm vs TD2	232	232					53	81/152		0.51	
Altieri et al, 2017	F2F Derm vs TD3	252	232					55	01/152		0.51	
(C)		232	232					53	80/152		0.57	
Azfar et al, 2014	F2F Derm vs TD1											
(A)		76	159					47	63/136		0.41	
Azfar et al, 2014 (B)	F2F Derm vs TD2	76	159					57	77/136		0.51	
Azfar et al, 2014	F2F Derm vs TD3	70	157						///150		0.01	
(C)		76	159					49	66/136		0.43	
Barbieri et al, 2014 (A)	F2F Derm vs TD1	50	50			58	29/50	64	32/50			
Barbieri et al,	F2F Derm vs TD2											
2014 (B)		50	50					56	28/50			
Barcaui et al, 2018		31	41					90	37/41			
Batalla, 2016	F2F Derm vs TD	183	183					55	36/65			
Borve et al, 2012	F2F Derm vs TD1			0.0	25/10	(0)	07/40					
(A) Derma et el 2012	E2E Dame an TD2	40	40	88	35/40	68	27/40	78	31/40			
Borve et al, 2012 (B)	F2F Derm vs TD2	40	40					78	31/40			

Borve et al, 2013 (A)	F2F Derm vs TD1	62	69	58	40/69	55	38/69			0.47	0.5
Borve et al, 2013 (B)	F2F Derm vs TD2	62	69			57	39/69			0.48	
Carter et al, 2017 (A)	F2F nonspecialist vs TD	79	79	38	30/79	14	11/79				
Carter et al, 2017 (B)	F2F Derm vs TD	79	79	00		38	30/79				
Chen et al, 2010	F2F nonspecialist vs TD	405	405			48	194/405				
Clarke et al, 2021	F2F Derm vs TD	206	308			67	205/308	65	40/62	0.6	
Costello et al, 2020	F2F nonspecialist vs TD	37	37			32	12/37				
Duong et al, 2014 (A)	F2F nonspecialist vs TD (Videoconference)	111	110			65	44/68				
Duong et al, 2014 (B)	F2F nonspecialist vs TD (SFTD)	111	110			31	34/110				
Gabel et al, 2021	F2F Derm vs TD	41	41			67	27/41			0.33	
Gatica, 2015	F2F Derm vs TD	125	125			82	103/125				
Gerhardt et al, 2021	F2F Derm vs TD	809	809			75	609809				
Giavina-Bianchi et al, Nov 2020	F2F Derm vs TD	17233	17233			61	490/803	54	156/289	0.21	0.0
Giavina-Bianchi et al, Oct 2020	F2F Derm vs TD	17255						34	130/289		0.0
,		24210	27519			78	576/739			0.74	
Gonzalez- Coloma, 2019	F2F nonspecialist vs TD	326	326							0.5	
Goulart-Silveira, et al, 2019	F2F Derm vs TD	39	39							0.96	0.5
Jones et al, 2021	F2F nonspecialist vs TD (Suspicious Skin Cancer					25	102/520	50	<i>c</i> 0/114		
Kallan et al. 2020	pathway)	NA	528			35	183/528	53	60/114		
Keller et al, 2020 (A)	F2F nonspecialist vs TD	100	100			45	24/53			0.4	
Keller et al, 2020 (B)	F2F Derm vs TD	100	100			53	28/53			0.45	
	F2F Derm vs TD		107				66/107			0.6	

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Marchell et al, 2017	F2F Derm vs TD (SFTD)	216	216	91	122/134			76	162/213		
Marchell et al,	F2F Derm vs TD	210	210	91	122/134			70	102/213		
2017	(Uncompressed video)	216	216					76	77/101		
Marchell et al, 2017	F2F Derm vs TD (Compressed video)	216	216					72	81/112		
Muir et al, 2011 (A)	F2F nonspecialist vs TD	60	60					72	43/60		0.42
Muir et al, 2011 (B)	F2F Derm vs TD	60	60					98	49/50		0.93
Nami et al, 2015	F2F Derm vs TD	391	391					91	356/391		0.93
Okita et al, 2016	F2F Derm vs TD	100	100					54	54/100		
Patro et al, 2015	F2F nonspecialist vs TD	206	206					56	115/206		
Piccoli, et al, 2014	F2F nonspecialist vs TD	184	184								0.69
Ribas et al, 2010	F2F Derm vs TD	174	174	83	145/174	81	141/174	82	142/174		0.8
Rios-Yuil, 2012	F2F Derm vs TD	30	30	00	110/1/1	01	111/1/1	83	25/30	67	0.65
Romero Aguilera et al, 2014 (A)	F2F Derm vs TD1	457	102			69	110/170	70	124/170		
Romero Aguilera et al, 2014 (B)	F2F Derm vs TD2	457 457	192 192			73	118/170 124/170	73 72	124/170 123/170		
Romero Aguilera et al, 2014 (C)	F2F Derm vs TD3										
Romero et al,	F2F Derm vs TD (SFTD)	457	192			67	114/170	88	150/170		
2010 (A) Romero et al,	F2F Derm vs TD (SFTD and	457	192					88	325/368		
2010 (B)	videoconferencing)	457	176					85	314/368		
Rubegni et al, 2011	F2F Derm vs TD	130	130					88	114/130		0.86
Saleh et al, 2017	F2F Derm vs TD	600	600			88	526/600	81	488/600		0.46- 0.52
Senel, et al, 2013	F2F Derm vs TD1 (no dermoscopy)	150	150								0.77
Senel, et al, 2013	F2F Derm vs TD2 (no dermoscopy)	150	150								0.75

Senel, et al, 2013	F2F Derm vs TD1 (dermoscopy)	150	150									0.85
Senel, et al, 2013	F2F Derm vs TD2 (dermoscopy)	150	150									0.86
Sola-Ortigosa et al, 2020 (A)	F2F Derm vs TD1 (no dermoscopy)	636	1000			82	821/1000	88	875/1000			0.87
Sola-Ortigosa et al, 2020 (B)	F2F Derm vs TD2 (no dermoscopy)	636	1000			83	832/1000	84	835/1000			0.83
Sola-Ortigosa et al, 2020 (C)	F2F Derm vs TD3 (no dermoscopy)	636	1000			81	813/1000	88	884/1000			0.89
Sola-Ortigosa et al, 2020 (D)	F2F Derm vs TD1 (dermoscopy)	636	1000			92	915/1000	92	915/1000			0.91
Sola-Ortigosa et al, 2020 (E)	(dermoscopy)	636	1000			90	9021000	91	912/1000			0.9
Sola-Ortigosa et al, 2020 (F)	F2F Derm vs TD3 (dermoscopy)	636	1000			90	899/1000	90	903/1000			0.89
Tan et al, 2010 (A)	F2F Derm vs TD1, F2F Derm 1 vs F2F Derm 2	200	491	82	157/191	72	355/491	74	283/385			
Tan et al, 2010 (B)	F2F Derm vs TD2, F2F Derm 2 vs F2F Derm 3	200	491	76	80/106			74	162/219			
Tan et al, 2010 (C)	F2F Derm 1 vs F2F Derm 3	200	491	76	147/194							
Tran et al, 2011	F2F Derm vs TD	30	30					75	23/30			
Vano-Galvan et al, 2011	F2F Derm vs TD	100	100					69	1381/2000			
Vestergaard et al, 2020 (A)		519	600			62	370/600	62	372/600	58	170/292	
Vestergaard et al, 2020 (B)	F2F Derm vs TD2	519	600					60	361/600	54	157/292	
Warshaw et al, 2015 (A)	pigmented lesions, Macro)	2152	3021					76	570/753			0.56
Warshaw et al, 2015 (B)	F2F Derm vs TD (non biopsied pigmented lesions, Macro+PLD)	2152	3021					75	566/752			0.56
Warshaw et al, 2015 (C)	F2F Derm vs TD (non biopsied pigmented lesions, Macro+PLD)	2152	3021					80	548/684			0.62
	wiaci0+rLD)	2132	3021					00	J40/004			0.02

Warshaw et al, 2015 (D)	F2F Derm vs TD (biopsied pigmented lesions, Macro)	2152	3021	53	344/651			0.44
Warshaw et al, 2015 (E)	F2F Derm vs TD (biopsied pigmented lesions, Macro+PLD)	2152	3021	53	348/652			0.45
Warshaw et al, 2015 (F)	F2F Derm vs TD (biopsied pigmented lesions, Macro+PLD)	2152	3021	60	357/595			0.52
Warshaw et al, 2015 (G)	F2F Derm vs TD (NONbiopsied NONpigmented lesions, Macro)	2152	3021	52	300/583			0.38
Warshaw et al, 2015 (H)	F2F Derm vs TD (NONbiopsied NONpigmented lesions, Macro+PLD)	2152	3021	50	291/579			0.38
Warshaw et al, 2015 (I)	F2F Derm vs TD (biopsied NONpigmented lesions, Macro)	2152	3021	46	473/1034			0.32
Warshaw et al, 2015 (J)	F2F Derm vs TD (biopsied NONpigmented lesions, Macro+PLD)	2152	3021	50	511/1020			0.37
Zanini, 2013	F2F Derm vs TD	100	100	76	76/100			
Zink et al, 2017,	F2F Derm vs TD						100/10-	
July (A)		195	195	59	115/195	56	108/195	
Zink et al, 2017, Sept (B)	F2F Derm vs TD	26	26	92	24/26	67	17/26	

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**eTable 4. Included unique study groupings and letter codes for individual agreement rates and kappa concordance values.** The abbreviations used in the text are as follows: TD (Teledermatology or Teledermatologist), Derm (Dermatologist), F2F (Face-to-Face), SFTD (Store and Forward Technology), PLD (Polarized Light Dermoscopy), and Macro (Macroscopic clinical images).

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 3 24 25 26 27 28 29 30 31	
24 25 26 27 28 29 30 31 32 33 34 35 36 37	
38 39 40 41 42 43 44 45 46 47	
48 49 50 51 52 53 54 55 56 57 58 59 60	

Study ID	Journal	Reason For Exclusion	
NCT03034694, 2016	ClinicalTrials.gov	Wrong study design	
Andersson et al, 2017	Lakartidningen	Wrong study design	
Romero et al, 2018	Actas dermo-sifiliograficas	Wrong study design	
Orruno et al, 2016	Health Technology Assessment Database	Wrong study design	
Batalla et al, 2016	Piel	Wrong study design	
Kroemer et al, 2011	British Journal of Dermatology	Wrong study design	
Ernstberger et al, 2014	Zentralblatt fur Chirurgie	Wrong study design	
Totty et al, 2018	Journal of wound care	Wrong study design	
Wurm et al, 2013	Journal of Telemedicine and Telecare	Wrong study design	
Wang et al, 2017	Telemedicine journal and e-health : the official journal of the American Telemedicine Association	Wrong study design	
Singh et al, 2011	Australasian Journal of Dermatology	Wrong study design	
Grey et al, 2017	Dermatitis	Wrong study design	
Crompton et al, 2010	Journal of Visual Communication in Medicine	Wrong study design	
Ali et al, 2021	JMIR formative research	Wrong study design	
Boyce et al, 2011	Dermatology	Wrong study design	
Berg et al, 2017	Sarcoidosis Vasculitis and Diffuse Lung Diseases	Wrong study design	
Shin et al, 2014	Journal of telemedicine and telecare	Wrong study design	
Gacto-Sanchez et al,		• • •	
2020	Burns . Journal of the International Society for Burn injuries	Wrong study design	
Tian et al, 2017	Journal of Cosmetic Dermatology	Wrong study design	
Thind et al, 2011	Clinical and Experimental Dermatology	Wrong study design	
Silveira et al, 2014	BMC Dermatology	Wrong study design	
O'Connor et al, 2017	JAMA Dermatology	Wrong study design	
Janda et al, 2020	The Lancet. Digital health	Wrong study design	
Day et al, 2020	Military medicine	Wrong study design	
Karlsson et al, 2015	Acta Dermato-Venereologica	Wrong study design	
Seghers et al, 2015	Australasian Journal of Dermatology	Wrong study design	
Hazenberg et al, 2010	Journal of Medical Engineering and Technology	Wrong study design	
Borve et al, 2015	Acta Dermato-Venereologica	Wrong study design	
Boissin et al, 2015	Burns	Wrong study design	
Da Silva et al, 2018	Dermatology online journal	Wrong study design	
Devrim et al, 2019	BMC pediatrics	Wrong study design	
Danielsson et al, 2016	Health Technology Assessment Database	Wrong study design	
Berglund et al, 2020	Journal of the European Academy of Dermatology and Venereology : JEADV	Wrong study design	
Forsblom et al, 2013	Clinical Infectious Diseases	Wrong study design	
G Bianchi et al, 2020	Journal of medical Internet research	Wrong study design	
Congalton et al, 2015	Journal of the European Academy of Dermatology and Venereology	wrong study design	
Ferrandiz et al, 2012	Archives of Dermatology	Wrong study design	
Ismail et al, 2018	International Journal of Women's Dermatology	Wrong study design	
Gamus et al, 2019	International journal of medical informatics	Wrong study design	
Paudel et al, 2020	Case reports in dermatological medicine	Wrong study design	
Georgesen et al, 2020	Telemedicine journal and e-health : the official journal of the American Telemedicine Association	Wrong study design	
Gagnon et al, 2015	Dermatology Times	Wrong study design	
Philp et al, 2013	Pediatric Dermatology	Wrong study design	
Mooney et al, 2011	Skin Research and Technology	Wrong study design	
Do Khac et al, 2021	JMIR mHealth and uHealth	Wrong study design	
Chambers et al, 2012	Journal of the American Academy of Dermatology	Wrong study design	
2011	Telemedicine journal and e-health : the official journal of the American Telemedicine Association	Wrong study design	
Ahmed et al, 2020	Annals of internal medicine	Wrong study design	
Marwaha et al, 2019	Journal of the American Academy of Dermatology	Wrong study design	
NCT02122432, 2014	<u>ClinicalTrials.gov</u>	Wrong study design	
Lowe et al, 2021	Clinical and experimental dermatology	Wrong study design	

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3	Bowling et al, 2011	Wound Repair and Regeneration	Wrong study design
4		Journal of primary care & community health	Wrong study design
5	Veronese et al, 2021	Diagnostics (Basel, Switzerland)	Wrong study design
б	Ismail et al, 2018	International journal of dermatology	Wrong study design
7	NCT02905851, 2016	ClinicalTrials.gov	Wrong study design
8	Trinidad et al, 2020	Journal of the American Academy of Dermatology	Wrong study design
9	Tensen et al, 2019	Studies in health technology and informatics	Wrong study design
9 10	Karavan et al, 2014	Journal of telemedicine and telecare	Wrong study design
	Viola et al, 2011	Archives of Dermatology	Wrong study design
11	van Netten et al, 2017	Scientific reports	Wrong study design
12	Cai et al, 2016	Burns : journal of the International Society for Burn Injuries	Wrong study design
3	Hazenberg et al, 2010	Diabetes Technology and Therapeutics	Wrong study design
4	Jacoby et al, 2021	Journal of drugs in dermatology : JDD	Wrong study design
5	Jacoby et al, 2021	Wound repair and regeneration : official publication of the	wrong study design
6 7	Pak et al, 2018	Wound Healing Society [and] the European Tissue Repair Society	Wrong study design
3	Kummerow Broman et al, 2019	JAMA surgery	Wrong study design
	Munoz-Lopez et al, 2021	Journal of the European Academy of Dermatology and Venereology : JEADV	Wrong study design
	Markun et al, 2017	Medicine	Wrong study design
	Piette et al, 2017	Journal of telemedicine and telecare	Wrong study design
	Tan et al, 2010	British Journal of Dermatology	Wrong study design
	Watson et al, 2010	Archives of Dermatology	Wrong study design
	Wiseman et al, 2016	Journal of vascular surgery. Venous and lymphatic disorders	Wrong study design
	Wolf et al, 2013	JAMA dermatology	Wrong study design
	Laggis et al, 2020	The American Journal of dermatopathology	Wrong study design
	Kazi et al, 2021	Telemedicine journal and e-health : the official journal of the American Telemedicine Association	Wrong study design
	Kanthraj et al, 2013	Indian Journal of Dermatology, Venereology and Leprology	Wrong study design
	Shah et al, 2016	Journal of the American Academy of Dermatology	Wrong study design
	Kim et al, 2018	Skin research and technology	Wrong study design
	Nguyen et al, 2017	Journal of Clinical and Aesthetic Dermatology	Wrong study design
	Rizvi et al, 2020	PloS one	Wrong study design
	Mehrtens et al, 2019	Clinical and experimental dermatology	Wrong study design
	Knudsen et al, 2012	Lakartidningen	Research letter or letter to the editor
	Korman et al, 2020	Journal of the American Academy of Dermatology	Research letter or letter to the editor
	Mercer et al, 2014	Journal of Cutaneous Medicine and Surgery	Research letter or letter to the editor
	Grunig et al, 2015	JAMA Dermatology	Research letter or letter to the editor
	Cartron et al, 2020	Dermatologic therapy	Research letter or letter to the editor
	McAfee et al, 2020	Journal of the American Academy of Dermatology	Research letter or letter to the editor
	-	JAMA dermatology	Research letter or letter to the editor Research letter or letter to the editor
	Wong et al, 2021 Baranowski et al, 2020		
		Journal of the American Academy of Dermatology	Research letter or letter to the editor
	Micheletti et al, 2014	Journal of the American Academy of Dermatology	Research letter or letter to the editor
	Osei-Tutu et al, 2013	Journal of the American Academy of Dermatology	Research letter or letter to the editor
	Nair et al, 2015	International Journal of Dermatology	Research letter or letter to the editor
	Miller et al, 2021	Journal of the American Academy of Dermatology	Research letter or letter to the editor
	Keleshian et al, 2017	Journal of the American Academy of Dermatology	Research letter or letter to the editor
	HAYES; Inc et al, 2016	Health Technology Assessment Database	Research letter or letter to the editor
	Jacob et al, 2017	Journal of telemedicine and telecare	Research letter or letter to the editor
	Perkins et al, 2020	Journal of the American Academy of Dermatology	Research letter or letter to the editor
	Halpern et al, 2010	British Journal of Dermatology	Research letter or letter to the editor
	Newman et al, 2020	Journal of the American Academy of Dermatology	Research letter or letter to the editor
	Hunt et al, 2020	Clinical and experimental dermatology	Research letter or letter to the editor
	2018	Nursing	Research letter or letter to the editor
	Taneja et al, 2021	Indian journal of dermatology, venereology and leprology	Research letter or letter to the editor
	Echeverria-Garcia et al,	Actas dermo-sifiliograficas	Research letter or letter to the editor
	2019 Henning et al, 2010	Archives of Dermatology	Research letter or letter to the editor
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Demo et al, 2019	Clinical and experimental dermatology	Research letter or letter to the ed
Byamba et al, 2015	British Journal of Dermatology	Research letter or letter to the ed
Gupta et al, 2020	Journal of the American Academy of Dermatology Journal of the European Academy of Dermatology a	Research letter or letter to the ed
De Giorgi et al, 2017	Venereology	Research letter or letter to the ed
Duong et al, 2016	Annales de Dermatologie et de Venereologie	Research letter or letter to the ed
Mortimer et al, 2021	Journal of the American Academy of Dermatology	Research letter or letter to the ed
Gravely et al, 2010	Journal of the American Academy of Dermatology	Research letter or letter to the ed
Choi et al, 2021	International journal of dermatology	Research letter or letter to the ed
Motley et al, 2012	BMJ: British Medical Journal (Clinical Research Edition)	Research letter or letter to the ed
Leavitt et al, 2016	Journal of the American Academy of Dermatology	Research letter or letter to the ed
Cheng et al, 2020	Dermatitis : contact, atopic, occupational, drug	Research letter or letter to the ed
Clark et al, 2021	Journal of the American Academy of Dermatology	Research letter or letter to the ed
Fuesl et al, 2010	MMW-Fortschritte der Medizin	Research letter or letter to the ed
English III et al, 2013	Journal of the American Academy of Dermatology	Research letter or letter to the ed
Cotes et al, 2021	Journal of the American Academy of Dermatology	Research letter or letter to the ed
Abi Rafeh et al, 2021	Journal of cutaneous medicine and surgery	Research letter or letter to the ed
Okeke et al, 2020 Splete et al, 2014	The Journal of dermatological treatment	Research letter or letter to the ed Research letter or letter to the ed
Khosravi et al, 2014	Emergency Medicine (00136654) Clinical and experimental dermatology	Research letter or letter to the ed
Sivesind et al, 2021	Journal of the American Academy of Dermatology	Research letter or letter to the ed
Stoecker et al, 2013	JAMA dermatology	Research letter or letter to the ed
,	Journal of the European Academy of Dermatology	and
Skayem et al, 2020	Venereology : JEADV	Research letter or letter to the ed
Su et al, 2020	Journal of the American Academy of Dermatology	Research letter or letter to the ed
Massone et al, 2021	Anais brasileiros de dermatologia	Research letter or letter to the ed
Li et al, 2021	The Journal of infection	Research letter or letter to the ed
Afanasiev et al, 2021	Journal of the American Academy of Dermatology	Research letter or letter to the ed
Varma et al, 2011	British Journal of Dermatology	Research letter or letter to the ed
Van Der Heijden et al, 2010	Journal of the European Academy of Dermatology a Venereology	Research letter or letter to the ec
Motley et al, 2012	BMJ (Online)	Research letter or letter to th editor
Villani et al, 2020	Dermatologic therapy	Research letter or letter to th editor
Portnoy et al, 2018	The journal of allergy and clinical immunology. In practice	Research letter or letter to th editor
Tschandl et al, 2018	British Journal of Dermatology	Research letter or letter to th
Poolworaluk et al, 2020	Future healthcare journal	Research letter or letter to th
Anonymous et al, 2020	Journal of drugs in dermatology : JDD	Research letter or letter to th
Tan et al, 2021	Annals of the Academy of Medicine, Singapore	Research letter or letter to th
Silva et al, 2021	Anais brasileiros de dermatologia	editor Research letter or letter to th
de Giorgi et al, 2016	International Journal of Dermatology	editor Wrong outcomes
Senel et al, 2014	Journal of telemedicine and telecare	Wrong outcomes
Goodier et al, 2014	Contact dermatitis	Wrong outcomes
Foolad et al, 2017	International Journal of Dermatology	Wrong outcomes
Wells et al, 2020	The Journal of clinical and aesthetic dermatology	Wrong outcomes
Arzberger et al, 2016	Acta Dermato-Venereologica	Wrong outcomes
Creighton-Smith et al, 2017	International Journal of Dermatology	Wrong outcomes
Marwaha et al, 2019	Journal of the American Academy of Dermatology	Wrong outcomes
Pasquali et al, 2021	Actas dermo-sifiliograficas	Wrong outcomes
Vestergaard et al, 2020	Family practice	Wrong outcomes
Kravets et al, 2018	Acta dermatovenerologica Alpina, Pannonica, et Adriatica	Wrong outcomes
Speiser et al, 2014	American Journal of Dermatopathology	Wrong outcomes
N/A	Journal of the American Academy of Dermatology	Wrong outcomes
Whited et al, 2013	Journal of Telemedicine and Telecare	Wrong outcomes

Abhishek et al, 2021	medRxiv	Wrong outcomes
Villa et al, 2020	Internal and emergency medicine	Wrong outcomes
Lubeek et al, 2016	Tijdschrift voor gerontologie en geriatrie	review
Ndegwa et al, 2016	Health Technology Assessment Database	review
Moreno-Ramirez et al, 2017	Acta dermato-venereologica	review
Moreno-Ramirez et al, 2017	Acta Dermato-Venereologica	review
Van Der Heijden et al, 2010	Huisarts en Wetenschap	review
Walocko et al, 2017	Dermatologic Clinics	review
Roman et al, 2014	Journal of the Dermatology Nurses' Association	review
Hart et al, 2011	Telemedicine journal and e-health : the official journal of the American Telemedicine Association	review
Elsner et al, 2020	Journal der Deutschen Dermatologischen Gesellschaft = Journal of the German Society of Dermatology : JDDG	review
Kaliyadan et al, 2020	Indian journal of dermatology	review
Burch et al,		review
Evans et al, 2017	Pharmazeutische Zeitung	Editorial
Anonymous. et al, 2016	Journal of AHIMA / American Health Information Management Association	Editorial
Luk et al, 2018	Hong Kong Journal of Dermatology and Venereology	Editorial
Queen et al, 2018	International wound journal	Editorial
Anguita et al, 2014	Nurse Prescribing	Editorial
Haworth et al. 2020	Clinical and experimental dermatology	Editorial
Romero-Aguilera et al,		
2019	Actas dermo-sifiliograficas	Editorial
Barrio Garde et al, 2016	Piel	Editorial
Morand et al, 2010	Annales de dermatologie et de venereologie	Editorial
N/A	Journal of the American Academy of Dermatology	Abstract
N/A	Journal of the American Academy of Dermatology	Abstract
Bianchi et al, 2020	Journal of the American Academy of Dermatology	Abstract
Creadore et al, 2020	Journal of the American Academy of Dermatology	Abstract
N/A	Journal of the American Academy of Dermatology	Abstract
Tognetti L et al, 2020		Abstract
SPLETE et al, 2014	Emergency Medicine (00136654)	Abstract
N/A	Journal of the American Academy of Dermatology	Abstract
Dahlen Gyllencreutz et al, 2017	Journal of the European Academy of Dermatology and Venereology	Wrong intervention
Tandjung et al, 2015	Journal of Evaluation in Clinical Practice	Wrong intervention
Paradela-De-La-Morena	European Journal of Dermatology	Wrong intervention
et al, 2015		•
Horsham et al, 2015	British Journal of Dermatology	Wrong intervention
Saenz et al, 2018	International Journal of Telemedicine and Applications	Wrong intervention
Kochmann et al, 2016	Telemedicine journal and e-health : the official journal of the American Telemedicine Association	Wrong comparator
Markun et al, 2017	Medicine (United States)	Wrong comparator
Feigenbaum et al, 2017	Pediatric Dermatology	Wrong comparator
Massone et al, 2014	Journal of the European Academy of Dermatology and Venereology	Wrong comparator
MacLellan et al, 2021	Journal of the American Academy of Dermatology	Wrong comparator
Koysombat et al, 2021	Journal of plastic, reconstructive & aesthetic surgery : JPRAS	Corrrespondence
Jakhar et al, 2020	Clinical and experimental dermatology	Corrrespondence
Alkmim et al, 2013	Journal of Telemedicine and Telecare	Corrrespondence
NCT02836665, 2016	ClinicalTrials.gov	Clinical trial - no associat manuscript
JPRN-UMIN000020873 et al, 2016		Clinical trial - no associat manuscript
	Journal of the American Academy of Dermatology	Commentary
Fogel et al, 2016 Hover et al. 2020	('1)f1s	Commentary
Hoyer et al, 2010 Pasadyn et al, 2020	Cutis Journal of the American Academy of Dermatology	Commentary Duplicate

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Moreno-Ramirez et al, 2017	American Journal of Clinical Dermatology	Erratum		
Trovato et al, 2011	Eplasty	Wrong patient population		
Bowns et al, 2016	Health Technology Assessment Database	Wrong publication date		
Gemelas et al, 2019	Telemedicine journal and e-health : the official journal of the American Telemedicine Association	Wrong setting		
eTable 5. List of studies excluded at the full-text screening stage.				

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Signalling Q1	MPLE SELECTION           Was a consecutive or random sample of patients enrolled?	Yes/No/Unclear
Signaling Q1	- In the study by Giavina-Bianchi et al., a consecutive sample of patients	res/110/Officieal
	was enrolled, introducing less bias.	
	Skewed patient demographics: e.g., over 70% female, select age groups,	
	studies.	
	that do not disclose age range and or sex/gender of the patients.	
	- In the study by Carter et al., over 70% of the patients were female, which	
Signalling Q2	may introduce bias and reduce applicability. Was a case-control design avoided?	Yes/No/Unclear
Signaling Q2	- Gabel et al. avoided a case-control design, which reduces the risk of bias.	res/110/Officieal
Signalling Q3	Did the study avoid inappropriate exclusions?	Yes/No/Unclear
3 3 3 3	- In the study by Giavina-Bianchi et al., complex, and severe cases were	
	excluded, which may introduce bias and affect applicability.	
	Could the selection of patients have introduced bias?	
Risk of bias	- For example, Giavina-Bianchi removed the most complex/severe cases	RISK: LOW/HIGH/
	and then excluded any non-skin neoplasms, and then they further filtered to only include the 10 most common skin neoplasms.	UNCLEAR
Concerns	Is there concern that the included patients do not match the review	RISK: LOW/HIGH/
regarding	question?	UNCLEAR
applicability	- 'High' if the study only looked at a specific lesion category such as skin	
	cancers only, or pigmented lesions only, or if they had a skewed patient	
	demographics (e.g., 70% female, or geriatric population only). Our study	
	is focuses on generalizability of teledermatology in all skin conditions.	
	EX TEST (Teledermatology consult)	
Signalling Q1	Were the derms/physicians making the index diagnoses unaware of the	Yes/No/Unclear
	<ul> <li>reference diagnosis?</li> <li>Same dermatologist doing F2F and teledermatology consuls? Is there</li> </ul>	
	blinding of dermatologists to each other's diagnoses? In the study by Tan	
	et al., the same dermatologist performed both the F2F and	
	teledermatology consultations, which may introduce bias if they were not	
	blinded to each other's diagnoses.	
Signalling Q2	Did the study require physicians to provide a specific primary diagnosis, or were	Yes/No/Unclear
	they only required to provide a general grouping, e.g., inflammatory vs. skin	
	neoplasm. Was analysis only performed for categories instead of complete primary diagnoses (such as skin neoplasm vs basal cell carcinoma)?	
	Did physicians use standardized referral/consult sheet with set diagnoses? Did	
	they group similar / synonymous diagnoses (e.g dermatitis / eczema together?	
	Was a non-specialist in charge of comparing diagnoses and deciding if there was	
	agreement?	
	- In the study by Warshaw et al., physicians were required to provide a	
	categorical or pooled diagnosis (e.g., skin neoplasm instead of basal cell	
Risk of bias	carcinoma), which may introduce bias and reduce applicability.	
RISK OF DIAS	Could the conduct (technology used for taking images/viewing images) or interpretation (what constituted primary diagnosis/ complete agreement) of	RISK: LOW/HIGH/
	the index test have introduced bias?	ONOLEAR
Concerns	Is there concern that the index test, its conduct, or interpretation differ from the	RISK: LOW/HIGH/
regarding	review question?	UNCLEAR
applicability		
Domain 3: REI	FERENCE TEST (F2F, in some cases histopathology)	
Signalling Q1	Describe the reference standard and how it was conducted and interpreted:	Yes/No/Unclear

	What was the order of visits? What was the experience level and specialization of the F2F physician? Did the same dermatologist do both teledermatology and F2F consult?	
Signalling Q2	Is the reference standard likely to correctly classify the target condition?	Yes/No/Unclear
Risk of bias	<ul> <li>Could the reference standard, its conduct, or its interpretation have introduced bias?</li> <li>In studies where the reference standard was a consultation with a non-specialist, such as Costello et al., there is a risk of introducing bias.</li> </ul>	RISK: LOW/HIGH/ UNCLEAR
Concerns regarding applicability Domain 4: FLC	Could the reference standard, its conduct, or its interpretation have introduced bias? - Applicability was impacted by physician specialization. W AND TIMING	RISK: LOW/HIGH/ UNCLEAR
Signalling Q1	<ul> <li>Was there an appropriate interval between index test(s) and reference standard?</li> <li>Was the time interval greater than 2 weeks? In studies where the same dermatologist did F2F and teledermatology -&gt; Say 'No' regardless of the time between teledermatology and F2F consult.</li> <li>In the study by Gerhardt et al., there was a 30-day interval between teledermatology and F2F, which may introduce bias.</li> </ul>	Yes/No/Unclear
Signalling Q2	Did all patients receive a reference standard?	
Signalling Q3	<ul> <li>Did all patients receive the same reference standard?</li> <li>In studies like Sola-Ortigosa et al., all patients received a reference standard, either histopathology or F2F consultation.</li> <li>Did a paper use histopathology as the reference standard for cancer lesions but F2F for non-cancer lesions? Were all patients evaluated by physicians with similar level of experience?</li> </ul>	Yes/No/Unclear
Signalling Q4	<ul> <li>Were all patients included in the analysis?</li> <li>In studies like Gabel et al., all patients were included in the analysis, reducing the risk of bias.</li> </ul>	Yes/No/Unclear
Risk of bias	Could the patient flow have introduced bias?	RISK: LOW/HIGH/UNCLEA

Page 65 of 72					BN	1J Open				
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5 1	В	1	D1	Risk D2	of bias dom D3	ains D4	Overall			
5		Altieri, et al, 2017	+	+	+	+	+			
		Azfar, et al, 2014	+	+	+	+	X			
		Barbieri, et al, 2014	+	+	-	+	-			
		Barcaui, et al, 2018	+	+	×	×	X			
0		Batalla, et al, 2015	-	+	+	+	-			
1		Borve, et al, 2012	+	+	×	×	×			
2		Borve, et al, 2013	×	-	+	+	×			
3 4		Carter, et al, 2017	×	-	+	×	×			
5		Chen, et al, 2010	+	X	×	-	×			
5		Clarke, et al, 2021	×	×	+	+	×			
7		Costello, et al, 2019	×	+	×	×	×			
3		Duong, et al, 2014	+	-	×	×	×			
) )		Gabel, et al, 2021	×	+	+	×	×			
1		Gatica, 2015	+	+	-	+	-			
2		Gerhardt, et al, 2021	×	-	×	×	X			
3		Giavina-Bianchi, et al, Oct 2020	×	+	-	×	×			
4		Giavina-Bianchi, et al, Nov 2020	×	+	-	×	X			
5 6		Gonzalez-Coloma, et al, 2019	+	X	×	+	×			
7		Goulart-Silveira, et al, 2019	×	+	+	×	×			
3		Jones, et al, 2021	+	-	+	+	-			
9	Study	Keller, et al, 2020	+	+	+	+	+			
)	0)	Lamel, et al, 2012	-	-	+	+	-			
1 2		Marchell, et al, 2017	+	+	+	+	+			
3		Muir, et al, 2011	×	+	+	×	×			
4		Nami, et al, 2015	×	+	+	+	×			
5		Okita, et al, 2016	+	+	+	+	×			
5		Patro, et al, 2015	+	+	×	+	X			
3		Piccoli, et al, 2015	×	+	×	×	×			
)		Ribas, et al, 2010	×	+	×	×	×			
)		Rubegni, et al, 2011	+	+	+	+	+			
		Saleh, et al, 2017	+	+	+	+	+			
2 3		Senel, et al, 2013	X	+	+	X	X			
, 1		Sola-Ortigosa, et al, 2020	+	+	×	X	×			
5		Tan, et al, 2010	X	×	+	X	X			
5		Tran, et al, 2011	+	+	X	+	X			
7		Vano-Galvan, et al, 2010	+	+	+	+	X			
3 9		Vestergaard, et al, 2020	+	+	+	X	X			
)		Warshaw, et al, 2015	+	-	+	+	-			
1		Zanini, 2013	-	+	+	-	-			
2		Zink, et al, 2017, July	+	-	×	X	X			
3 4		Zink, et al, 2017, Sept	+	+	+	+	+			
4 5			Domains: D1: Patient se		_	Jud	gement			
6			D2: Index test D3: Reference D4: Flow & tin	e standard.		-	High Some concerns			
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### eTable 6. Risk of Bias (ROB) results.

(A) QUADAS-2 summary sheet. (B,C) QUADAS-2 RoB analysis of 41 observational studies. (D,E) ROB-2 analysis of three randomized controlled trials.

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This supplementary material has been provided by the authors to give readers additional information about their work.

Item No	Recommendation	Reported on Page No
Reporting o	f background should include	·
1	Problem definition	4
2	Hypothesis statement	4
3	Description of study outcome(s)	4-5
4	Type of exposure or intervention used	6-8
5	Type of study designs used	6-8
6	Study population	6-8
Reporting o	f search strategy should include	1
7	Qualifications of searchers (eg, librarians and investigators)	6
8	Search strategy, including time period included in the synthesis and key words	6-8
9	Effort to include all available studies, including contact with authors	6-8
10	Databases and registries searched	6-8
11	Search software used, name and version, including special features used (eg, explosion)	6-8
12	Use of hand searching (eg, reference lists of obtained articles)	6-8
13	List of citations located and those excluded, including justification	Supplement
14	Method of addressing articles published in languages other than English	6-8
15	Method of handling abstracts and unpublished studies	6-8, Supplement
16	Description of any contact with authors	6-8, Supplement
Reporting o	of methods should include	
17	Description of relevance or appropriateness of studies assembled for assessing the hypothesis to be tested	9-12
18	Rationale for the selection and coding of data (eg, sound clinical principles or convenience)	9-12
19	Documentation of how data were classified and coded (eg, multiple raters, blinding and interrater reliability)	9-12
20	Assessment of confounding (eg, comparability of cases and controls in studies where appropriate)	9-12
21	Assessment of study quality, including blinding of quality assessors, stratification or regression on possible predictors of study results	9-12
22	Assessment of heterogeneity	9-12
23	Description of statistical methods (eg, complete description of fixed or random effects models, justification of whether the chosen models account for predictors of study results, dose-response models, or cumulative meta-analysis) in sufficient detail to be replicated	9-12
24	Provision of appropriate tables and graphics	9-12, Supplement
Reportina a	f results should include	Supplement
25	Graphic summarizing individual study estimates and overall estimate	Fig 1-3, Supplement
26	Table giving descriptive information for each study included	Tables 1, 2, Supplement
27	Results of sensitivity testing (eg, subgroup analysis)	9-12
28	Indication of statistical uncertainty of findings	9-12

# **MOOSE Checklist for Meta-analyses of Observational Studies**

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Item No	Recommendation	Reported on Page No
Reporting of discussion should include		
29	Quantitative assessment of bias (eg, publication bias)	9-12
30	Justification for exclusion (eg, exclusion of non-English language citations)	9-12
31	Assessment of quality of included studies	9-12
Reporting of conclusions should include		
32	Consideration of alternative explanations for observed results	13-17
33	Generalization of the conclusions (ie, appropriate for the data presented and within the domain of the literature review)	13-17
34	Guidelines for future research	13-17
35	Disclosure of funding source	18

*From*: Stroup DF, Berlin JA, Morton SC, et al, for the Meta-analysis Of Observational Studies in Epidemiology (MOOSE) Group. Meta-analysis of Observational Studies in Epidemiology. A Proposal for Reporting. *JAMA*. 2000;283(15):2008-2012. doi: 10.1001/jama.283.15.2008.



# PRISMA 2020 Checklist

Section and Topic	ltem #	Checklist item	Location where item is reported
TITLE			
7 Title	1	Identify the report as a systematic review.	p1
ABSTRACT			
Abstract	2	See the PRISMA 2020 for Abstracts checklist.	p3-4
Rationale	3	Describe the rationale for the review in the context of existing knowledge.	p5-6
Objectives	4	Provide an explicit statement of the objective(s) or question(s) the review addresses.	p5-6
5 Eligibility criteria	5	Specify the inclusion and exclusion criteria for the review and how studies were grouped for the syntheses. p8, Su	pplementary p15
6 Information	6	Specify all databases, registers, websites, organisations, reference lists and other sources searched or consulted to identify studies. Specify the date when each source was last searched or consulted.	р7
8 Search strategy	7	Present the full search strategies for all databases, registers and websites, including any filters and limits used.	Supplementary p2
Selection process	8	Specify the methods used to decide whether a study met the inclusion criteria of the review, including how many reviewers screened each record and each report retrieved, whether they worked independently, and if applicable, details of automation tools used in the process.	p8
Data collection process	9	Specify the methods used to collect data from reports, including how many reviewers collected data from each report, whether they worked independently, any processes for obtaining or confirming data from study investigators, and if applicable, details of automation tools used in the process.	p8
Data items	10a	List and define all outcomes for which data were sought. Specify whether all results that were compatible with each outcome domain in each study were sought (e.g. for all measures, time points, analyses), and if not, the methods used to decide which results to collect.	Supplementary p15
20 27 28	10b	List and define all other variables for which data were sought (e.g. participant and intervention characteristics, funding sources). Describe any assumptions made about any missing or unclear information.	p8 and Supplementary p15
Study risk of bias assessment	11	Specify the methods used to assess risk of bias in the included studies, including details of the tool(s) used, how many reviewers assessed each study and whether they worked independently, and if applicable, details of automation tools used in the process.	p9
Effect measures	12	Specify for each outcome the effect measure(s) (e.g. risk ratio, mean difference) used in the synthesis or presentation of results.	p8-9
32 Synthesis 33 methods	13a	Describe the processes used to decide which studies were eligible for each synthesis (e.g. tabulating the study intervention characteristics and comparing against the planned groups for each synthesis (item #5)).	p8-9
34 35	13b	Describe any methods required to prepare the data for presentation or synthesis, such as handling of missing summary statistics, or data conversions.	p 8-9 Supplementary p2
36	13c	Describe any methods used to tabulate or visually display results of individual studies and syntheses.	Supplementary p2
37 38	13d	Describe any methods used to synthesize results and provide a rationale for the choice(s). If meta-analysis was performed, describe the model(s), method(s) to identify the presence and extent of statistical heterogeneity, and software package(s) used.	p 8-9 Supplementary p2
39 10	13e		9 Supplementary p2
+φ 11	13f	Describe any sensitivity analyses conducted to assess robustness of the synthesized results.	NA
12 Reporting bias 13 assessment	14	Describe any methods used to assess risk of bias due to missing results in a synthesis (arising from reporting biases).	p9
14 Certainty 15 assessment	15	Describe any methods used to assess certainty (or confidence) in the body of evidence for an outcome. For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml	NA

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# **PRISMA 2020 Checklist**

**BMJ** Open

Section and Topic	ltem #	Checklist item	Location where item is reported			
RESULTS						
Study selection	16a	Describe the results of the search and selection process, from the number of records identified in the search to the number of studies included in the review, ideally using a flow diagram.	Figure 1, p10			
	16b	Cite studies that might appear to meet the inclusion criteria, but which were excluded, and explain why they were excluded.	Supplementary p23			
Study characteristics	17	Cite each included study and present its characteristics.	p10-11, Table 1, 2			
Risk of bias in studies	18	Present assessments of risk of bias for each included study.	p15, Supplementa eTable 5			
Results of individual studies	19	For all outcomes, present, for each study: (a) summary statistics for each group (where appropriate) and (b) an effect estimate and its precision (e.g. confidence/credible interval), ideally using structured tables or plots.	p15, Supplementa eTable 5			
Results of	20a	For each synthesis, briefly summarise the characteristics and risk of bias among contributing studies.	mentary eFigure 1-5			
syntheses	20b	Present results of all statistical syntheses conducted. If meta-analysis was done, present for each the summary estimate and its precision (e.g. confidence/credible interval) and measures of statistical heterogeneity. If comparing groups, describe the direction of the effect.	p 11-13 Supplementary p3			
	20c	Present results of all investigations of possible causes of heterogeneity among study results.	p 11-13 Supplementary p3			
	20d	Present results of all sensitivity analyses conducted to assess the robustness of the synthesized results.	NA			
Reporting biases	21	Present assessments of risk of bias due to missing results (arising from reporting biases) for each synthesis assessed.	ementary eTable 5			
Certainty of evidence	22	Present assessments of certainty (or confidence) in the body of evidence for each outcome assessed.	p 11-13 Supplementary p3			
DISCUSSION	1					
Discussion	23a	Provide a general interpretation of the results in the context of other evidence.	p14			
	23b	Discuss any limitations of the evidence included in the review.	p15-16			
	23c	Discuss any limitations of the review processes used.	p16			
	23d	Discuss implications of the results for practice, policy, and future research.	p17			
	OTHER INFORMATION					
Registration and protocol	24a	Provide registration information for the review, including register name and registration number, or state that the review was not registered.	p7			
protocol	24b	Indicate where the review protocol can be accessed, or state that a protocol was not prepared.	р7			
	24c	Describe and explain any amendments to information provided at registration or in the protocol.	NA			
Support	25	Describe sources of financial or non-financial support for the review, and the role of the funders or sponsors in the review.	p18			
Competing interests	26	Declare any competing interests of review authors.	p18			
Availability of data, code and	27	Report which of the following are publicly available and where they can be found: template data collection forms; data extracted from included studies; data used for all analyses; analytic code; any other materials used in the review.				

44 From: Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ 2021;372:n71. doi: 45 10.1136/bmj.n71 For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml For more information, visit: <u>http://www.prisma-statement.org/</u>

# **BMJ Open**

# **Diagnostic Reliability in Teledermatology: A Systematic Review and a Meta-Analysis**

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<b>Primary Subject Heading</b> :	Dermatology
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2 3 4	1	Title: Diagnostic Reliability in Teledermatology: A Systematic Review and a Meta-Analysis
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Abstract Objectives: To compare teledermatology and face-to-face (F2F) agreement in primary diagnoses of dermatological conditions. Design: Systematic Review and Meta-Analysis Methods: MEDLINE, Embase, Cochrane Library (Wiley), CINAHL, and medRxiv were searched between January 2010 and May 2022. Observational studies and randomized clinical

trials that reported percentage agreement or kappa concordance for primary diagnoses between teledermatology and F2F physicians were included. Titles, abstracts, and full-text articles were screened in duplicate. From 7,173 citations, 44 articles were included. A random-effects meta-analysis was conducted to estimate pooled estimates. Primary outcome measures were mean percentage and kappa concordance for assessing diagnostic matches between teledermatology and F2F physicians. Secondary outcome measures included the agreement between teledermatologists, F2F dermatologists, and teledermatology and histopathology results. Results: 44 studies were extracted and reviewed. The pooled agreement rate was 68.9%, and kappa concordance was 0.67. When dermatologists conducted F2F and teledermatology consults, the overall diagnostic agreement was significantly higher at 71%, compared to 44% for non-specialists. Kappa concordance was 0.69 for teledermatologist vs specialist and 0.52 for non-specialists. Higher diagnostic agreements were also noted with image acquisition training and digital photography. The agreement rate was 76.4% between teledermatologsists, 82.4% between F2F physicians, and 55.7% between teledermatology and histopathology. Conclusions and Relevance: Teledermatology can be an attractive option particularly in

resource-poor settings. Future efforts should be placed on incorporating image acquisition

training and access to high-quality imaging technologies.

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2 3 4	49	Registration number: 10.17605/OSF.IO/FJDVG
5 6	50	
7 8 9	51	Keywords: teledermatology, dermatology consultations, store-and-forward, telemedicine,
10 11	52	remote consultation, dermatology hospitalists
12 13	53	
14 15 16	54	Article Summary:
17 18	55	Strengths and limitations of this study:
19 20	56	• This is the most comprehensive systematic review and meta-analysis of the topic to date
21 22 23	57	without language restrictions applied.
23 24 25	58	• Inclusion criteria were broad, including all types of dermatological diseases, imaging
26 27	59	technologies, in-person physician specializations (GPs, hospitalists, and dermatologists),
28 29 30	60	and the presence or absence of image acquisition training.
30 31 32	61	• The article search was limited to 2010 and later due to the recent incorporation of
33 34	62	smartphones in teledermatology practices.
35 36 27	63	• Due to considerable heterogeneity between studies, meta-analysis and synthesis of
37 38 39	64	predictors for accurate diagnoses remotely were limited even after subgrouping.
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# 65 Introduction

With the emergence of COVID-19, the introduction of virtual consults in healthcare settings, especially dermatology, has been expanded to allow many patients the opportunity for equitable access to care when in-person appointments pose a challenge and risk to patients.(1) Different modalities were introduced to support teledermatology. This involves remote sharing of patient data, including synchronous video-streaming teledermatology and asynchronous sharing of still images via emails, or text messages, or store-and-forward teledermatology (SFTD).

Although both synchronous and asynchronous approaches have been shown to be cost-effective, SFTD is particularly popular as it requires fewer resources and less coordination than synchronous teledermatology.(2, 3) With the advent of higher resolution smartphone cameras, relatively minimal training is required to capture data for remote dermatologists correctly; multiple SFTD studies opted to provide no training in image capture and still found value in teledermatology.(4, 5)

There is valid concern over the reliability of teledermatology given the significant variability in diagnostic accuracy predicted across pre-pandemic research.(6) This is expected given the lack of standardization across studies and the potential for confounders across teledermatology methodologies and applications, e.g., level of training or skin lesion type. This variability in approach may benefit from an increased demand, which could provide greater impetus to optimize and standardize teledermatology.

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To our knowledge, this is the first and most inclusive meta-analysis (MA) that compares teledermatology consults to face-to-face (F2F) that looked at all relevant studies without overly exclusive inclusion criteria. The primary objective of this study was to compare the reliability of teledermatology diagnoses to F2F consults, as determined by Cohen's kappa interrater agreement and total agreement rates. Teledermatology can assume important roles as a routine complement to primary care and an alternate route to the typical in-person referrals. Consequently, we wanted to determine agreement for teledermatology and all F2F consults, teledermatology and F2F primary care consults, and finally teledermatology and F2F dermatologist consults, which would arguably best capture the limitations introduced by the change in medium from F2F to teledermatology.

Additional subset analyses were performed to control for potential confounders (e.g., inflammatory vs. malignant, staff training for image acquisition, teledermoscopy, and smartphone vs digital cameras) introduced by the heterogenous methodology. The secondary objectives sought to determine the agreement rate within teledermatology diagnoses and F2F consults to provide an idea of each medium's consistency, and provide the best estimate of accuracy for the agreement rate between teledermatology and histopathology.

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3 4	104	Methods
5 6	105	This study was reported in accordance with the Preferred Reported Items for Systematic Reviews
7 8 9	106	and Meta-Analyses (PRISMA) guidelines.
9 10 11	107	
12 13	108	Protocol Registration
14 15	109	Prior to the conduct of this review, a protocol which adhered to the PRISMA-protocols (i.e.,
16 17 18	110	PRISMA-P) guidelines was developed and then registered on Open Science Framework (OSF).
18 19 20	111	Access: <u>https://osf.io/fjdvg</u> .(7)
21 22	112	
23 24 25	113	Search Strategy
25 26 27 28 29	114	A comprehensive search of major bibliographic databases, MEDLINE, Embase, Cochrane Library
	115	(Wiley), CINAHL, and medRxiv was performed in August 2021. MEDLINE was searched again
30 31	116	between August 2021 and May 2022 to screen any new articles published after our protocol was
32 33 34	117	registered. The search strategy was developed by a medical librarian at Queen's University
35 36	118	(Kingston, ON). Please see the supplementary appendix for additional information on the search
37 38	119	strategy.
39 40 41	120	
42 43	121	No restrictions were placed on the language or status of the publications. Search results were
44 45	122	limited to studies published between January 2010 and May 2022 due to the novelty of
46 47 48	123	incorporating smartphones in teledermatology remote consultations.(8) The International
48 49 50	124	Prospective Register of Systematic Reviews (PROSPERO) and OSF were searched up to May
51 52	125	2022 for relevant ongoing systematic reviews using the terms 'telemedicine,' 'teledermatology,'
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'dermatology,' 'diagnostic accuracy,' and 'diagnostic concordance.' Reference lists of included
studies were screened to identify additional studies not captured in the search.

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# 129 <u>Eligibility Criteria</u>

130 Studies evaluating the diagnostic reliability of teledermatology that reported on patients with 131 dermatological conditions assessed by a clinician using asynchronous or synchronous telemedicine 132 systems were included. All articles were required to compare tele- to F2F diagnoses conducted by 133 a physician. In this context, an 'F2F physician' refers to healthcare professionals, such as 134 dermatologists, general practitioners, or emergency department physicians, who conducted in-135 person assessments only. This term is used to represent the comparison group in our analyses, and 136 these assessments may occur concurrently or sequentially with teledermatology consultations, 137 depending on the case. Exclusion criteria encompassed survey articles, feasibility studies, non-138 dermatological telemedicine studies, cost-effectiveness studies, editorials, review articles, studies 139 using teledermatology as the reference standard, studies comparing only dermatoscopic images 140 without clinical images, and studies where patients captured their own photographs. The latter was 141 excluded to ensure consistent image quality, enabling a more accurate comparison of diagnostic 142 reliability between tele- and F2F methods. Included articles are summarized in eTable 1 in the 143 supplementary appendix. Inclusion and exclusion criteria are summarized in eTable 2, available 144 in the supplementary appendix.

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# 146 Data Selection & Extraction

Following the removal of duplicated citations, the titles and abstracts were screened. Following
this step, a full-text assessment was conducted. At both stages, two reviewers performed screening

independently [AB and NB]. Any disagreements were resolved through consensus by the tworeviewers and when necessary, through discussion with a third reviewer [JLRG].

A data collection form was created on the *Covidence* website and piloted by two reviewers [AB, NB]. Three additional reviewers assisted with data extraction [JLRG, MB, MM]. Two reviewers were assigned to each paper. One reviewer extracted all characteristics of the included literature, and the second reviewer validated the characteristics for accuracy. Any disagreements were resolved by consensus. In the supplementary appendix, **eTable 3** summarizes the information extracted from full-text articles.

159 Data Synthesis

160 This meta-analysis assessed the effectiveness of SFTD technologies and live video conferencing 161 in diagnosing skin conditions. Outcomes regarding complete diagnostic percentage agreement 162 rates and Cohen's kappa concordance were evaluated separately, with some studies being part of 163 both analyses if they reported both variables. The patient, intervention type, lesion, and geographic 164 characteristics were summarized qualitatively. Please see the supplementary appendix and **eTable** 165 **4** for more details on data synthesis and nomenclature for each study grouping.

<sup>2</sup> 166

# 167 <u>Risk of Bias</u>

168 Three reviewers [AB, NB, MB] completed the risk of bias assessment; all studies were 169 independently reviewed. Version 2 of the Cochrane risk-of-bias tool for randomized trials (RoB 170 2) was used to assess the risk of bias in three randomized trials.(9, 10, 11) RoB 2 is structured into 171 a fixed set of domains of bias, focusing on different aspects of trial design, conduct, and Page 11 of 73

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reporting.(12) The Quality Assessment of Diagnostic Assessment of Diagnostic Accuracy (2<sup>nd</sup>
Edition, QUADAS-2) was used to assess the risk of bias. Uncertain risk of bias was assigned to
studies with insufficient information except for studies that were likely to be biased due to missing
data. In the latter case, a high risk of bias was assigned.

177 <u>Synthesis of Results</u>

178 Statistical analysis was performed using the dmetar package in R v.4.0.1 (R Foundation for 179 Statistical Computing, 2022). Agreement rates and Cohen's kappa concordances for unique study 180 groupings were treated as individual and independent values. For the percentage of agreement, 181 meta-analyses were conducted using the aggregated data, and proportions were calculated with the 182 corresponding 95 percent confidence intervals (CI). Point-biserial correlations were utilized to 183 calculate pooled kappa values. Statistical heterogeneity was investigated using the I<sup>2</sup> index and the 184  $\tau^2$  statistic, leading to the use of a random-effects model for overall complications with a logit 185 transformation due to the high degree of heterogeneity. Possible sources of heterogeneity were 186 explored through sub-group analysis, and confounding factors were controlled using meta-187 regression. A random-effects model, as proposed by DerSimonian and Laird, was chosen as the 188 primary method to estimate all pooled estimates. Further details on the statistical analysis can be 189 found in the supplementary appendix.

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7 191 <u>Patient and Public Involvement</u>

192 Patients or the public were not involved in our research's design, conduct, reporting, or193 dissemination plans.

**Results** 

A total of 7,173 studies were screened for eligibility of which 44 were included in this study. Of these, 40 studies reported diagnostic agreement rates (4, 5, 9, 10, 11, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47) and 21 studies reported kappa concordance. (5, 9, 13, 14, 19, 22, 25, 28, 29, 30, 31, 32, 33, 35, 36, 37, 48, 49, 50, 51, 52) Further details are provided in the PRISMA diagram in **Figure 1**. The complete list of excluded studies can be found in the supplementary appendix, eTable 5.

#### Study and patient characteristics

**eTable 1** summarizes the study and participant characteristics for the 44 included papers. Forty one of the included studies were observational, of which 32 were prospective, eight were retrospective. One study was ambispective. Two studies were randomized controlled trials and one study was a quasi-randomized trial. Studies selected for the review included a total of 52,075 patients (Range: 26 to 24,210 patients). Some patients had multiple lesions and the total number of lesions included in the study was 57,222 (Range: 26 to 27,519 lesions).

The mean age reported in 27 (61%) studies was  $54.78 \pm 15.69$  years (Range: 0 to 100 years old). Thirty-four (77%) studies reported participant gender, with a mean of 57% females (Range: 3.2% to 74%). Only 13 (29%) studies reported information on Fitzpatrick skin types, ethnicity, or race. Twenty-eight studies (64%) included in this analysis were inclusive of all types of dermatoses, 13 (29%) studies looked specifically at suspicious lesions, and three (7%) studies excluded skin cancers completely.

1 2		
2 3 4	216	
5 6	217	Diagnostic reliability of teledermatology when compared to F2F (specialist and non-specialist)
7 8 9	218	evaluation
10 11	219	We assessed the diagnostic reliability of teledermatology compared to F2F evaluations by
12 13	220	analyzing diagnostic agreement rates and concordance. The overall diagnostic agreement rate
14 15 16	221	ranged from 13.9% to 98.0% (mean 68.9%, CI 64.4% to 73.1%), with a concordance that ranged
10 17 18	222	from 0.21 to 0.96 (mean 0.67, CI 0.60 to 0.74). See eFigure 1 and the supplementary appendix
19 20	223	for further details.
21 22 22	224	
23 24 25	225	Sub-group analyses
26 27	226	
28 29	227	Diagnostic agreement between teledermatologist and teledermatologist, F2F and F2F physicians,
30 31 32	228	and teledermatology and histopathology
33 34	229	See supplementary appendix and eFigure 2 for further details.
35 36	230	
37 38 39	231	Diagnostic reliability of teledermatologist vs F2F specialist and non-specialist
40 41	232	Teledermatologists' 70.96% agreement rate with F2F dermatologists significantly exceeded the
42 43	233	44.1% rate from non-specialists ( $p < 0.001$ ). Non-specialists consistently showed lower diagnostic
44 45	234	concordance across studies; see supplementary appendix and eFigure 3 for further details.
46 47 48	235	
49 50	236	Diagnostic reliability of teledermatology vs F2F by training provided for image acquisition
51 52	237	Twenty studies with 37 unique comparisons explicitly provided training to those in charge of
53 54 55	238	image acquisition shown in Figure 2.(9, 10, 11, 14, 15, 16, 19, 20, 23, 26, 29, 32, 35, 36, 37, 38,
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39, 40, 41, 43, 44) The mean agreement rate between teledermatology and F2F physicians in these studies was 75.9% (CI 74.4% to 77.27%), significantly higher than the 62.1% (CI 60.5% to 63.7%) observed when no training was provided (p = 0.033, heterogeneity:  $I^2 = 98\%$ ). Concordance values were also higher when training was provided (mean 0.77, CI 0.66-0.84) compared to when no training was provided (mean 0.60, CI 0.49-0.69) (p = 0.01, I<sup>2</sup>=98%).

Diagnostic reliability of teledermatology vs F2F by type of technology used for image acquisition Approximately half of the studies with 41 unique comparisons that compared Teledermatologists with F2F physicians used digital cameras for image acquisition. Eighteen studies comparing F2F and teledermatology agreement rates with 26 unique comparisons reported the use of smartphones and tablets for image acquisition. Figure 3 shows that the mean percentage agreement rate for digital cameras was 71.7% (CI 70.3% to 73.1% compared to 59.8% (CI 57.2% to 62.3%) for smartphones or tablets. The higher agreement rate with digital photography was statistically significant (p = 0.029, heterogeneity: I^2=98%). The concordance values for digital photography were reported for twelve studies with a mean of 0.70 (CI 0.61 to 0.76). Concordance values for smartphone or tablet technologies were reported for eight studies with a mean of 0.62 (CI 0.38 to (0.78). The higher concordance with digital photography was statistically significant (p = 0.003, heterogeneity: I<sup>2</sup>=100%).

Other sub-group analyses

No statistically significant patterns could be identified with the inclusion of teledermoscopy in

addition to clinical images (eFigure 4), lesion type (eFigure 5), grouping studies as pre- or post-

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pandemic (figure not shown), or risk of bias (figure not shown). Please see the supplementaryappendix for further details.

# 264 **Quality assessment**

The quality assessment results for risk of bias and applicability in individual studies are displayed in the supplementary appendix and **eTable 6**.

268 **Discussion**:

To our knowledge, this study constitutes the most extensive systematic review and meta-analysis on teledermatology, including 44 studies across four languages.

Our sub-group analyses revealed that agreement rates between teledermatology consultations and F2F physicians were significantly higher when dermatologists conducted in-person assessments compared to non-specialists. This finding suggests that teledermatology may be more beneficial in supplementing primary care than specialist care, as lower concordance with non-specialists indicates reduced reference test accuracy. Although we did not directly assess the impact of consulting teledermatologists on non-specialist accuracy, the included studies report high levels of non-specialist satisfaction with the teleconsultation process. In fact, 96% of non-specialists agreed that they learned about the dermatologic diagnosis, and 100% agreed that it helped patient care.(23) These results are consistent with prior research attributing high provider satisfaction to streamlined workflows, effective communication, and fast turnaround times in teledermatology.(2, 53)

The study emphasizes the importance of standardized training on image acquisition in improving agreement rates between in-person and remote care. Additionally, digital photography was linked to increased agreement rates, potentially due to enhanced image resolution and experienced staff conducting virtual consultations using standardized procedures. This suggests a crucial need for comprehensive training in image acquisition, highlighting the importance of equipping primary care providers supporting telehealth delivery with high-quality cameras and the latest smartphone models.(24, 54, 55)

Assessing agreement on the management plan is crucial in teledermatology as it serves as a triage tool for distinguishing mild/benign cases from severe/malignant/uncertain cases. Ensuring concordance in the management plan between telemedicine and face-to-face consultations is vital for optimizing patient care. Future research should explore the consistency of treatment recommendations and interventions between telemedicine and in-person consultations to further enhance the evaluation of telemedicine's effectiveness in guiding appropriate patient management.

Pathological assessment of skin lesions is the cornerstone of skin cancer diagnosis. This meta-analysis found a 55.7% (CI 53.0% to 58.4%) agreement rate between teledermatology and histopathology. This low agreement rate reflects all skin biopsies and specific diagnostic accuracy rates could not be calculated by lesion type due to the small number of studies that reported this value. Through sub-group analyses, we were able to compare cancerous and non-cancerous lesions; slightly higher concordance was seen with skin cancers compared to studies that also included non-suspicious lesions like dermatitis and psoriasis. However, the data was too heterogeneous for any significant conclusions. We also looked at the use of teledermoscopy,

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another technique that could help improve the diagnostic accuracy of teledermatology for
 suspicious lesions, but no significant trends could be identified. These findings reflected the results
 of a 2016 systematic review on teledermatology.<sup>(6)</sup>

310 Many teledermoscopy studies grouped statistics from lesions analyzed with and without 311 dermoscopy, preventing the assessment of the dermatoscope's incremental contributions without 312 the influence of potentially less accurate, dermatoscope-free analysis. Supporting this explanation, 313 the three teledermoscopy studies focused on cancer lesions demonstrated greater concordance rates 314 than the teledermoscopy studies targeting broader lesions. One study identified agreement rates 315 between teledermatology and F2F dermatology of 92.3% (24/26) and between teledermatology 316 and histopathology of 66.7% (17/26), both above our identified median. (45) Another study found 317 an agreement rate of 90% (37/41) when targeting pigmented lesions, although the rate may have 318 been inflated due to recall bias introduced by having the same dermatologist perform 319 teledermatology and F2F consults.(16) Finally, one study diagnosed keratotic lesions in sun-320 exposed areas, finding a high agreement rate of 92% (915/1000).(37) However, this study also 321 risked bias from its experimental design, which excluded lesions with poor image quality. This 322 fails to recapitulate the complexities of practical teledermatology, which must contend with 323 potentially difficult image acquisition.

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The 68.9% (CI 64.4% to 73.05%) combined agreement rate between teledermatology and F2F is lower than the agreement rates outlined in a recent review.(56) This suggests our greater sample size introduces more studies with poor agreement, which may better reflect the reality of adopting teledermatology at a larger scale and signal risk from a lack of standardization.(55) Our date cut-

off of 2010 means our dataset has little overlap with existing reviews, and more heavily features new relevant technologies like smartphone apps for image acquisition.(6, 57) The most recent MA(57) on teledermatology limited its dataset to studies with multiple teledermatology and F2F

332 consults and variably choosing to filter low-frequency diagnoses from certain studies.<sup>(46)</sup>

We acknowledge several potential limitations. The heterogeneity of the data, though at first glance might limit generalizability, enhances the adaptability and applicability of teledermatology across diverse real-world contexts. Challenges exist due to the absence of stratification by study design and a limited number of randomized controlled trials. Nevertheless, our findings emphasize the critical importance of standardized processes for effective teledermatology, such as training in image acquisition, reporting guidelines, and addressing privacy concerns. Our study reveals a greater degree of heterogeneity compared to previous meta-analyses, reflecting real-world application and clinical practice, bolstering the robustness of our conclusions. We advocate for a nuanced interpretation when generalizing these findings across all settings, recognizing the demographic and technological diversity in our sample as an asset. While our attempts to filter biased studies didn't yield significant improvements to our meta-analysis model, we are mindful of the potential risk of publication bias in our review. 

Furthermore, our study only included a limited number of live video conferencing studies,(11, 24, 46) and our ability to draw meaningful conclusions regarding the differences between live video conferencing and SFTD methods is therefore limited. A recent study by Duong et al. demonstrated that live video conferencing can significantly contribute to diagnosis in teledermatology by improving the quality of collected information and accuracy of the patient's status evaluation.(24) Page 19 of 73

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The study found that videoconferencing significantly improved the diagnostic performance in 68.7% of cases. While these results are promising, further research is needed to explore the potential differences between clinical images and live video conferencing.

In addition, our search was limited to published literature and may have missed relevant studies in the grey literature and reports from low- and middle-income countries. Nonetheless, the variability across providers and settings underlines the need for a standardized framework to employ and assess teledermatologists. Future research is needed to explore the differences between these methods and other potential factors that may impact the efficacy of teledermatology, particularly in low- and middle-income countries. We acknowledge these limitations and encourage further research to address these gaps in the literature.

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Current trends suggest that teledermatology will continue to expand, there have been many recent studies examining its accuracy without the design considerations necessary to allow comparisons beyond siloed investigations.(1) The implementation of evidence-informed processes is critical to the success of teledermatology services, and the accurate assessment of teledermatology will be required to assess which contexts it should be employed in, e.g., suspected malignancy vs. erythema.

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While acknowledging the significant potential of artificial intelligence (AI) in enhancing teledermatology, particularly in areas like image recognition and diagnosis, it is crucial to note that our current study does not incorporate these aspects. The impact of AI on teledermatology, while

374 promising, introduces an additional layer of complexity, necessitating a dedicated, separate375 investigation beyond the scope of our current study.

The factors targeted by our sub-analysis are undoubtedly important to standardize with best practices requiring the inclusion of primary care provider training in image acquisition, explicitly outlined conditions where dermatoscope attachments are required, and standardized reporting with a lesion's anatomical site, size, distribution, morphology, and colour. Additional guidelines for data reporting could be designed with a mind to future research goals, e.g., the inclusion of Fitzpatrick grading to identify gaps in medical care. Finally, both clinical and research guidelines must address privacy concerns, as integrating EMR and sharing of patient images or videos presents potential vulnerabilities.

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# 385 <u>Conclusion:</u>

This meta-analysis indicates that diagnostic agreement between remote and in-person dermatologists is acceptable in select conditions (i.e., when training for image acquisition is provided and technologies for high-quality images are used). Telemedicine adoption rates are accelerating globally, and teledermatology must be considered for enhanced accessibility, flexibility, reduced costs, and safer environments it can provide patients.

The results of this meta-analysis represent significant evidence to indicate the suitability of teledermatology for remote care, particularly as a complement to primary care, where it can serve as an intermediate step before F2F specialist consultations. Furthermore, the categorization of diagnostic concordance highlights important factors to further improve diagnostic accuracy. Additionally, it highlights the lack of standardization in teledermatology studies, calling for greater structure in clinical practice and conducting primary research.

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# 7 404 <u>Author Contributions:</u>

JLRG is the guarantor of the review and supervised study design. JLRG also contributed to data
analysis and provided statistical expertise. AB and NB oversaw study design, data collection,
data analysis, and original draft preparation. AB designed the search strategy with the guidance

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#### 408 of the medical librarian, AKP. AB, NB, MB, and MM participated in the abstract and full-text

409 screen, data extraction, and risk of bias assessment. RDJF, AL, and SCW contributed to the draft

- 410 review and editing. All authors read, provided feedback and approved the final manuscript.
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416 **Competing interests:** 

RDJF is an employee, and SCW is a co-founder, chief medical officer, and shareholder of Swift 417 418 Medical. JRGL and AL were formerly employees of Swift. No funding bodies have any role in 419 study design, data collection and analysis, decision to publish, or preparation of the manuscript.

All other authors declare no conflict of interest. 420

#### 422 Data availability statement:

423 Data are available in a public, open access repository. All data relevant to the study are included 424 in the article, uploaded as supplementary information, or deposited on Open Science Framework: 425 https://osf.io/fjdvg. Data are available under the terms of the Creative Commons Zero "No rights 426 reserved" data waiver (CC0 1.0 Public domain dedication). Our systematic review produced a large amount of information, and the arising database is available for future collaboration on 427 428 additional analyses. Please contact the corresponding author with any inquiries. 429 430 **Patient consent for publication:** 

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### **Figure Legends**

#### Figure 2. Forest plot representing F2F and teledermatology primary diagnostic agreement by whether imaging acquisition training was indicated by the study.

Figure 1. PRISMA Flow diagram of study selection.

Forest plot representing F2F and teledermatology primary diagnostic agreement when image acquisition training is involved. Studies were sorted into two groups, a) Did not conduct or did not report training personnel on image acquisition; b) Stated that person in charge of image acquisition was trained. (Left) Forest plot representing percentage agreement and 95% C.I. for overall concordance across 40 studies with a total of 72 unique number of comparisons, N of events and total included participants. (Right) Forest plot representing kappa concordance and 95% C.I. for overall concordance across 21 studies with a total of 45 unique number of comparisons, N of total included participants. Abbreviations: F2F (Face-to-Face), PCP (Primary Care Provider), TD (Teledermatology or Teledermatologist). 

#### Figure 3. Forest plot representing F2F and teledermatology primary diagnostic agreement by device type used to capture clinical photographs.

Forest plot representing F2F and teledermatology primary diagnostic agreement by imaging technology used. Studies were sorted into three groups, i) Digital photography ii) Imaging technology not mentioned iii) Smartphone or tablet. (Left) Forest plot representing percentage agreement and 95% C.I. for overall concordance across 40 studies with a total of 72 unique number of comparisons, N of events and total included participants. (Right) Forest plot representing kappa concordance and 95% C.I. for overall concordance across 21 studies with a total of 45 unique number of comparisons, N of total included participants. Abbreviations: F2F (Face-to-Face), PCP (Primary Care Provider), TD (Teledermatology or Teledermatologist) 

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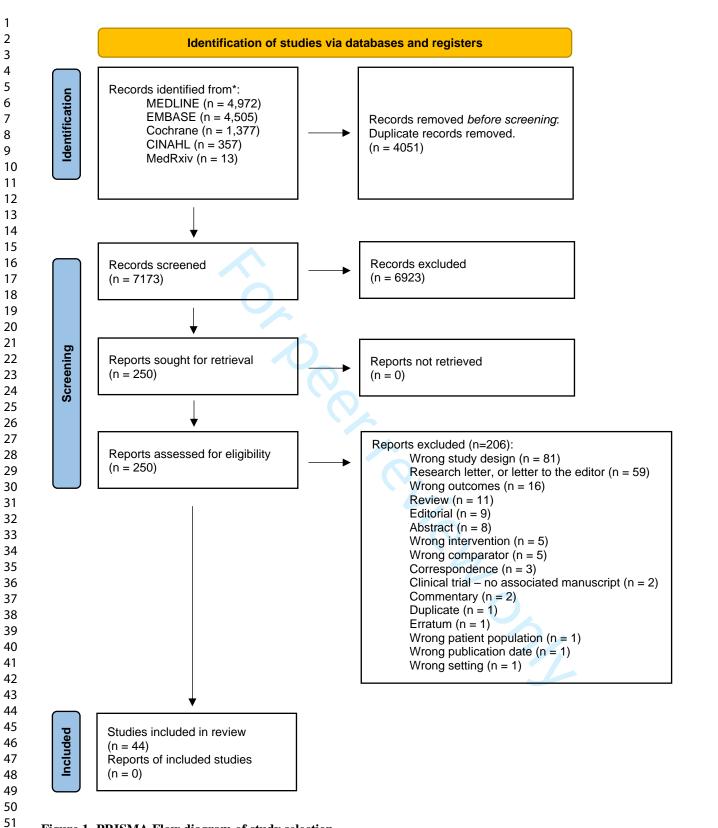
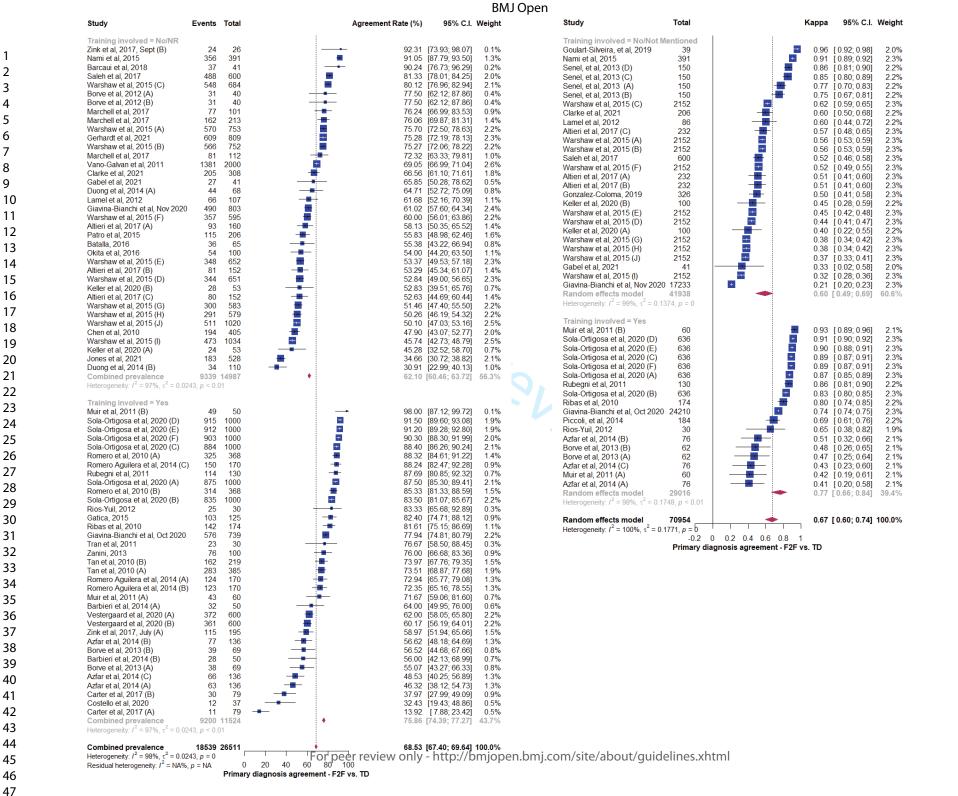


Figure 1. PRISMA Flow diagram of study selection.



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ruge sr or / s	Study Event	s Total	Agreement Rate (%) 95% C.I	Weight	Study	Total	Kappa 95% C.I. Weight
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99.72           91.50         [80.60; 93.06           91.20         [89.26; 92.80           90.30         [83.30; 91.99           88.40         [86.26; 90.24           88.32         [84.61; 91.22           88.42         [82.47; 92.28           87.69         [90.55; 92.29           87.69         [90.65; 92.29           87.69         [90.65; 92.29           83.30         [66.68; 92.69           83.31         [65.68; 92.69           82.40         [74.71; 88.12           81.61         [75.15; 86.69           81.33         [76.07; 82.37           75.27         [72.66; 82.24           80.12         [76.69; 82.44           80.12         [76.69; 82.44           80.12         [76.69; 82.74           81.61         [77.70; 78.33           75.27         [72.66; 82.27           73.97         [67.76; 79.35           73.51         [68.87, 77.06           72.24         [65.97; 71.04]           66.56         [61.10; 71.61]           65.55         [65.65; 65.27]           53.37         [49.90; 56.65]</th> <th>Weight           0.1%           1.8%           1.9%           2.0%           1.4%           0.9%           0.8%           2.0%           1.6%           2.0%           1.6%           2.0%           1.0%           2.0%           1.0%           2.1%           1.9%           2.1%           1.5%           1.8%           1.4%           0.7%           2.1%           1.4%           0.6%           2.1%           1.4%           1.4%           2.2%           1.4%           2.2%           1.4%           2.1%           2.1%           2.1%           2.1%           2.1%           2.1%           2.1%           2.1%           2.1%           2.1%           2.1%           2.1%           2.1%           2.1%           2.1%           2.1%           2.1%</th> <th>Technology = Digital photog Muir et al, 2011 (B) Sola-Ortigosa et al, 2020 (D) Sola-Ortigosa et al, 2020 (E) Sola-Ortigosa et al, 2020 (E) Sola-Ortigosa et al, 2020 (F) Sola-Ortigosa et al, 2020 (A) Rubegni et al, 2011 Senel, et al, 2013 (D) Senel, et al, 2013 (C) Sola-Ortigosa et al, 2020 (A) Rubegni et al, 2013 (C) Sola-Ortigosa et al, 2020 (A) Rubegni et al, 2013 (C) Sola-Ortigosa et al, 2020 (B) Rubas et al, 2013 (C) Sola-Ortigosa et al, 2020 (B) Rubas et al, 2013 (C) Sola-Ortigosa et al, 2021 (C) Clarke et al, 2011 (C) Varshaw et al, 2015 (C) Clarke et al, 2017 (C) Warshaw et al, 2015 (B) Saleh et al, 2017 (B) Warshaw et al, 2015 (F) Attien et al, 2017 (C) Warshaw et al, 2015 (F) Warshaw et al, 2015 (F) Warshaw et al, 2015 (C) Warshaw et al, 2015 (C) Warshaw et al, 2015 (J) Gabel et al, 2021 Warshaw et al, 2015 (J) Gabel et al, 2021 Warshaw et al, 2015 (J) Gabel et al, 2015 (J) Random effects model Heterogeneity. <math>I^2 = 99\%</math>, <math>\tau^2 = 0.11</math> Technology = Marthonee o Goulart-Silveira, et al, 2017 Nami et al, 2015</th> <th>intervention     intervention       60     intervention       636     intervention       150     intervention       2152     intervention</th> <th><math display="block">\begin{array}{c} 0.93 &amp; [0.89; 0.96] &amp; 2.1\% \\ 0.91 &amp; [0.90; 0.92] &amp; 2.3\% \\ 0.90 &amp; [0.88; 0.91] &amp; 2.3\% \\ 0.89 &amp; [0.87; 0.91] &amp; 2.3\% \\ 0.89 &amp; [0.87; 0.91] &amp; 2.3\% \\ 0.87 &amp; [0.85; 0.89] &amp; 2.3\% \\ 0.87 &amp; [0.85; 0.89] &amp; 2.2\% \\ 0.86 &amp; [0.81; 0.90] &amp; 2.2\% \\ 0.86 &amp; [0.81; 0.90] &amp; 2.2\% \\ 0.85 &amp; [0.80; 0.89] &amp; 2.2\% \\ 0.85 &amp; [0.80; 0.85] &amp; 2.3\% \\ 0.77 &amp; [0.70; 0.83] &amp; 2.2\% \\ 0.69 &amp; [0.61; 0.76] &amp; 2.2\% \\ 0.69 &amp; [0.61; 0.76] &amp; 2.2\% \\ 0.65 &amp; [0.53; 0.59] &amp; 2.3\% \\ 0.56 &amp; [0.53; 0.59] &amp; 2.3\% \\ 0.52 &amp; [0.46; 0.58] &amp; 2.3\% \\ 0.52 &amp; [0.46; 0.58] &amp; 2.3\% \\ 0.51 &amp; [0.41; 0.60] &amp; 2.3\% \\ 0.51 &amp; [0.41; 0.60] &amp; 2.3\% \\ 0.54 &amp; [0.42; 0.48] &amp; 2.3\% \\ 0.45 &amp; [0.42; 0.48] &amp; 2.3\% \\ 0.45 &amp; [0.42; 0.48] &amp; 2.3\% \\ 0.37 &amp; [0.33; 0.41] &amp; 2.3\% \\ 0.33 &amp; [0.34; 0.42] &amp; 2.3\% \\ 0.33 &amp; [0.26; 0.58] &amp; 2.3\% \\ 0.37 &amp; [0.51; 0.76] &amp; 71.7\% \\ \hline</math></th>	Agreement Rate (%)         95% C I           98.00         [87.12; 99.72           91.50         [80.60; 93.06           91.20         [89.26; 92.80           90.30         [83.30; 91.99           88.40         [86.26; 90.24           88.32         [84.61; 91.22           88.42         [82.47; 92.28           87.69         [90.55; 92.29           87.69         [90.65; 92.29           87.69         [90.65; 92.29           83.30         [66.68; 92.69           83.31         [65.68; 92.69           82.40         [74.71; 88.12           81.61         [75.15; 86.69           81.33         [76.07; 82.37           75.27         [72.66; 82.24           80.12         [76.69; 82.44           80.12         [76.69; 82.44           80.12         [76.69; 82.74           81.61         [77.70; 78.33           75.27         [72.66; 82.27           73.97         [67.76; 79.35           73.51         [68.87, 77.06           72.24         [65.97; 71.04]           66.56         [61.10; 71.61]           65.55         [65.65; 65.27]           53.37         [49.90; 56.65]	Weight           0.1%           1.8%           1.9%           2.0%           1.4%           0.9%           0.8%           2.0%           1.6%           2.0%           1.6%           2.0%           1.0%           2.0%           1.0%           2.1%           1.9%           2.1%           1.5%           1.8%           1.4%           0.7%           2.1%           1.4%           0.6%           2.1%           1.4%           1.4%           2.2%           1.4%           2.2%           1.4%           2.1%           2.1%           2.1%           2.1%           2.1%           2.1%           2.1%           2.1%           2.1%           2.1%           2.1%           2.1%           2.1%           2.1%           2.1%           2.1%           2.1%	Technology = Digital photog Muir et al, 2011 (B) Sola-Ortigosa et al, 2020 (D) Sola-Ortigosa et al, 2020 (E) Sola-Ortigosa et al, 2020 (E) Sola-Ortigosa et al, 2020 (F) Sola-Ortigosa et al, 2020 (A) Rubegni et al, 2011 Senel, et al, 2013 (D) Senel, et al, 2013 (C) Sola-Ortigosa et al, 2020 (A) Rubegni et al, 2013 (C) Sola-Ortigosa et al, 2020 (A) Rubegni et al, 2013 (C) Sola-Ortigosa et al, 2020 (B) Rubas et al, 2013 (C) Sola-Ortigosa et al, 2020 (B) Rubas et al, 2013 (C) Sola-Ortigosa et al, 2021 (C) Clarke et al, 2011 (C) Varshaw et al, 2015 (C) Clarke et al, 2017 (C) Warshaw et al, 2015 (B) Saleh et al, 2017 (B) Warshaw et al, 2015 (F) Attien et al, 2017 (C) Warshaw et al, 2015 (F) Warshaw et al, 2015 (F) Warshaw et al, 2015 (C) Warshaw et al, 2015 (C) Warshaw et al, 2015 (J) Gabel et al, 2021 Warshaw et al, 2015 (J) Gabel et al, 2021 Warshaw et al, 2015 (J) Gabel et al, 2015 (J) Random effects model Heterogeneity. $I^2 = 99\%$ , $\tau^2 = 0.11$ Technology = Marthonee o Goulart-Silveira, et al, 2017 Nami et al, 2015	intervention     intervention       60     intervention       636     intervention       150     intervention       2152     intervention	$\begin{array}{c} 0.93 & [0.89; 0.96] & 2.1\% \\ 0.91 & [0.90; 0.92] & 2.3\% \\ 0.90 & [0.88; 0.91] & 2.3\% \\ 0.89 & [0.87; 0.91] & 2.3\% \\ 0.89 & [0.87; 0.91] & 2.3\% \\ 0.87 & [0.85; 0.89] & 2.3\% \\ 0.87 & [0.85; 0.89] & 2.2\% \\ 0.86 & [0.81; 0.90] & 2.2\% \\ 0.86 & [0.81; 0.90] & 2.2\% \\ 0.85 & [0.80; 0.89] & 2.2\% \\ 0.85 & [0.80; 0.89] & 2.2\% \\ 0.85 & [0.80; 0.89] & 2.2\% \\ 0.85 & [0.80; 0.89] & 2.2\% \\ 0.85 & [0.80; 0.89] & 2.2\% \\ 0.85 & [0.80; 0.85] & 2.3\% \\ 0.77 & [0.70; 0.83] & 2.2\% \\ 0.69 & [0.61; 0.76] & 2.2\% \\ 0.69 & [0.61; 0.76] & 2.2\% \\ 0.65 & [0.53; 0.59] & 2.3\% \\ 0.56 & [0.53; 0.59] & 2.3\% \\ 0.52 & [0.46; 0.58] & 2.3\% \\ 0.52 & [0.46; 0.58] & 2.3\% \\ 0.51 & [0.41; 0.60] & 2.3\% \\ 0.51 & [0.41; 0.60] & 2.3\% \\ 0.54 & [0.42; 0.48] & 2.3\% \\ 0.45 & [0.42; 0.48] & 2.3\% \\ 0.45 & [0.42; 0.48] & 2.3\% \\ 0.37 & [0.33; 0.41] & 2.3\% \\ 0.33 & [0.34; 0.42] & 2.3\% \\ 0.33 & [0.26; 0.58] & 2.3\% \\ 0.37 & [0.51; 0.76] & 71.7\% \\ \hline$
24 25 26 27 28	Technology = Not Mentioned         Marchell et al, 2017       76         Marchell et al, 2017       166         Gerhardt et al, 2021       60         Marchell et al, 2017       8         Batala, 2016       33         Combined prevalence       96         Heterogeneity. $I^2 = 68\%$ , $\tau^2 = 0.0334$ , $p =$ Technology = Smartphone or tablet	2 213 9 809 1 112 6 65 5 1300 0.01	76.24 [66.99; 83.53 76.06 [69.87; 81.31 75.28 [72.19; 78.13 72.32 [63.33; 79.81 55.38 [43.22; 66.94 72.76 [68.10; 76.97	1.4% 2.1% 1.1% 0.9% 6.5%	Giavina-Bianchi et al, Oct 2020 Lamel et al, 2012 Azfar et al, 2014 (B) Borve et al, 2013 (B) Borve et al, 2013 (A) Keller et al, 2020 (B) Azfar et al, 2014 (C) Azfar et al, 2014 (A) Keller et al, 2021 (A) Giavina-Bianchi et al, Nov 2022 Bandom effects model	86	$\begin{array}{cccccccccccccccccccccccccccccccccccc$
29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44	$ \begin{array}{llllllllllllllllllllllllllllllllllll$	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	92.31 [73.93, 98.07 91.05 [87.79, 93.50 90.24 [76.73, 96.22 77.94 [74.81, 80.79 77.50 [62.12, 87.86 77.50 [62.12, 87.86 76.67 [58.50, 88.45 64.71 [52.72, 75.09 64.00 [49.95; 76.00 62.00 [58.05, 65.80 61.08 [52.16; 70.39 61.02 [57.60; 64.34 60.17 [56.19; 64.10] 58.97 [51.94, 65.66 56.62 [48.18; 64.69 56.60 [42.13; 68.99 55.07 [43.27; 66.33 54.00 [44.20; 63.50 52.83 [39.51; 65.76 44.63; 70.42, 26.56 94.632 [38.12; 54.73 45.28 [32.52; 58.70 34.66 [30.72; 38.29 32.43 [19.43; 48.86 30.91 [22.99; 40.13 59.77 [57.19; 62.30	$\begin{array}{c} 1.3\%\\ 0.3\%\\ 2.1\%\\ 0.5\%\\ 0.5\%\\ 0.5\%\\ 0.4\%\\ 10.9\%\\ 2.1\%\\ 1.2\%\\ 2.2\%\\ 2.1\%\\ 1.2\%\\ 2.2\%\\ 2.1\%\\ 1.6\%\\ 1.3\%\\ 0.9\%\\ 0.7\%\\ 0.9\%\\ 1.2\%\\ 0.8\%\\ 1.4\%\\ 1.4\%\\ 1.4\%\\ 1.4\%\\ 1.4\%\\ 1.4\%\\ 1.1\%\\ 29.0\%\\ \end{array}$	Random effects model Heterogeneity: <i>I</i> <sup>2</sup> = 100%, τ <sup>2</sup> = 0. <b>Random effects model</b> Heterogeneity: <i>I</i> <sup>2</sup> = 100%, τ <sup>2</sup> = 0.	70954 1771, p = 0 -0.2 0 0.2 0.4 0.6 0.8 Primary diagnosis agreement - F2F	0.62 [0.38; 0.78] 26.0% 0.67 [0.60; 0.74] 100.0% 1 vs. TD
45 46	Heterogeneity: $I^2 = 98\%$ , $\tau^2 = 0.0334$ , $p =$ Residual heterogeneity: $I^2 = NA\%$ , $p = NA$	0	00	,, sinjopen.orij.com	, site, about, guidell		

# **Supplementary Online Content**

Title: Diagnostic Reliability in Teledermatology: A Systematic Review and Meta-Analysis

## Authors

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- GarciaLuna<sup>4</sup> (MD, PhD)
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- <sup>5</sup>Swift Medical Inc., Toronto, Ontario, Canada
  - <sup>6</sup>Arthur Labatt Family School of Nursing, Western University, London, Ontario Canada
- <sup>7</sup>Department of Medicine, Division of Dermatology, McGill University Health Centre, Montreal, Quebec, Canada

### **Supplementary eMethods**

### Search Strategy

The search strategy was written for Ovid Medline and translated using each database's syntax, controlled vocabulary, and search fields. MeSH terms, Emtree terms, and free text words were used for teledermatology and skin conditions such as melanoma and related synonyms. To identify additional articles not captured through the aforementioned search, a manual search was conducted via reference search of the included studies.

All database records were downloaded to EndNote X9 (Clarivate) and uploaded to web-based software for deduplication, screening, and full-text evaluation (Covidence; Veritas Health Innovation). We contacted three study authors to gain access to their published work.(1, 2, 3) The search strategy is available below.

### **Ovid MEDLINE Search**

Ovid MEDLINE(R) and Epub Ahead of Print, In-Process, In-Data-Review & Other Non-Indexed Citations and Daily <1946 to 2022 May 02>

16	35	Ov1d	I MEDLINE(R) and Epub Ahead of Print, In-Process, In-Data-Review & Other Non-Inde
17	36	<194	46 to 2022 May 02>
18	37		
19	38	1	e consult*.mp. 322
20	39	2	econsult*.mp. 218
21	40	3	electronic consult*.mp. 366
22	41	4	e health.mp. 4095
23	42	5	ehealth.mp. 6823
24	43	6	e visit*.mp. 88
24	44	7	evisit*.mp. 26
25	45	8	home video visit*.mp. 4
	46	9	internet/ or internet-based intervention/ 82046
27	47	10	internet mp 128675
28	48	11	offsite care.mp. 4
29	49	12	off site care.mp. 9
30	50	13	ontario telemedicine network.mp. 19
31	51	14	Remote Consultation/ 5689
32	52	15	remote consultation*.mp. 6406
33	53	16	remote visit*.mp. 95
34	54	17	tele care.mp. 40
35	55	18	telecare.mp. 945
36	56	19	offsite care.mp. 4 off site care.mp. 9 ontario telemedicine network.mp. 19 Remote Consultation/ 5689 remote consultation*.mp. 6406 remote visit*.mp. 95 tele care.mp. 40 telecare.mp. 945 tele consult*.mp. 208 teleconsult*.mp. 208
37	57	20	teleconsult*.mp. 2208
38	58	21	remote visit*.mp. 95 tele care.mp. 40 telecare.mp. 945 tele consult*.mp. 208 teleconsult*.mp. 2208 tele diagnos*.mp. 46 telehealth.mp. 13222 tele health.mp. 287 telemedicine/36763 telemedicine.mp. 47751 tele medicine.mp. 197
39	59	22	telehealth.mp. 13222
40	60	23	tele health.mp. 287
41	61	24	telemedicine/ 36763
42	62	25	telemedicine.mp. 47751
43	63	26	tele medicine.mp. 197
44	64	27	telemonitor*.mp. 2380
45	65	28	tele monitor*.mp. 209
46	66	29	Telepathology/ 918
47	67	30	telepatholog*.mp. 1223
47	68	31	tele patholog*.mp. 25
40 49	69	32	telepractice*.mp. 276
	70	33	tele practice*.mp. 16
50	71	34	Therapy, Computer-Assisted/ 6969
51	72	35	video consult*.mp. 827
52	73	36	videoconsult*.mp. 41
53	74	37	virtual care.mp. 1177
54	75	38	web based.mp. 42402
55	76	39	Telepathology/ 918
56			1 07
57			
58			
50			

2		
3	77	40 or/1-39 216985
4	78	41 Dermatology/21077
5	79	42 dermatolog*.mp. 110593
6	80	43 dermatopatholog*.mp. 2990
7	81	44 exp Skin Diseases/di [Diagnosis] 196739
8	82	45 exp Skin Neoplasms/ 142454
9	83	46 skin.mp. 880457
10	84	47 exp Skin Abnormalities/ 34228
11	85	48 burns/ or burns, chemical/ or burns, electric/ or sunburn/ 59533
12	86	49 burn*.mp. 141877
13	87	50 wound healing/ or cicatrix/ 127484
14	88	51 wound*.mp. 446154
15	89	52 or/41-51 1580012
16	90	53 40 and 52 7160
17	91	54 teledermatolog*.mp. 1273
18	92	55 tele dermatolog*.mp. 35
19	93	56 54 or 55 1298
20	94	57 53 or 56 7448
21	95	58         limit 57 to dt=20100101-20220501 [January 1st, 2010 to May 1st, 2022]         4972
22	96 97	
23	97 98	Embase Search
24	99	Embase Classic+Embase <1947 to 2021 July 15>
25	100	1 computer assisted therapy/ 4772
26	101	2 e consult*.mp. 411
27	102	
28	103	4 electronic consult*.mp. 461
29	104	5 e health.mp. 4440
30	105	<ul> <li>3 econsult*.mp. 283</li> <li>4 electronic consult*.mp. 461</li> <li>5 e health.mp. 4440</li> <li>6 ehealth.mp. 5099</li> <li>7 e visit*.mp. 83</li> <li>8 evisit*.mp. 30</li> <li>9 home video visit*.mp. 10</li> <li>10 internet/ or web-based intervention/ 114861</li> <li>11 internet.mp. 143810</li> <li>12 offsite care.mp. 5</li> <li>13 off site care.mp. 12</li> <li>14 ontario telemedicine network.mp. 36</li> </ul>
31	106	7 e visit*.mp. 83
32	107	8 evisit*.mp. 30
33	108	9 home video visit*.mp. 10
34	109	10 internet/ or web-based intervention/ 114861
35	110	11 internet.mp. 143810
36	111	12 offsite care.mp. 5
37	112	13 off site care.mp. 12
38	113	
39	114	15 remote consultation*.mp. 808
40	115	16 remote visit*.mp. 79
41	116 117	17 tele care.mp. 55
42	117	18 telecare.mp. 983 19 teleconsultation/ 11686
43	119	20 tele consult*.mp. 243
44	120	21 teleconsult*.mp. 12352
45	120	22 tele diagnos*.mp. 53
46	122	23 telehealth.mp. 15276
47	123	24 tele health.mp. 389
48	124	25 telemedicine/ 31867
49	125	26 telemedicine.mp. 38951
50	126	27 tele medicine.mp. 333
51	127	28 telemonitor*.mp. 4838
52	128	29 tele monitor*.mp. 344
53	129	30 Telepathology/ 869
54	130	31 telepatholog*.mp. 1265
55	131	32 tele patholog*.mp. 41
56	132	33 telepractice*.mp. 162
57		
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2		
3	133	34 tele practice*.mp. 9
4	134	35 video consult*.mp. 751
5	135	36 videoconsult*.mp. 54
6	136	37 virtual care.mp. 496
7	137	38 web based.mp. 49157
8	138	39 or/1-38 240118
9	139	40 dermatology/ or cosmetic dermatology/ or pediatric dermatology/ or psychodermatology/ 51419
10	140	41 dermatolog*.mp. 161210
11	141	42 dermatopatholog*.mp. 3737
12	142	43 burn/ or burn contracture/ or electric burn/ or face burn/ or hand burn/ or ionizing radiation burn/ or scald/ or
13	143	sunburn/ 74890
14	144	44 burn*.mp. 189010
15	145	45 exp skin disease/di [Diagnosis] 209136
16	146	46 exp skin tumor/ 213775
17	147	47 skin*.mp. 1294867
18	148	48 or/40-47 1665263
19	149	49 39 and 48 7063
20	150	50 teledermatology/ 1295
21	151	51 tele dermatolog*.mp. 42
22	152	52 teledermatolog*.mp. 1798
23	153	53 50 or 51 or 52 1812
24	154	54 49 or 53 8004
25	155	55 limit 54 to (books or chapter or conference abstract or conference paper or "conference review") 1828
26	156	56 54 not 55 6176
20	157	57 limit 56 to yr="2010 -Current" 4505
28	158 159	Cashrona Saarah
20	160	Cochrane Search EBM Reviews - Cochrane Database of Systematic Reviews <2005 to July 14, 2021> EBM Reviews - ACP Journal
30	161	Club <1991 to June 2021> EBM Reviews - Database of Abstracts of Reviews of Effects <1st Quarter 2016> EBM
31	162	Reviews - Cochrane Clinical Answers <june 2021=""> EBM Reviews - Cochrane Central Register of Controlled Trials</june>
32	163	<june 2021=""> EBM Reviews - Cochrane Methodology Register &lt;3rd Quarter 2012&gt; EBM Reviews - Health</june>
33	164	Technology Assessment <4th Quarter 2016> EBM Reviews - NHS Economic Evaluation Database <1st Quarter
34	165	2016>
35	166	1 e consult*.mp. 44
36	167	2 econsult*.mp. 22
37	168	3 electronic consult*.mp. 29
38	169	4 e health.mp. 617
39	170	
40	171	<ul> <li>5 enealth.mp. 766</li> <li>6 e visit*.mp. 14</li> <li>7 evisit*.mp. 1</li> <li>8 home video visit*.mp. 3</li> <li>9 internet/ or internet-based intervention/ 4.275</li> </ul>
41	172	7 evisit*.mp. 1
42	173	8 home video visit*.mp. 3
42	174	9 internet/ or internet-based intervention/ 4,275
44	175	10 internet.mp. 15,059
44	176	11 offsite care.mp. 2
45 46	177	12 off site care.mp. 2
40 47	178	13 ontario telemedicine network.mp. 7
47	179	14 Remote Consultation/ 460
40 49	180	15 remote consultation*.mp. 551
49 50	181	16 remote visit*.mp. 17
51	182	17 tele care.mp. 34
52	183 184	18 telecare.mp. 249
53	184	19 tele consult*.mp. 59 20 teleconsult*.mp. 822
55 54	185	20 teleconsult*.mp. 822 21 tele diagnos*.mp. 4
55	180	21 telehalth.mp. 2,308
56	188	23 tele health.mp. 128
57	100	-
58		4
58 59		
59		For peer review only - http://bmiopen.bmi.com/site/about/guidelines.xhtml

2		
3	189	24 telemedicine/ 2,617
4	190	25 telemedicine.mp. 4,819
5	191	26 tele medicine.mp. 57
6	192	27 telemonitor*.mp. 1,236
7	193	28 tele monitor*.mp. 115
8	194 105	29 Telepathology/ 8
9	195 196	30 telepatholog*.mp. 22
10	190	<ul> <li>31 tele patholog*.mp. 2</li> <li>32 telepractice*.mp. 37</li> </ul>
11 12	198	33 tele practice*.mp. 0
12	199	34 Therapy, Computer-Assisted/ 1,391
14	200	35 video consult*.mp. 117
15	201	36 videoconsult*.mp. 8
16	202	37 virtual care.mp. 31
17	203	38 web based.mp. 9,110
18	204	39 Telepathology/ 8
19	205	40 or/1-39 29,268
20	206	41 Dermatology/ 124
21	207	42 dermatolog*.mp. 10,838
22	208 209	<ul> <li>43 dermatopatholog*.mp. 80</li> <li>44 exp Skin Diseases/di [Diagnosis] 630</li> </ul>
23	210	45 exp Skin Neoplasms/ 1,738
24	210	46 skin.mp. 67,534
25	212	47 exp Skin Abnormalities/ 269
26	213	48 burns/ or burns, chemical/ or burns, electric/ or sunburn/ 1,779
27	214	40 hum * mm 12 780
28	215	50 wound healing/ or cicatrix/ 5,677
29	216	51 wound*.mp. 35,982
30	217	<ul> <li>49 burn*.mp. 12,780</li> <li>50 wound healing/ or cicatrix/ 5,677</li> <li>51 wound*.mp. 35,982</li> <li>52 or/41-51 110,390</li> <li>53 40 and 52 1,622</li> <li>54 teledermatolog*.mp. 149</li> <li>55 tele dermatolog*.mp. 20</li> <li>56 54 or 55 151</li> <li>57 53 or 56 1,684</li> <li>58 limit 57 to yr="2010 -Current" 1,377</li> </ul>
31	218	53 40 and 52 1,622
32	219	54 teledermatolog*.mp. 149
33	220 221	55 tele dermatolog*.mp. 20 56 54 or 55 151
34	221	56 54 or 55 151 57 53 or 56 1,684
35 36	223	58 limit 57 to yr="2010 -Current" 1,377
30 37	224	
37	225	CINAHL Search
39	226	Searched keyword teledermatology and set limit to yr="2010-Current" 357
40	227	
41	228	MedRxiv Search Searched keyword teledermatology and set limit to vr="2010-Current" 13
42	229	Searched keyword teledermatology and set limit to yr="2010-Current" 13
43	230	
44	231	Eligibility Criteria
45	232 233	Inclusion and exclusion criteria are summarized in eTable 2.
46	233	Data Selection and Extraction
47	235	Information extracted from full-text articles is summarized in <b>eTable 3</b> .
48	236	
49	237	Data Analysis and Synthesis
50	238	In this study, a letter was assigned to each unique study grouping as explained in <b>eTable 4</b> . For both the percentage
51	239	of agreement and kappa values, forest plots, the I <sup>2</sup> index, and the $\tau^2$ statistic were used in combination to investigate
52	240	statistical heterogeneity. To evaluate the statistical significance of differences between kappa values, we performed
53	241	meta-regressions and derived corresponding p-values.
54	242	
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Cohen's kappa values for diagnostic concordance between teledermatology and F2F physicians were interpreted based
on the following criteria.(4) Values between 0–.20 indicate no agreement, .21–.39 minimal agreement, .40–.59 weak
agreement, .60–.79 moderate agreement, .80–.90 strong agreement, and above .90 almost perfect agreement.

Sub-group analysis included different skin conditions, specialization of the F2F physician, whether staff were trained
 on image acquisition, the technology used for image acquisition, the use of teledermoscopy, studies conducted pre- or
 post-pandemic, and the risk of bias. Confounding factors, such as technology type, year of publication, and training
 of study raters, were controlled using meta-regression.

Proportions meta-analysis looked at weighted averages, and 95% confidence intervals were reported. Given the unique properties of proportional data and the considerable heterogeneity observed, conventional publication bias tests, specifically designed for comparative data, were not considered applicable. As such, statistical pursuit of publication bias was not undertaken. Instead, a methodologically appropriate qualitative assessment of publication bias was implemented for this type of analysis. This approach was deemed to provide the most accurate and robust outcome.

or of the terms only

# 257 Supplementary eResults258

Our analysis incorporated forty-four relevant studies. Key study and participant details are summarized in eTable 1,
 with a concise overview provided in the main text. Articles excluded based on our criteria are listed in eTable 5.

### 262 Diagnostic reliability of teledermatology when compared to F2F (specialist and non-specialists) evaluation

Of the 40 studies that reported diagnostic agreement rates there were 72 unique comparisons made between F2F and teledermatology.(5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44) **eFigure 1A** shows that the mean percentage agreement of 68.9% (CI 64.4%-73.1%) ranged from 14% to 98%, where 35/72 had percentage agreement above 70% and 7 studies had over 90% agreement. The studies were heterogeneous (I^2=98%, p <0).

Of the 21 studies that reported concordance values, there were 45 unique comparisons made.(5, 6, 11, 14, 17, 20, 21, 22, 23, 24, 25, 28, 29, 32, 33, 34, 45, 46, 47, 48, 49) **eFigure 1B** shows that the mean diagnostic concordance of 0.67 (CI 0.60 to 0.74) ranged from 0.213 (CI 0.20 to 0.23) to 0.96 (CI 0.92 to 0.98), with 21 studies (47%) having moderate agreement (k=0.6 and above), and 13 (29%) studies having strong agreement. The studies were heterogeneous (I^2=100%, p <0.001).

# Diagnostic agreement between teledermatologist and teledermatologist, F2F and F2F, and teledermatology and histopathology

Of the ten studies that reported diagnostic agreement rates between telermatologists, there were 17 unique comparisons made between F2F and teledermatology consults. **eFigure 2A** shows the mean percentage agreement of 76.4% (CI 69% to 82.5%) ranged from 37% to 91.5%, with 10/17 having percentage agreement above 70% and two studies having over 90% agreement. The studies were heterogeneous (I^2=97%, p <0.001).

From four studies that reported diagnostic agreement rates between F2F dermatologists there were 6 unique comparisons. **eFigure 2B** shows that the mean percentage agreement 82.4% (CI 76.7%-87.0%) ranged from 75.5% to 91%. The studies were heterogeneous (I $^2$ =68%, p <0.001).

Five studies compared teledermatology to histopathology data, and there were six unique comparisons. **eFigure 2C** shows that the mean percentage agreement of 55.7% (CI 53% to 58.4%) ranged from 53.8% to 65.4%. The mean agreement rate between histopathology and teledermatology was 55.7% (CI 53.0 to 58.4). The studies were homogeneous ( $I^2=0\%$ , p = 0.49).

## Subgroup analyses

## Diagnostic reliability of teledermatology vs F2F specialist and non-specialist

Within the same modality, eFigure 3A shows that teledermatologists had a diagnostic agreement rate of 70.96% (CI 69.8% to 72.1%) with F2F dermatologists, while the agreement rate with F2F non-specialists was 44.1% (CI 39.9% to 48.4%). Comparing telermatologists to non-specialists showed significantly lower agreement among non-specialists  $(p < 0.001, heterogeneity: I^2 = 98\%)$ . Among 35 studies reporting diagnostic agreement rates, 44 out of 64 comparisons between teledermatology and F2F dermatologists had a percentage agreement above 60%, with seven studies reporting over 90% agreement. The mean kappa concordance value for diagnostic agreement between teledermatology and F2F dermatologists shown in eFigure 3B was 0.69 (CI 0.60 to 0.75). Additionally, telermatologists had a mean concordance value of 0.52 (CI 0.25 to 0.71) when compared to non-specialists. Non-specialists showed significantly lower diagnostic concordance compared to dermatologists for F2F vs. teledermatology (p = 0.031, heterogeneity: I<sup>2</sup> = 100%). Moreover, studies comparing teledermatologists to F2F and teledermatology to histopathology showed a range of agreement rates, with heterogeneity observed in the former (I<sup>2</sup> = 97%, p < 0.001) and homogeneity in the latter (I<sup>2</sup> = 0%, p = 0.49). 

# 308 Diagnostic reliability of teledermatology vs F2F by the inclusion of teledermoscopy in both teledermatology 309 and F2F assessments

54310Overall, twelve studies with 22 unique comparisons used teledermoscopy for diagnosing suspicious lesions. (8, 11, 15,5531129, 32, 34, 38, 39, 42, 44) **eFigure 4A** shows that with teledermoscopy, the mean diagnostic agreement rates was5631269.1% (CI 66.8% to 71.4%), and this percentage ranged between from 31.6% to 92.3%. Without the use of

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teledermsocopy, the mean agreement rate was 68.3% (CI 66.8% to 69.8%). The means were not significantly different between the two groups and the studies were heterogeneous (I $^2=97\%$ , p<0.001). **eFigure 4B** shows concordance values of seven studies that adapted teledermoscopy had a mean of 0.71 (CI 0.58 to 0.80).(11, 29, 32, 34, 39, 47, 48) Without teledermsocopy, the mean was 0.65 (CI 0.54 to 0.74). This difference was not statistically significant, and the studies were heterogeneous (I $^2=100\%$ , p<0.001).

## 319 Diagnostic reliability of teledermatology vs F2F by the inclusion of lesion category

Twenty-six studies with 39 unique comparisons reporting percentage agreement rates that were inclusive to all lesion types as shown in eFigure 5A.(5, 6, 7, 8, 9, 10, 15, 16, 17, 18, 19, 22, 24, 25, 26, 28, 29, 30, 31, 32, 33, 36, 37, 40, 41, 43) The mean percentage agreement was 69.9% (CI 67.9% to 71.7%) and ranged from 30.9% to 98%, with the majority (26/39) having percentage agreement above 60% and 4 studies having over 90%. Eleven studies only looked at suspicious lesions, (11, 12, 14, 20, 23, 34, 35, 38, 39, 42, 44) and the mean percentage agreement was 68.1% (CI 66.3% to 69.8%). Three studies excluded skin cancers(13, 21, 27) and the mean percentage agreement was 62.2% (CI 56.2% to 67.8%). No statistical significance could be identified between the three lesion groups and the studies were heterogeneous (I^2=98%, p<0.001). 

Concordance values for studies inclusive to all lesions seen in **eFigure 5B** were reported in ten studies with a mean of 0.62 (CI 0.48 to 0.74).(5, 6, 17, 22, 24, 25, 28, 29, 32, 33) Six studies that looked at cancerous skin lesions only reported a mean of 0.70 (CI 0.59 to 0.78).(11, 14, 20, 23, 34, 39) Only one study that looked at all lesions except cancerous ones reported a concordance value.<sup>22</sup> No statistical significance could be identified between the three lesion groups and the studies were heterogeneous (I^2=100%, p<0.001).

### Diagnostic reliability of teledermatology vs F2F by pre- and post-pandemic timelines

When comparing telermatologists to all F2F physicians, the average agreement rate was 65.5% (CI 64.0-66.9) for prepandemic studies, and 75.3% (CI 73.4% to 77.2%) for studies published after January 2020. When the percentage agreements were compared between the two groups, they were not statistically significant (p = 0.421) and also heterogeneous (I^2=98%, p<0.001). eTable not included.

### Risk of bias and quality assessment

The QUADAS-2 framework was utilized to evaluate bias and applicability across four essential domains, ensuring
 that our conclusions are both accurate and applicable to real-life clinical situations. eTable 6A summarizes the
 QUADAS-2 criteria tailored to this study.

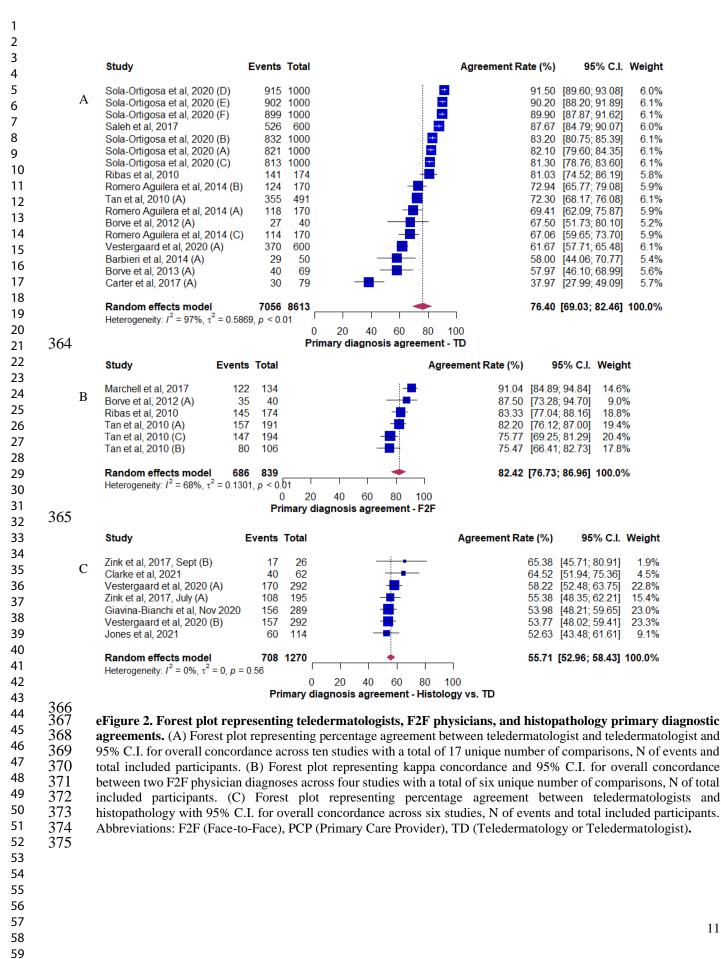
The results of quality assessment for risk of bias and applicability in individual studies are displayed in. **eTable 6B**-**E.** Six of the studies had low risk of bias, nine had moderate risk, and 29 had high-risk of bias. There were no systematic differences between the results of studies that attempted to reduce risk of bias, compared with those with higher risk of bias. The mean diagnostic agreement rate between F2F and teledermatology was 66.4% (CI 62.4% to 70.1%) for low risk, and 69.1% (CI 67.6% to 70.6%) for high risk (p = 0.932). When the percentage agreements were compared between groups, they were heterogeneous (I<sup>^</sup> 2=98%, p<0.001). eTable not included.

#### Supplementary eFigures and Legends

4	554	Supplementary eriguit		-	lus			
5		Study	Events	Total		Agreement Rate (%)	95% C.I.	Weight
-		Muir et al, 2011 (B)	49	50	i —	98.00	[87.12: 99.72]	0.6%
6	A		24	26			[73.93; 98.07]	0.8%
7		Sola-Ortigosa et al, 2020 (D)	915	1000			[89.60; 93.08]	1.5%
8		Sola-Ortigosa et al, 2020 (E) Nami et al, 2015	912 356	1000 391	*		[89.28; 92.80] [87.79; 93.50]	1.5% 1.4%
9		Sola-Ortigosa et al, 2020 (F)	903	1000			[88.30; 91.99]	1.4%
		Barcaui et al, 2018	37	41			[76.73; 96.29]	1.1%
10		Sola-Ortigosa et al, 2020 (C)	884	1000	+		[86.26; 90.24]	1.5%
11		Romero et al, 2010 (A) Romero Aguilera et al, 2014 (C)	325 150	368 170			[84.61; 91.22] [82.47; 92.28]	1.4% 1.4%
12		Rubegni et al, 2011	114	130			[80.85; 92.32]	1.4%
13		Sola-Ortigosa et al, 2020 (A)	875	1000		87.50	[85.30; 89.41]	1.5%
14		Romero et al, 2010 (B)	314	368			[81.33; 88.59]	1.4%
		Sola-Ortigosa et al, 2020 (B) Rios-Yuil, 2012	835 25	1000 30			[81.07; 85.67] [65.68; 92.89]	1.5% 1.1%
15		Gatica, 2015	103	125			[74.71; 88.12]	1.4%
16		Ribas et al, 2010	142	174			[75.15; 86.69]	1.4%
17		Saleh et al, 2017	488 548	600 684			[78.01; 84.25]	1.5% 1.5%
18		Warshaw et al, 2015 (C) Giavina-Bianchi et al, Oct 2020	576	739			[76.96; 82.94] [74.81; 80.79]	1.5%
19		Borve et al, 2012 (A)	31	40			[62.12; 87.86]	1.2%
		Borve et al, 2012 (B)	31	40			[62.12; 87.86]	1.2%
20		Tran et al, 2011 Marchell et al, 2017	23 77	30 101			[58.50; 88.45] [66.99; 83.53]	1.2% 1.4%
21		Marchell et al, 2017	162	213			[69.87; 81.31]	1.4%
22		Zanini, 2013	76	100		76.00	[66.68; 83.36]	1.4%
23		Warshaw et al, 2015 (A)	570	753			[72.50; 78.63]	1.5%
		Gerhardt et al, 2021 Warshaw et al, 2015 (B)	609 566	809 752			[72.19; 78.13] [72.06; 78.22]	1.5% 1.5%
24		Tan et al, 2010 (B)	162	219			[67.76; 79.35]	1.4%
25		Tan et al, 2010 (A)	283	385	<u>-</u>		[68.87; 77.68]	1.5%
26		Romero Aguilera et al, 2014 (A) Romero Aguilera et al, 2014 (B)	124 123	170 170			[65.77; 79.08] [65.16; 78.55]	1.4% 1.4%
27		Marchell et al, 2017	81	112			[63.33; 79.81]	1.4%
28		Muir et al, 2011 (A)	43	60			[59.06; 81.60]	1.3%
		Vano-Galvan et al, 2011	1381	2000	<b></b>		[66.99; 71.04]	1.5%
29		Clarke et al, 2021 Gabel et al, 2021	205 27	308 41			[61.10; 71.61] [50.28; 78.62]	1.5% 1.3%
30		Duong et al, 2014 (A)	44	68	<b>_</b> _		[52.72; 75.09]	1.4%
31		Barbieri et al, 2014 (A)	32	50			[49.95; 76.00]	1.3%
32		Vestergaard et al, 2020 (A)	372 66	600 107			[58.05; 65.80]	1.5%
33		Lamel et al, 2012 Giavina-Bianchi et al, Nov 2020	490	803			[52.16; 70.39] [57.60; 64.34]	1.4% 1.5%
		Vestergaard et al, 2020 (B)	361	600	<b>—</b>		[56.19; 64.01]	1.5%
34		Warshaw et al, 2015 (F)	357	595	<b></b>		[56.01; 63.86]	1.5%
35		Zink et al, 2017, July (A) Altieri et al, 2017 (A)	115 93	195 160			[51.94; 65.66] [50.35; 65.52]	1.4% 1.4%
36		Azfar et al, 2014 (B)	77	136			[48.18; 64.69]	1.4%
37		Borve et al, 2013 (B)	39	69			[44.68; 67.66]	1.4%
38		Barbieri et al, 2014 (B) Patro et al, 2015	28 115	50 206			[42.13; 68.99]	1.3% 1.4%
		Batalla, 2016	36	65			[48.98; 62.46] [43.22; 66.94]	1.4%
39		Borve et al, 2013 (A)	38	69	— <u>—</u> —		[43.27; 66.33]	1.4%
40		Okita et al, 2016	54	100			[44.20; 63.50]	1.4%
41		Warshaw et al, 2015 (E) Altieri et al, 2017 (B)	348 81	652 152			[49.53; 57.18] [45.34; 61.07]	1.5% 1.4%
42		Warshaw et al, 2015 (D)	344	651			[49.00; 56.65]	1.5%
43		Keller et al, 2020 (B)	28	53		52.83	[39.51; 65.76]	1.3%
44		Altieri et al, 2017 (C) Warshaw et al, 2015 (G)	80 300	152 583			[44.69; 60.44] [47.40; 55.50]	1.4% 1.5%
		Warshaw et al, 2015 (G)	291	579	<b></b>		[46.19; 54.32]	1.5%
45		Warshaw et al, 2015 (J)	511	1020	<u> </u>	50.10	[47.03; 53.16]	1.5%
46		Azfar et al, 2014 (C)	66	136			[40.25; 56.89]	1.4%
47		Chen et al, 2010 Azfar et al, 2014 (A)	194 63	405 136			[43.07; 52.77] [38.12; 54.73]	1.5% 1.4%
48		Warshaw et al, 2015 (I)	473	1034	-		[42.73; 48.79]	1.5%
		Keller et al, 2020 (A)	24	53	<b></b>	45.28	[32.52; 58.70]	1.3%
49		Carter et al, 2017 (B)	30 183	79 528			[27.99; 49.09] [30.72; 38.82]	1.4%
50		Jones et al, 2021 Costello et al, 2020	183 12	528 37			[30.72, 36.62]	1.5% 1.3%
51		Duong et al, 2014 (B)	34	110			[22.99; 40.13]	1.4%
52		Carter et al, 2017 (A)	11	79		13.92	[7.88; 23.42]	1.3%
53		Random effects model	18539	26511	<b>_</b>	68 97	[64.36; 73.05]	100.0%
		Heterogeneity: $I^2 = 98\%$ , $\tau^2 = 0.715$				00.07	[04.00, 70.00]	
54		<b>U</b> ,		0	20 40 60 80 10			
55	255			Primary	diagnosis agreement - F2F v	s. TD		
56	355							
57								
50								

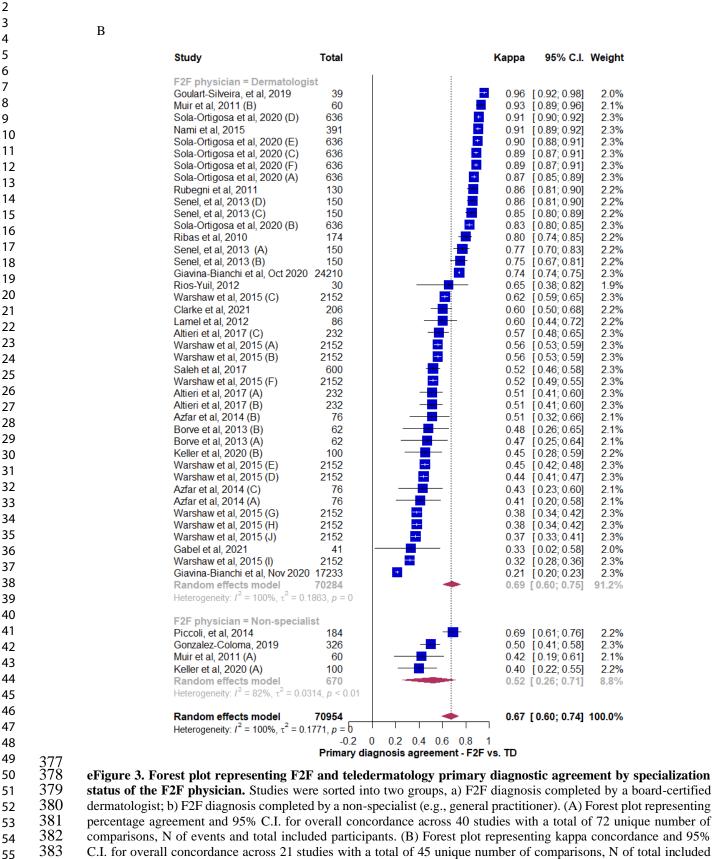
2								
3								
4		Study	Total		Kappa	95% C.I.	Weight	
5		Coulort Silvoira, et al. 2010	39	: 💻	0.06	10 02: 0 091	2.09/	
6	В	Goulart-Silveira, et al, 2019 Muir et al, 2011 (B)	60			[0.92; 0.98] [0.89; 0.96]	2.0% 2.1%	
7		Sola-Ortigosa et al, 2020 (D)	636	+		[0.89, 0.90]	2.1%	
8		Nami et al, 2015	391			[0.89; 0.92]	2.3%	
9		Sola-Ortigosa et al, 2020 (E)	636			[0.88; 0.91]	2.3%	
		Sola-Ortigosa et al, 2020 (C)	636			[0.87; 0.91]	2.3%	
10		Sola-Ortigosa et al, 2020 (F)	636	+		[0.87; 0.91]	2.3%	
11		Sola-Ortigosa et al, 2020 (A)	636	+		[0.85; 0.89]	2.3%	
12		Rubegni et al, 2011	130		0.86	[0.81; 0.90]	2.2%	
13		Senel, et al, 2013 (D)	150		0.86	[0.81; 0.90]	2.2%	
14		Senel, et al, 2013 (C)	150		0.85	[0.80; 0.89]	2.2%	
15		Sola-Ortigosa et al, 2020 (B)	636			[0.80; 0.85]	2.3%	
		Ribas et al, 2010	174			[0.74; 0.85]	2.2%	
16		Senel, et al, 2013 (A)	150			[0.70; 0.83]	2.2%	
17		Senel, et al, 2013 (B)	150			[0.67; 0.81]	2.2% 2.3%	
18		Giavina-Bianchi et al, Oct 2020 Piccoli, et al, 2014	184			[0.74; 0.75] [0.61; 0.76]	2.3%	
19		Rios-Yuil, 2012	30			[0.38; 0.82]	1.9%	
20		Warshaw et al, 2015 (C)	2152			[0.59; 0.65]	2.3%	
21		Clarke et al, 2021	206			[0.50; 0.68]	2.2%	
22		Lamel et al, 2012	86	<mark></mark>		[0.44; 0.72]	2.2%	
		Altieri et al, 2017 (C)	232			[0.48; 0.65]	2.3%	
23		Warshaw et al, 2015 (A)	2152	<u></u>	0.56	[0.53; 0.59]	2.3%	
24		Warshaw et al, 2015 (B)	2152			[0.53; 0.59]	2.3%	
25		Saleh et al, 2017	600			[0.46; 0.58]	2.3%	
26		Warshaw et al, 2015 (F)	2152			[0.49; 0.55]	2.3%	
27		Altieri et al, 2017 (A)	232			[0.41; 0.60]	2.3%	
28		Altieri et al, 2017 (B) Azfar et al, 2014 (B)	232 76			[0.41; 0.60]	2.3% 2.1%	
29		Gonzalez-Coloma, 2019	326			[0.32, 0.00]	2.3%	
30		Borve et al, 2013 (B)	62			[0.26; 0.65]	2.1%	
		Borve et al, 2013 (A)	62	<b>_</b>		[0.25; 0.64]	2.1%	
31		Keller et al, 2020 (B)	100	—— <b>—</b>		[0.28; 0.59]	2.2%	
32		Warshaw et al, 2015 (E)	2152		0.45	[0.42; 0.48]	2.3%	
33		Warshaw et al, 2015 (D)	2152	<u></u>	0.44	[0.41; 0.47]	2.3%	
34		Azfar et al, 2014 (C)	76			[0.23; 0.60]	2.1%	
35		Muir et al, 2011 (A)	60			[0.19; 0.61]	2.1%	
36		Azfar et al, 2014 (A)	76			[0.20; 0.58]	2.1%	
37		Keller et al, 2020 (A)	100			[0.22; 0.55]	2.2%	
38		Warshaw et al, 2015 (G) Warshaw et al, 2015 (H)	2152 2152			[0.34; 0.42] [0.34; 0.42]	2.3% 2.3%	
		Warshaw et al, 2015 (J)	2152			[0.33; 0.42]	2.3%	
39		Gabel et al, 2021	41			[0.02; 0.58]	2.0%	
40		Warshaw et al, 2015 (I)	2152			[0.28; 0.36]	2.3%	
41		Giavina-Bianchi et al, Nov 2020		+		[0.20; 0.23]	2.3%	
42		,				- / -		
43		Random effects model	70954		0.67	[0.60; 0.74]	100.0%	
44		Heterogeneity: $I^2 = 100\%$ , $\tau^2 = 0.1$						
45	356		C	0 0.2 0.4 0.6 0.8 1				
45	357							

eFigure 1. Forest plot representing F2F and teledermatology primary diagnostic agreement. (A) Forest plot
 representing percentage agreement and 95% C.I. for overall concordance across 40 studies with a total of 72 unique
 number of comparisons, N of events and total included participants. (B) Forest plot representing kappa concordance
 and 95% C.I. for overall concordance across 21 studies with a total of 45 unique number of comparisons, N of total
 included participants. Abbreviations: F2F (Face-to-Face), PCP (Primary Care Provider), TD (Teledermatology or
 Teledermatologist).



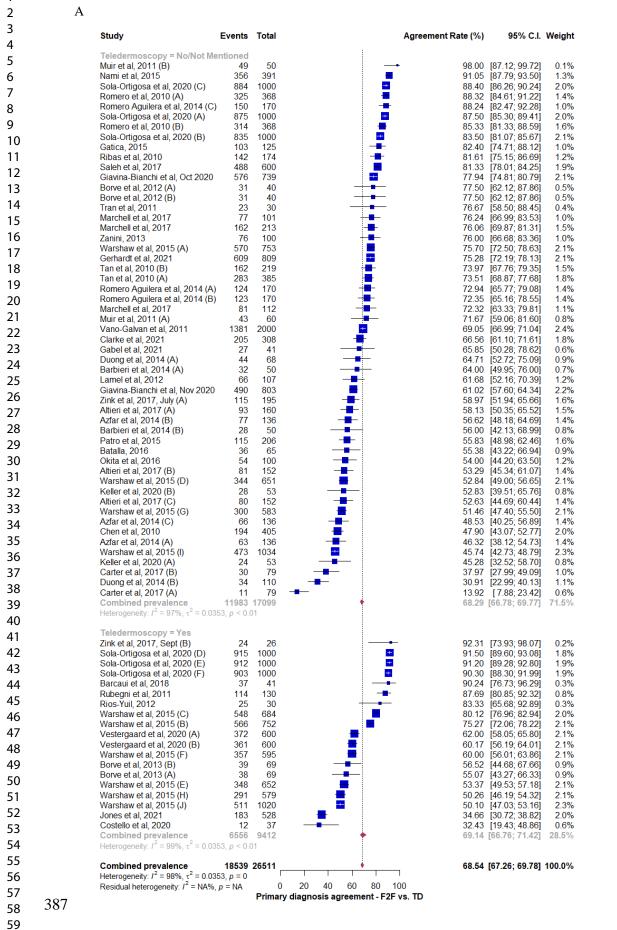
	Events	Total		Agreement Rate (%)	95% C.I.	Weight
F2F physician = Dermatologist Muir et al, 2011 (B) Ziek et al, 2017, Sept (B)	49 24	50 26		98.00 92.31	[87.12; 99.72] [73.93; 98.07]	0.1% 0.1%
Zink et al, 2017, Sept (B) Sola-Ortigosa et al, 2020 (D)	915	1000	+	91.50	[89.60; 93.08]	1.9%
Sola-Ortigosa et al, 2020 (E) Nami et al, 2015	912 356	1000 391	-	91.20 91.05	[89.28; 92.80] [87.79; 93.50]	1.9% 1.3%
Sola-Ortigosa et al, 2020 (F)	903	1000	+	90.30	[88.30; 91.99]	1.9%
Barcaui et al, 2018 Sola-Ortigosa et al, 2020 (C)	37 884	41 1000	-	90.24 88.40	[76.73; 96.29] [86.26; 90.24]	0.3% 2.0%
Romero et al, 2010 (A) Romero Aguilera et al, 2014 (C)	325 150	368 170	-		[84.61; 91.22] [82.47; 92.28]	1.4% 0.9%
Rubegni et al, 2011	114	130	-	87.69	[80.85; 92.32]	0.8%
Sola-Ortigosa et al, 2020 (A) Romero et al, 2010 (B)	875 314	1000 368			[85.30; 89.41] [81.33; 88.59]	2.0% 1.5%
Sola-Ortigosa et al, 2020 (B)	835	1000		83.50	[81.07; 85.67]	2.2%
Rios-Yuil, 2012 Gatica, 2015	25 103	30 125		83.33 82.40	[65.68; 92.89] [74.71; 88.12]	0.3% 0.9%
Ribas et al, 2010	142	174	-	81.61	[75.15; 86.69]	1.2%
Saleh et al, 2017 Warshaw et al, 2015 (C)	488 548	600 684			[78.01; 84.25] [76.96; 82.94]	2.0% 2.0%
Giavina-Bianchi et al, Oct 2020	576	739		77.94	[74.81; 80.79]	2.1%
Borve et al, 2012 (A) Borve et al, 2012 (B)	31 31	40 40			[62.12; 87.86] [62.12; 87.86]	0.5% 0.5%
Tran et al, 2011	23 77	30		76.67	[58.50; 88.45]	0.4%
Marchell et al, 2017 Marchell et al, 2017	162	101 213	-		[66.99; 83.53] [69.87; 81.31]	0.9% 1.4%
Zanini, 2013 Warshaw et al, 2015 (A)	76 570	100 753			[66.68; 83.36] [72.50; 78.63]	0.9% 2.2%
Gerhardt et al, 2021	609	809	-		[72.19; 78.13]	2.2%
Warshaw et al, 2015 (B) Tan et al, 2010 (B)	566 162	752 219			[72.06; 78.22] [67.76; 79.35]	2.2% 1.5%
Tan et al, 2010 (A)	283	385	-	73.51	[68.87; 77.68]	1.8%
Romero Aguilera et al, 2014 (A) Romero Aguilera et al, 2014 (B)	124 123	170 170			[65.77; 79.08] [65.16; 78.55]	1.3% 1.3%
Marchell et al, 2017	81	112		72.32	[63.33; 79.81]	1.1%
Vano-Galvan et al, 2011 Clarke et al, 2021	1381 205	2000 308		69.05 66.56		2.5% 1.8%
Gabel et al, 2021 Barbieri et al, 2014 (A)	27 32	41 50			[50.28; 78.62]	0.6% 0.7%
Vestergaard et al, 2020 (A)	372	600	-	64.00 62.00	[49.95; 76.00] [58.05; 65.80]	2.2%
Lamel et al, 2012 Giavina-Bianchi et al, Nov 2020	66 490	107 803			[52.16; 70.39] [57.60; 64.34]	1.1% 2.3%
Vestergaard et al, 2020 (B)	361	600	-	60.17	[56.19; 64.01]	2.2%
Warshaw et al, 2015 (F) Zink et al, 2017, July (A)	357 115	595 195	- <mark></mark>	60.00 58.97	[56.01; 63.86] [51.94; 65.66]	2.2% 1.6%
Altieri et al, 2017 (A)	93	160		58.13	[50.35; 65.52]	1.4%
Azfar et al, 2014 (B) Borve et al, 2013 (B)	77 39	136 69			[48.18; 64.69] [44.68; 67.66]	1.3% 0.9%
Barbieri et al, 2014 (B)	28 36	50 65			[42.13; 68.99]	0.7% 0.9%
Batalla, 2016 Borve et al, 2013 (A)	38	69			[43.22; 66.94] [43.27; 66.33]	0.9%
Okita et al, 2016 Warshaw et al, 2015 (E)	54 348	100 652			[44.20; 63.50] [49.53; 57.18]	1.1% 2.2%
Altieri et al, 2017 (B)	81	152		53.29	[45.34; 61.07]	1.4%
Warshaw et al, 2015 (D) Keller et al, 2020 (B)	344 28	651 53			[49.00; 56.65] [39.51; 65.76]	2.2% 0.7%
Altieri et al, 2017 (C)	80 300	152 583		52.63	[44.69; 60.44]	1.4% 2.2%
Warshaw et al, 2015 (G) Warshaw et al, 2015 (H)	291	579	<b>.</b>		[47.40; 55.50] [46.19; 54.32]	2.2%
Warshaw et al, 2015 (J) Azfar et al, 2014 (C)	511 66	1020 136			[47.03; 53.16] [40.25; 56.89]	2.4% 1.3%
Azfar et al, 2014 (A)	63	136	<b>—</b>		[38.12; 54.73]	1.3%
Warshaw et al, 2015 (l) Carter et al, 2017 (B)	473 30	1034 79			[42.73; 48.79] [27.99; 49.09]	2.4% 0.9%
	17879		•		[69.76; 72.14]	
F2F physician = Non-specialist						
Muir et al, 2011 (A)	43	60			[59.06; 81.60]	0.7%
Duong et al, 2014 (A) Patro et al, 2015	44 115	68 206	-		[52.72; 75.09] [48.98; 62.46]	0.8% 1.6%
Chen et al, 2010	194	405		47.90	[43.07; 52.77]	2.0%
Keller et al, 2020 (A) Jones et al, 2021	24 183	53 528			[32.52; 58.70] [30.72; 38.82]	0.7% 2.1%
Costello et al, 2020	12	37		32.43	[19.43; 48.86]	0.5%
Duong et al, 2014 (B) Carter et al, 2017 (A)	34 11	110 79		13.92	[22.99; 40.13] [7.88; 23.42]	1.1% 0.6%
<b>Combined prevalence</b> Heterogeneity: $I^2 = 91\%$ , $\tau^2 = 0.0291$	660	1546	•		[39.92; 48.37]	
Combined prevalence	18539	26511	•	68.54	[67.34; 69.71]	100.0%

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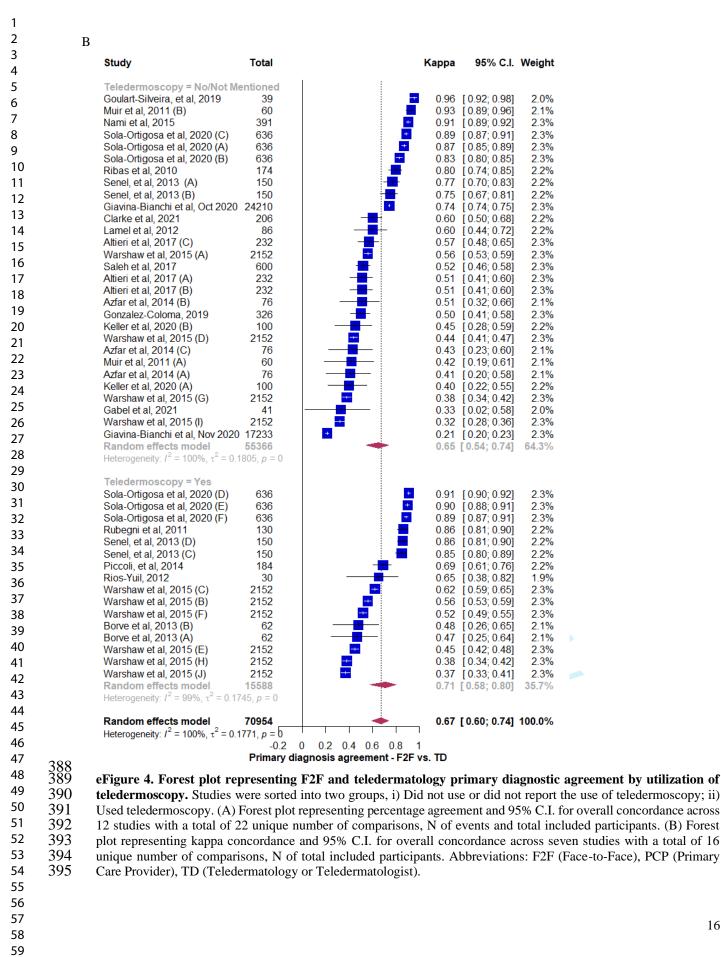
1 2 3 4	384 385	participants. Abbreviations: F2F (Face-to-Face), PCP (Primary Care Provider), TD (Teledermatology or Teledermatologist).
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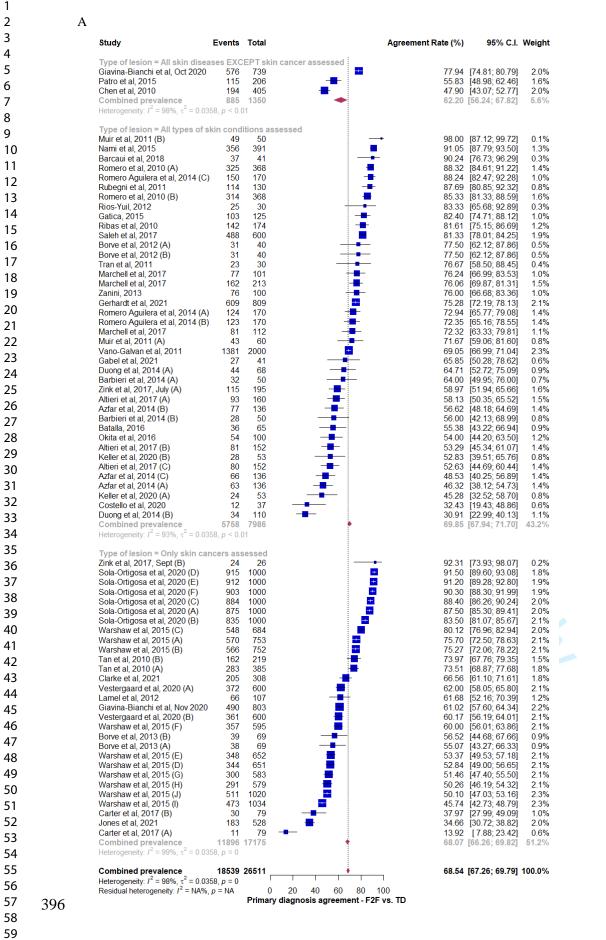
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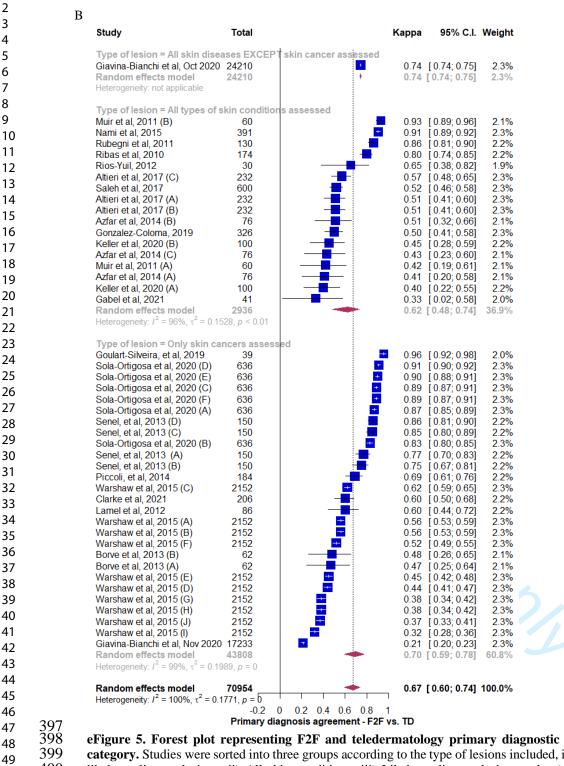


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eFigure 5. Forest plot representing F2F and teledermatology primary diagnostic agreement by skin lesion category. Studies were sorted into three groups according to the type of lesions included, i) All skin conditions except likely malignant lesions; ii) All skin conditions; iii) Likely malignant lesions only. (A) Forest plot representing percentage agreement and 95% C.I. for overall concordance across 26 studies with a total of 39 unique number of comparisons, N of events and total included participants. (B) Forest plot representing kappa concordance and 95% C.I. for overall concordance across ten studies with a total of 27 unique number of comparisons, N of total included participants. Abbreviations: F2F (Face-to-Face), PCP (Primary Care Provider), TD (Teledermatology or Teledermatologist).

## Supplementary eTables

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1	Author, Year	Study design	Country	Funding reported	Intervention	*Outcome	Patients (n)	Female (%)	Mean Age (y)	Lesions (N)	
2					TD vs F2F Dermatologist						
3	Altieri, et al, 2017	Prospective Cohort	USA	Y	TD and F2F dermatologists via clinical images taken by digital photography	Diagnostic agreement rate, Concordance	232	N/A	NA	232	
4 5	Azfar, et al, 2014	Prospective Cohort	USA, Botswana	Ν	TD and F2F dermatologists via smartphone images	Diagnostic agreement rate, Concordance	76	57	39	159	
6 7	Barbieri, et al, 2014	Prospective Cohort	USA	Ν	TD and F2F dermatologists via smartphone images using the AccessDerm smartphone platform	Diagnostic agreement rate	50	64	55.2	50	
8	Barcaui, et al, 2018	Prospective Cohort	Brazil	Ν	TD and F2F consult by the same dermatologist via digital photography and dermoscopy images stored in WhatsApp	Diagnostic agreement rate	31	71	56.5	41	
9 10	Batalla, 2015	Retrospective Cohort	Spain	Ν	TD and F2F dermatologists by via clinical images	Diagnostic agreement rate	183	66	9	65	
11 12	Borve, et al, 2012	Prospective Cohort	Sweden	Y	TD and F2F consults by the same dermatologist via smartphone images stored in Tele-Dermis	Diagnostic agreement rate	40	57.5	49	40	
13	Gabel, et al, 2021	Prospective Cohort	USA	Y	TD and F2F dermatologists via clinical images taken by digital photography and tablets	Diagnostic agreement rate, Concordance	41	N/A	N/A	41	
14 15	Gatica, et al, 2015	Prospective Cohort	Chile	Ν	TD and F2F dermatologists via clinical images taken by digital photography	Diagnostic agreement rate	125	57.6	37.7	125	
16 17	Gerhardt, et al, 2021	Retrospective Cohort	USA	Y	TD and F2F dermatologists via clinical images	Diagnostic agreement rate	809	N/A	N/A	809	
18	Keller, et al, 2020	Prospective Cohort	USA	Y	TD and F2F dermatologists or hospitalists on clinical images taken by smartphones and tablets	Diagnostic agreement rate, Concordance	100	43.2	N/A	100	
19 20	Marchell, et al., 2017	Quasi RCT	USA	Y	TD and F2F dermatologists via digital photography, compressed and uncompressed video	Diagnostic agreement rate (SFTD, video)	216	N/A	N/A	216	
21 22	Muir, et al, 2011	Prospective Cohort	Australia	Ν	TD and F2F emergency derms and non-specialists via clinical images taken by digital photography	Diagnostic agreement rate, Concordance	50	65	47	50	All lesions
23	Nami, et al, 2015	Prospective Cohort	Italy and Austria	Y	TD and F2F dermatologists via smartphone images stored in MugDerma	Diagnostic agreement rate, Concordance	391	52.2	54	391	sions
24	Okita, et al, 2016	Prospective Cohort	Brazil	Ν	TD and F2F dermatologists via smartphone images	Diagnostic agreement rate	100	N/A	N/A	100	
25 26	Ribas, et al, 2010	Prospective Cohort	Brazil	Y	TD and F2F dermatologists via digital photography	Diagnostic agreement rate, Concordance	174	53.4	34.7	174	
27	Rios-Yuil, 2011	RCT	Panama	Ν	TD and F2F dermatologists via clinical images taken by digital photography for case conferences	Diagnostic agreement rate, Concordance	30	63.3	N/A	30	
28 29 30	Romero Aguilera, et al, 2014	Prospective Cohort	Spain	Y	TD and F2F dermatologists via clinical images taken by digital photography stored in DERMARED.Some patients were seen by the same derm for F2F and TD.	Diagnostic agreement rate	457	56%	36	170	
31	Romero, et al, 2010	RCT	Spain	Y	TD and F2F consults by the same dermatologist via digital photography and videoconferences via DERMARED software	Diagnostic agreement rate	328	56%	36	510	
32 33	Rubegni, et al, 2011	Prospective Cohort	Italy	Ν	TD and F2F dermatologists via digital photography and dermoscopy images stored in Dermo-image.	Diagnostic agreement rate, Concordance	130	53.9	80.6	130	
34 35	Saleh, et al, 2017	Prospective Cohort	Egypt	Y	TD and F2F dermatologists via clinical images taken by digital photography stored in Dropbox	Diagnostic agreement rate, Concordance	600	50.7	N/A	600	
	Tran, et al, 2011	Prospective Cohort	Egypt	Y	TD and F2F dermatologists via smartphone images stored in ClickDoc	Diagnostic agreement rate	30	N/A	N/A	30	
36 37 38	Vano-Galvan, et al, 2010	Retrospective, Cross-sectional	Spain	Ν	TD and F2F dermatologists via clinical images taken by digital photography for case conferences	Diagnostic agreement rate, 100 patients each analyzed by 20 observers	100	N/A	N/A	100	
39	Zanini, 2013	Prospective Cohort	Brazil	Ν	TD and F2F dermatologists via clinical images taken by digital photography	Diagnostic agreement rate	100	N/A	N/A	100	
40 41	Zink, et al, 2017, July	Prospective Cohort	Germany	Y	TD and F2F dermatologists via smartphone images stored in the KLARA app	Diagnostic agreement rate	195	20.5	N/A	195	
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	ebołvo,fc73₁, 2013	Prospective Cohort	Sweden	Y	TD and F2F consults by the same <b>BM: hapeg</b> ist via smartphone and dermoscopy images stored in iDoc 24 app	Diagnostic agreement rate, Concordance	62	38.7	64	69	
	Carter, et al, 2017	Ambispective Cohort	USA	Y	TD and F2F dermatologists, as well as F2F PCP via clinical images stored using Epic EHR software	Diagnostic agreement rate	79	74	47	79	
1 2	Clarke, et al, 2021	Prospective Cohort	USA	Y	TD and F2F dermatologists via clinical images taken by digital photography stored in Research Electronic Data Capture	Diagnostic agreement rate, Concordance	206	49.5	56.9	308	
3 4	Giavina-Bianchi, et al, 2020 Nov	Retrospective Cohort	Brazil	Ν	TD and F2F dermatologists via smartphone images	Diagnostic agreement rate, Concordance	17,233	71.4	N/A	803	
5 6	Goulart-Silveira et al, 2019	Prospective Cohort	Brazil	Ν	TD and F2F dermatologists via smartphone images acquired and stored via Telederma app	Concordance	39	69	68	39	s
7	Lamel, et al, 2012	Prospective Cohort	USA	Ν	TD and F2F dermatologists via smartphone images stored in ClickDerm	Diagnostic agreement rate, Concordance	86	58.1	45.2	107	Skin cancers only
8 9	Senel, et al, 2013	Prospective Cohort	Turkey	Ν	TD and F2F dermatologists via digital photography and dermoscopy images	Concordance with and without dermoscopy	150	49	55	150	ncers (
10 11	Sola-Ortigosa, et al, 2020	Prospective Cohort	Spain	Ν	TD and F2F consults by the same dermatologist via dermoscopy and clinical images taken by digital photography and tablets	Diagnostic agreement rate, Concordance	636	43.2	72.8	1,000	only
12 13	Tan, et al, 2010	Prospective Cohort	New Zealand	Y	TD and F2F consults by the same dermatologist via digital photography	Diagnostic agreement rate	200	63	N/A	491	
14	Vestergaard, et al, 2020	Prospective Cohort	Denmark	Ν	TD and F2F dermatologists via smartphone and dermoscopy images using FotoFinder Systems	Diagnostic agreement rate, Concordance	519	57	55	600	
15 16	Warshaw, et al, 2015	Prospective, Cross-sectional	USA	Ν	TD and F2F dermatologists via digital photography and dermoscopy images	Diagnostic agreement rate, Concordance	2,152	3.2	68	3,021	
17	Zink, et al, 2017, Sept	Prospective Cohort	Germany	Y	TD and F2F dermatologists via smartphone and dermoscopy images using Handyfotos	Diagnostic agreement rate	26	N/A	N/A	26	
18	bept				images using Handylotos						
19	Giavina-Bianchi, et al, 2020 Oct	Retrospective Cohort	Brazil	N	TD and F2F dermatologists via smartphone images	Diagnostic agreement rate, Concordance	24,210	70	N/A	739	B.
19 20 21	Giavina-Bianchi,		Brazil Country	N Funding reported	TD and F2F dermatologists via smartphone images Intervention		24,210 Patients (n)	70 Female (%)	N/A Mean Age (y)	739 Lesions (N)	B.
19 20 21	Giavina-Bianchi, et al, 2020 Oct	Cohort		Funding	TD and F2F dermatologists via smartphone images	Concordance	Patients	Female	Mean	Lesions	B.
19 20 21 22 23	Giavina-Bianchi, et al, 2020 Oct	Cohort		Funding	TD and F2F dermatologists via smartphone images Intervention	Concordance	Patients	Female	Mean	Lesions	B.
19 20 21 22 23 24 25	Giavina-Bianchi, et al, 2020 Oct Author, Year Costello, et al,	Cohort Study design Prospective,	Country	Funding reported	TD and F2F dermatologists via smartphone images Intervention TD vs F2F Non-specialist TD and F2F PCP via smartphone and dermoscopy images using	Concordance *Outcome	Patients (n)	Female (%)	Mean Age (y)	Lesions (N)	All
19 20 21 22 23 24 25 26	Giavina-Bianchi, et al, 2020 Oct Author, Year Costello, et al, 2019	Cohort Study design Prospective, Cross-sectional Prospective,	Country USA	Funding reported Y	TD and F2F dermatologists via smartphone images Intervention TD vs F2F Non-specialist TD and F2F PCP via smartphone and dermoscopy images using the Photo Exam app TD and F2F emergency physicians via smartphone images and	Concordance *Outcome Diagnostic agreement rate Diagnostic agreement rate	Patients (n) 37	Female (%) 65	Mean Age (y) 47.9	Lesions (N) 37	All
19 20 21 22 23 24 25 26 27 28	Giavina-Bianchi, et al, 2020 Oct Author, Year Costello, et al, 2019 Duong, et al, 2014 Gonzalez-Coloma,	Cohort Study design Prospective, Cross-sectional Prospective, Observational Prospective,	Country USA France	Funding reported Y Y	TD and F2F dermatologists via smartphone images Intervention TD vs F2F Non-specialist TD and F2F PCP via smartphone and dermoscopy images using the Photo Exam app TD and F2F emergency physicians via smartphone images and videoconferences	Concordance *Outcome Diagnostic agreement rate Diagnostic agreement rate (SFTD, video)	Patients (n) 37 194	Female (%) 65 N/A	Mean Age (y) 47.9 N/A	Lesions (N) 37 178	
<ol> <li>19</li> <li>20</li> <li>21</li> <li>22</li> <li>23</li> <li>24</li> <li>25</li> <li>26</li> <li>27</li> <li>28</li> <li>29</li> <li>30</li> </ol>	Giavina-Bianchi, et al, 2020 Oct Author, Year Costello, et al, 2019 Duong, et al, 2014 Gonzalez-Coloma, et al, 2019	Cohort Study design Prospective, Cross-sectional Prospective, Observational Prospective, Cross-sectional	Country USA France Chile	Funding reported Y Y N	TD and F2F dermatologists via smartphone images Intervention TD vs F2F Non-specialist TD and F2F PCP via smartphone and dermoscopy images using the Photo Exam app TD and F2F emergency physicians via smartphone images and videoconferences TD and F2F PCP via clinical images TD and F2F dermatologists or hospitalists on clinical images taken by smartphones and tablets TD and F2F emergency physicians via clinical images taken by digital photography	Concordance *Outcome Diagnostic agreement rate Diagnostic agreement rate (SFTD, video) Diagnostic concordance Diagnostic agreement rate,	Patients (n) 37 194 326	Female (%) 65 N/A 59	Mean Age (y) 47.9 N/A 35.8	Lesions (N) 37 178 326	All
<ol> <li>19</li> <li>20</li> <li>21</li> <li>22</li> <li>23</li> <li>24</li> <li>25</li> <li>26</li> <li>27</li> <li>28</li> <li>29</li> <li>30</li> <li>31</li> </ol>	Giavina-Bianchi, et al, 2020 Oct Author, Year Costello, et al, 2019 Duong, et al, 2014 Gonzalez-Coloma, et al, 2019 Keller, et al, 2020	Cohort Study design Prospective, Cross-sectional Prospective, Observational Prospective, Cross-sectional Prospective Cohort	Country USA France Chile USA	Funding reported Y Y N N Y	TD and F2F dermatologists via smartphone images Intervention TD vs F2F Non-specialist TD and F2F PCP via smartphone and dermoscopy images using the Photo Exam app TD and F2F emergency physicians via smartphone images and videoconferences TD and F2F PCP via clinical images TD and F2F dermatologists or hospitalists on clinical images taken by smartphones and tablets TD and F2F emergency physicians via clinical images taken by	Concordance *Outcome Diagnostic agreement rate Diagnostic agreement rate (SFTD, video) Diagnostic concordance Diagnostic agreement rate, Concordance Diagnostic agreement rate,	Patients (n) 37 194 326 100	Female (%) 65 N/A 59 43.2	Mean Age (y) 47.9 N/A 35.8 N/A	Lesions (N) 37 178 326 100	All skin lesions
19 20 21 22 23 24 25 26 27	Giavina-Bianchi, et al, 2020 Oct Author, Year Costello, et al, 2019 Duong, et al, 2014 Gonzalez-Coloma, et al, 2019 Keller, et al, 2020 Muir, et al, 2011	Cohort Study design Prospective, Cross-sectional Prospective, Observational Prospective, Cross-sectional Prospective Cohort Prospective Cohort Ambispective	Country USA France Chile USA Australia	Funding reported Y Y N V Y N	TD and F2F dermatologists via smartphone images Intervention TD vs F2F Non-specialist TD and F2F PCP via smartphone and dermoscopy images using the Photo Exam app TD and F2F emergency physicians via smartphone images and videoconferences TD and F2F PCP via clinical images TD and F2F dermatologists or hospitalists on clinical images taken by smartphones and tablets TD and F2F emergency physicians via clinical images taken by digital photography TD and F2F dermatologists, as well as F2F PCP via clinical	Concordance *Outcome Diagnostic agreement rate Diagnostic agreement rate (SFTD, video) Diagnostic concordance Diagnostic agreement rate, Concordance Diagnostic agreement rate, Concordance Diagnostic agreement rate SSC matched for age, sex, and ethnicity. Diagnostic	Patients (n) 37 194 326 100 60	Female (%) 65 N/A 59 43.2 65	Mean Age (y) 47.9 N/A 35.8 N/A 47	Lesions (N) 37 178 326 100 60	All skin lesions
<ol> <li>19</li> <li>20</li> <li>21</li> <li>22</li> <li>23</li> <li>24</li> <li>25</li> <li>26</li> <li>27</li> <li>28</li> <li>29</li> <li>30</li> <li>31</li> <li>32</li> <li>33</li> <li>34</li> <li>35</li> </ol>	Giavina-Bianchi, et al, 2020 Oct Author, Year Costello, et al, 2019 Duong, et al, 2014 Gonzalez-Coloma, et al, 2019 Keller, et al, 2020 Muir, et al, 2011 Carter, et al, 2017	Cohort Study design Prospective, Cross-sectional Prospective, Observational Prospective, Cross-sectional Prospective Cohort Prospective Cohort Prospective Cohort	Country USA France Chile USA Australia USA New	Funding reported Y Y N Y N Y Y	TD and F2F dermatologists via smartphone images Intervention TD vs F2F Non-specialist TD and F2F PCP via smartphone and dermoscopy images using the Photo Exam app TD and F2F emergency physicians via smartphone images and videoconferences TD and F2F PCP via clinical images TD and F2F dermatologists or hospitalists on clinical images taken by smartphones and tablets TD and F2F emergency physicians via clinical images taken by digital photography TD and F2F dermatologists, as well as F2F PCP via clinical images stored using Epic EHR software TD and F2F PCP via digital photography and dermoscopy	Concordance         *Outcome         Diagnostic agreement rate         Diagnostic agreement rate         (SFTD, video)         Diagnostic concordance         Diagnostic agreement rate, Concordance         Diagnostic agreement rate, Concordance         Diagnostic agreement rate, Concordance         Diagnostic agreement rate, SSC matched for age, sex, and	Patients (n) 37 194 326 100 60 79	Female (%) 65 N/A 59 43.2 65 74	Mean Age (y) 47.9 N/A 35.8 N/A 47 47	Lesions (N) 37 178 326 100 60 79	All skin lesions
<ol> <li>19</li> <li>20</li> <li>21</li> <li>22</li> <li>23</li> <li>24</li> <li>25</li> <li>26</li> <li>27</li> <li>28</li> <li>29</li> <li>30</li> <li>31</li> <li>32</li> <li>33</li> <li>34</li> </ol>	Giavina-Bianchi, et al, 2020 Oct Author, Year Costello, et al, 2019 Duong, et al, 2014 Gonzalez-Coloma, et al, 2019 Keller, et al, 2020 Muir, et al, 2011 Carter, et al, 2017 Jones, et al, 2021	Cohort Study design Prospective, Cross-sectional Prospective, Observational Prospective, Cross-sectional Prospective Cohort Prospective Cohort Ambispective Cohort Retrospective, Cohort Retrospective,	Country USA France Chile USA Australia USA New Zealand	Funding reported Y Y N Y N Y Y Y	TD and F2F dermatologists via smartphone images         Intervention         TD vis F2F Non-specialist         TD and F2F PCP via smartphone and dermoscopy images using the Photo Exam app         TD and F2F emergency physicians via smartphone images and videoconferences         TD and F2F PCP via clinical images         TD and F2F dermatologists or hospitalists on clinical images taken by smartphones and tablets         TD and F2F emergency physicians via clinical images taken by digital photography         TD and F2F dermatologists, as well as F2F PCP via clinical images stored using Epic EHR software         TD and F2F PCP via digital photography and dermoscopy images         TD and F2F PCP via digital photography and dermoscopy	Concordance         *Outcome         Diagnostic agreement rate         Diagnostic agreement rate         (SFTD, video)         Diagnostic concordance         Diagnostic agreement rate, Concordance         Diagnostic agreement rate, Concordance         Diagnostic agreement rate, Concordance         Diagnostic agreement rate, Concordance         Diagnostic agreement rate         SSC matched for age, sex, and ethnicity. Diagnostic agreement rate	Patients (n) 37 194 326 100 60 79 481	Female (%) 65 N/A 59 43.2 65 74 64	Mean Age (y) 47.9 N/A 35.8 N/A 47 47 N/A	Lesions (N) 37 178 326 100 60 79 528	All

<sup>59</sup> eTable 1. Study and patient characteristics for all included studies. The table is divided into two sections: one comparing teledermatology with Face-to-Face (F2F) dermatologists, and another comparing teledermatologists with F2F non-specialists. The studies are listed alphabetically and grouped by lesion type. \*See supplementary eTable 4 for agreement rates and concordance values. Abbreviations used in the table include B (Benign lesions only), ED (Emergency Department), EHR (Electronic Health Record), F2F (Face-to-Face), Histo 20

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(Histopathology), ICD10 (International Classification of Diseases, 10th Edition), N (N&MAP(Not available), PCP (Primary Care Provider), PLD (Polarized Light Dermosco (Randomized Controlled Trial), SFTD (Store-and-Forward Teledermatology), SSC (Specialized Skin Clinic), TD (Teledermatology or Teledermatologist), and Y (Yes). Patient characteristics for all 44 included studies are also provided, grouped by lesion type, with a column describing special inclusion and exclusion criteria.

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1 2				
3	406			
4 5		Inclusion criteria	Exclusion criteria	
6 7 8 9 10		Primary articles assessing diagnostic agreement where store-and-forward technology or live video conference consults were compared with a control group who attend in-person visits.	Survey articles, feasibility studies, studies regarding other forms of telemedicine unrelated to dermatology, cost-effectiveness studies, editorials, and review articles.	
11 12 13		Primarily comparing teledermatology to F2F, sometimes using histopathology as the reference standard.	Studies that clearly stated they used telermatologists as the gold- or reference standard.	
14 15 16			Studies that only compared dermatoscopic images in the absence of clinical images.	
17 18			Studies where patients captured their own photographs.	
19 20	407 408	<b>eTable 2. Inclusion and exclusion criteria f</b> F2F: Face-to-Face.	or screening of literature search results.	
21 22	409			
23	410 411			
24 25 26 27 28			untry of publication. Patient characteristics: total number of participants per study, mean age +/- SD, age ns evaluated, type of patients evaluated.	
29 30		Methodology - teledermatology and F2F	consults	
31 32		Method of correspondence, platform used for	or the teledermatology consult, training on telederma experience of the teledermatologist and F2F physici	
33 34		teledermatologist, number of teledermatolog	gists and F2F physicians who made a diagnosis for e ans in study, order of visits, wait time between teled	each patient, total
35 36		consult, whether same specialist conducted	teledermatology and F2F visit, specialization of the ividual who acquired the clinical photographs and w	F2F physician,
37 38		Metrics and results	iapiis.	
39 40 41 42		Technology used for image acquisition and images taken, use of teledermoscopy & dern	for viewing images with, distance between camera a noscopy, brand of dermatoscope, use of histopathole differential diagnoses agreement and concordance ra ivity, specificity, PPV and NPV.	ogy, referral content
43 44	412 413	eTable 3. Data extraction form with details F2F: Face-to-Face, PPV: Positive Predictive	of domains record.	
45 46	415		value, Nr v. Negative Fledicuve value.	
47 48				
49				
50 51				
52 53				
54 55				
56				
57 58				22
59 60		For peer review only - htt	p://bmjopen.bmj.com/site/about/guidelines.xhtm	I

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Author and Year	Unique Study Grouping	Participants (n)	Lesions (N)	Primary Diagnosis Agreement F2F vs F2F (%)	Diagnosis Agreement (N) / Total Diagnoses (N)	Primary Diagnosis Agreement TD vs TD (%)	Diagnosis Agreement (N) / Total Diagnoses (N)	Primary Diagnosis Agreement TD vs F2F (%)	Diagnosis Agreement (N) / Total Diagnoses (N)	Primary Diagnosis Agreement TD vs Histo (%)	Diagnosis Agreement (N) / Total Diagnoses (N)	Primary Diagnosis Kappa Value TD vs F2F	Primary Diagnosis Kappa Value TD vs Histo
Altieri et al, 2017 (A)	F2F Derm vs TD1	232	232					58	93/160			0.51	
Altieri et al, 2017	F2F Derm vs TD2	232	252					50	/3/100			0.51	
(B)		232	232					53	81/152			0.51	
Altieri et al, 2017 (C)	F2F Derm vs TD3	232	232					53	80/152			0.57	
Azfar et al, 2014 (A)	F2F Derm vs TD1	76	159					47	63/136			0.41	
Azfar et al, 2014 (B)	F2F Derm vs TD2	76	159					57	77/136			0.51	
Azfar et al, 2014	F2F Derm vs TD3							49				0.43	
(C) Barbieri et al, 2014 (A)	F2F Derm vs TD1	76 50	159 50			58	29/50	64	66/136 32/50			0.45	
Barbieri et al, 2014 (B)	F2F Derm vs TD2	50	50			30	29/30	56	28/50				
Barcaui et al, 2018	F2F Derm vs TD	31	41					90	37/41				
Batalla, 2016	F2F Derm vs TD	183	183					90 55	36/65				
Borve et al, 2012 (A)	F2F Derm vs TD1	40	40	88	35/40	68	27/40	78	31/40				
(A) Borve et al, 2012 (B)	F2F Derm vs TD2	40	40	00	55/40	00	21170	78	31/40				

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(A)	F2F Derm vs TD1	62	69	58	40/69	55	38/69			0.47	0
Borve et al, 2013	F2F Derm vs TD2	02	0)	50	10/07	55	50/07			0.17	0
(B)		62	69			57	39/69			0.48	
Carter et al, 2017 (A)	F2F nonspecialist vs TD	79	79	38	30/79	14	11/79				
Carter et al, 2017 (B)	F2F Derm vs TD	79	79			38	30/79				
Chen et al, 2010	F2F nonspecialist vs TD	405	405			48	194/405				
Clarke et al, 2021	F2F Derm vs TD	206	308			67	205/308	65	40/62	0.6	
Costello et al, 2020	F2F nonspecialist vs TD	37	37			32	12/37	05	10/02	0.0	
Duong et al, 2014 (A)	F2F nonspecialist vs TD (Videoconference)	111	110			65	44/68				
Duong et al, 2014 (B)	F2F nonspecialist vs TD (SFTD)	111	110			31	34/110				
Gabel et al, 2021	F2F Derm vs TD	41	41			67	27/41			0.33	
Gatica, 2015	F2F Derm vs TD	125	125			82	103/125			0.55	
Gerhardt et al, 2021	F2F Derm vs TD	809	809			75	609809				
Giavina-Bianchi et al, Nov 2020	F2F Derm vs TD	17233	17233			61	490/803	54	156/2 89	0.21	0.
Giavina-Bianchi et al, Oct 2020	F2F Derm vs TD							54	07		0.
Gonzalez-	F2F nonspecialist vs TD	24210	27519			78	576/739			0.74	
Coloma, 2019	121 houspectanst vs 1D	326	326							0.5	
Goulart-Silveira, et al, 2019	F2F Derm vs TD	39	39							0.96	0.
Jones et al, 2021	F2F nonspecialist vs TD (Suspicious Skin Cancer					25	102/500	53	60/11		
Keller et al, 2020	pathway) F2F nonspecialist vs TD	NA	528			35	183/528	55	4		
(A) Keller et al, 2020	F2F Derm vs TD	100	100			45	24/53			0.4	
(B)		100	100			53	28/53			0.45	
Lamel et al, 2012	F2F Derm vs TD		107			62	66/107			0.6	

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Marchell et al, 2017	F2F Derm vs TD (SFTD)	216	216	91	122/1 34			76	162/213		
Marchell et al,	F2F Derm vs TD			71	54						
2017	(Uncompressed video)	216	216					76	77/101		
Marchell et al, 2017	F2F Derm vs TD (Compressed video)	216	216					72	81/112		
Muir et al, 2011 (A)	F2F nonspecialist vs TD	60	60					72	43/60		0.42
Muir et al, 2011 (B)	F2F Derm vs TD	60	60					98	49/50		0.93
Nami et al, 2015	F2F Derm vs TD	391	391					91	356/391		0.91
Okita et al, 2016	F2F Derm vs TD	100	100					54	54/100		
Patro et al, 2015	F2F nonspecialist vs TD	206	206					56	115/206		
Piccoli, et al, 2014	F2F nonspecialist vs TD	184	184								0.69
Ribas et al, 2010	F2F Derm vs TD	174	174	83	145/1 74	81	141/17 4	82	142/174		0.8
Rios-Yuil, 2012	F2F Derm vs TD	30	30	00	7.	01		83	25/30	67	0.65
Romero Aguilera et al, 2014 (A)	F2F Derm vs TD1						118/17				
		457	192			69	0	73	124/170		
Romero Aguilera et al, 2014 (B)	F2F Derm vs TD2	457	192			73	124/17 0	72	123/170		
Romero Aguilera et al, 2014 (C)	F2F Derm vs TD3	457	192			67	114/17 0	88	150/170		
Romero et al, 2010 (A)	F2F Derm vs TD (SFTD)	457	192			07	0	88	325/368		
Romero et al,	F2F Derm vs TD (SFTD and	437	192					00	525/508		
2010 (B)	videoconferencing)	457	176					85	314/368		
Rubegni et al, 2011	F2F Derm vs TD	130	130					88	114/130		0.86
Saleh et al, 2017	F2F Derm vs TD	600	600			88	526/60 0	81	488/600		0.46- 0.52
Senel, et al, 2013	F2F Derm vs TD1 (no dermoscopy)	150	150								0.77
Senel, et al, 2013	F2F Derm vs TD2 (no dermoscopy)	150	150								0.75

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Senel, et al, 2013	F2F Derm vs TD1 (dermoscopy)	150	150									0.85	
Senel, et al, 2013	F2F Derm vs TD2 (dermoscopy)	150	150									0.86	
Sola-Ortigosa et al, 2020 (A)	F2F Derm vs TD1 (no dermoscopy)	636	1000			82	821/10 00	88	875/100 0			0.87	
Sola-Ortigosa et al, 2020 (B)	F2F Derm vs TD2 (no dermoscopy)	636	1000			83	832/10 00	84	835/100 0			0.83	
Sola-Ortigosa et al, 2020 (C)	F2F Derm vs TD3 (no dermoscopy)	636	1000			81	813/10 00	88	884/100 0			0.89	
Sola-Ortigosa et al, 2020 (D)	F2F Derm vs TD1 (dermoscopy)	636	1000			92	915/10 00	92	915/100 0			0.91	
al, 2020 (E)	F2F Derm vs TD2 (dermoscopy)	636	1000			90	90210 00	91	912/100 0			0.9	
Sola-Ortigosa et al, 2020 (F)	F2F Derm vs TD3 (dermoscopy)	636	1000			90	899/10 00	90	903/100 0			0.89	
Tan et al, 2010 (A)	F2F Derm vs TD1, F2F Derm 1 vs F2F Derm 2	200	491	82	157/1 91	72	355/49 1	74	283/385			,	
Tan et al, 2010 (B)	F2F Derm vs TD2, F2F Derm 2 vs F2F Derm 3	200	491	76	80/10 6			74	162/219				
(C)	F2F Derm 1 vs F2F Derm 3	200	491	76	147/1 94								
Tran et al, 2011	F2F Derm vs TD	30	30					75	23/30				
Vano-Galvan et al, 2011	F2F Derm vs TD	100	100					69	1381/20 00				
Vestergaard et al, 2020 (A)	A F2F Derm vs TD1	519	600			62	370/60 0	62	372/600	58	170/2 92		
Vestergaard et al, 2020 (B)	F2F Derm vs TD2	519	600					60	361/600	54	157/2 92		
Warshaw et al, 2015 (A)	F2F Derm vs TD (non biopsied pigmented lesions, Macro)	2152	3021					76	570/753			0.56	
Warshaw et al, 2015 (B)	F2F Derm vs TD (non biopsied pigmented lesions, Macro+PLD)	2152	3021					75	566/752			0.56	
Warshaw et al, 2015 (C)	F2F Derm vs TD (non biopsied pigmented lesions, Macro+PLD)	2152	3021					80	548/684			0.62	

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F2F Derm vs TD (biopsied pigmented lesions, Macro)	2152	3021		53	344/651			0.44
F2F Derm vs TD (biopsied pigmented lesions, Macro+PLD)	2152	3021		53	348/652			0.45
F2F Derm vs TD (biopsied pigmented lesions, Macro+PLD)	2152	3021		60	357/505			0.52
F2F Derm vs TD (NONbiopsied NONpigmented lesions, Macro)								0.38
F2F Derm vs TD (NONbiopsied NONpigmented lesions, Macro+PLD)								0.38
F2F Derm vs TD (biopsied NONpigmented lesions, Macro)	2152			46	473/103 4			0.32
F2F Derm vs TD (biopsied NONpigmented lesions, Macro+PLD)	2152			50	511/102 0			0.37
F2F Derm vs TD	100	100			76/100			
F2F Derm vs TD	195	195		59	115/195	56	108/1 95	
F2F Derm vs TD	26	26		92	24/26	67	17/26	
	<ul> <li>bigmented lesions, Macro)</li> <li>F2F Derm vs TD (biopsied bigmented lesions, Macro+PLD)</li> <li>F2F Derm vs TD (biopsied bigmented lesions, Macro+PLD)</li> <li>F2F Derm vs TD (NONbiopsied NONpigmented lesions, Macro)</li> <li>F2F Derm vs TD (NONbiopsied NONpigmented lesions, Macro)</li> <li>F2F Derm vs TD (biopsied NONpigmented lesions, Macro)</li> </ul>	bigmented lesions, Macro)2152F2F Derm vs TD (biopsied2152F2F Derm vs TD (biopsied2152F2F Derm vs TD (biopsied2152F2F Derm vs TD (NONbiopsied2152F2F Derm vs TD (biopsied2152F2F Derm vs TD (biopsied100F2F Derm vs TD100F2F Derm vs TD195F2F Derm vs TD195	bigmented lesions, Macro) 2152 3021 F2F Derm vs TD (biopsied bigmented lesions, Macro+PLD) 2152 3021 F2F Derm vs TD (biopsied bigmented lesions, Macro+PLD) 2152 3021 F2F Derm vs TD (NONbiopsied NONpigmented lesions, Macro) 2152 3021 F2F Derm vs TD (NONbiopsied NONpigmented lesions, Macro) 2152 3021 F2F Derm vs TD (biopsied NONpigmented lesions, Macro) 100 F2F Derm vs TD 100 100 F2F Derm vs TD 195 F2F Derm vs TD	bigmented lesions, Macro) 2152 3021 F2F Derm vs TD (biopsied bigmented lesions, Macro+PLD) 2152 3021 F2F Derm vs TD (biopsied bigmented lesions, Macro+PLD) 2152 3021 F2F Derm vs TD (NONbiopsied NONpigmented lesions, Macro) 2152 3021 F2F Derm vs TD (NONbiopsied NONpigmented lesions, Macro+PLD) 2152 3021 F2F Derm vs TD (biopsied NONpigmented lesions, Macro) 100 F2F Derm vs TD 100 100 F2F Derm vs TD 195 195	bigmented lesions, Macro) 2152 3021 53 F2F Derm vs TD (biopsied bigmented lesions, Macro+PLD) 2152 3021 53 F2F Derm vs TD (biopsied bigmented lesions, Macro+PLD) 2152 3021 60 F2F Derm vs TD (NONbiopsied NONpigmented lesions, Macro) 2152 3021 52 F2F Derm vs TD (NONbiopsied NONpigmented lesions, Macro+PLD) 2152 3021 50 F2F Derm vs TD (biopsied NONpigmented lesions, Macro) 2152 3021 50 F2F Derm vs TD (biopsied NONpigmented lesions, Macro) 2152 3021 46 F2F Derm vs TD (biopsied NONpigmented lesions, Macro) 2152 3021 50 F2F Derm vs TD (biopsied NONpigmented lesions, Macro) 2152 3021 50 F2F Derm vs TD (biopsied NONpigmented lesions, Macro) 2152 3021 50 F2F Derm vs TD (biopsied NONpigmented lesions, Macro) 2152 3021 50 F2F Derm vs TD 100 100 76 F2F Derm vs TD 100 100 76 F2F Derm vs TD 195 195 59 F2F Derm vs TD	bigmented lesions, Macro)       2152       3021       53       344/651         F2F Derm vs TD (biopsied       2152       3021       53       348/652         F2F Derm vs TD (biopsied       2152       3021       53       348/652         F2F Derm vs TD (biopsied       2152       3021       60       357/595         F2F Derm vs TD (NONbiopsied       2152       3021       60       357/595         F2F Derm vs TD (NONbiopsied       2152       3021       52       300/583         F2F Derm vs TD (NONbiopsied       2152       3021       50       291/579         F2F Derm vs TD (NONbiopsied       2152       3021       50       291/579         F2F Derm vs TD (NONbiopsied       2152       3021       50       291/579         F2F Derm vs TD (biopsied       2152       3021       46       4         F2F Derm vs TD (biopsied       2152       3021       46       4         F2F Derm vs TD (biopsied       2152       3021       50       0         F2F Derm vs TD (biopsied       2152       3021       50       0         F2F Derm vs TD       2152       3021       50       0         F2F Derm vs TD       100       100       76	bigmented lesions, Macro)       2152       3021       53       344/651         F2F Derm vs TD (biopsied       2152       3021       53       348/652         F2F Derm vs TD (biopsied       2152       3021       53       348/652         F2F Derm vs TD (biopsied       2152       3021       60       357/595         F2F Derm vs TD (NONbiopsied       2152       3021       60       357/595         F2F Derm vs TD (NONbiopsied       2152       3021       52       300/583         F2F Derm vs TD (NONbiopsied       2152       3021       50       291/579         F2F Derm vs TD (NONbiopsied       2152       3021       50       291/579         F2F Derm vs TD (biopsied       2152       3021       46       4         F2F Derm vs TD (biopsied       2152       3021       46       4         F2F Derm vs TD (biopsied       2152       3021       50       0         F2F Derm vs TD (biopsied       2152       3021       50       0         F2F Derm vs TD (biopsied       511/102       511/102       511/102         Macro+PLD)       2152       3021       50       0         F2F Derm vs TD       100       100       76       76/100	bigmented lesions, Macro)     2152     3021     53     344/651       F2F Derm vs TD (biopsied bigmented lesions, Macro+PLD)     2152     3021     53     348/652       F2F Derm vs TD (biopsied bigmented lesions, Macro+PLD)     2152     3021     60     357/595       F2F Derm vs TD (NONbiopsied NONpigmented lesions, Macro+PLD)     2152     3021     52     300/583       F2F Derm vs TD (NONbiopsied NONpigmented lesions, Macro+PLD)     2152     3021     50     291/579       F2F Derm vs TD (biopsied NONpigmented lesions, Macro)     2152     3021     50     291/579       F2F Derm vs TD (biopsied NONpigmented lesions, Macro)     2152     3021     46     4       F2F Derm vs TD (biopsied NONpigmented lesions, Macro)     2152     3021     50     291/579       F2F Derm vs TD (biopsied NONpigmented lesions, Macro)     2152     3021     46     4       F2F Derm vs TD (biopsied NONpigmented lesions, Macro)     2152     3021     50     0       F2F Derm vs TD (biopsied NONpigmented lesions, Macro)     2152     3021     50     0       F2F Derm vs TD     100     100     76     76/100     108/1       F2F Derm vs TD     195     195     59     115/195     56     95       F2F Derm vs TD     195     195     59     115/

**eTable 4. Included unique study groupings and letter codes for individual agreement rates and kappa concordance values.** The abbreviations used in the text are as follows: TD (Teledermatology or Teledermatologist), Derm (Dermatologist), F2F (Face-to-Face), SFTD (Store and Forward Technology), PLD (Polarized Light Dermoscopy), and Macro (Macroscopic clinical images).

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7 8 9 10 11	
12 13 14 15 16	
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37 38 39 40 41	
42 43 44 45 46	
47 48 49 50 51	
52 53 54 55 56	
57 58 59 60	

Study ID	Journal	Reason For Exclusion
NCT03034694, 2016	ClinicalTrials.gov	Wrong study design
Andersson et al, 2017	Lakartidningen	Wrong study design
Romero et al, 2018	Actas dermo-sifiliograficas	Wrong study design
Orruno et al, 2016	Health Technology Assessment Database	Wrong study design
Batalla et al, 2016	Piel	Wrong study design
Kroemer et al, 2011	British Journal of Dermatology	Wrong study design
Ernstberger et al, 2014	Zentralblatt fur Chirurgie	Wrong study design
Totty et al, 2018	Journal of wound care	Wrong study design
Wurm et al, 2013	Journal of Telemedicine and Telecare	Wrong study design
Wang et al, 2017	Telemedicine journal and e-health : the official journal of the American Telemedicine Association	Wrong study design
Singh et al, 2011	Australasian Journal of Dermatology	Wrong study design
Grey et al, 2017	Dermatitis	Wrong study design
Crompton et al, 2010	Journal of Visual Communication in Medicine	Wrong study design
Ali et al, 2021	JMIR formative research	Wrong study design
Boyce et al, 2011	Dermatology	Wrong study design
Berg et al, 2017	Sarcoidosis Vasculitis and Diffuse Lung Diseases	Wrong study design
Shin et al, 2014	Journal of telemedicine and telecare	Wrong study design
Gacto-Sanchez et al, 2020		Wrong study design
Tian et al, 2017	Journal of Cosmetic Dermatology	Wrong study design
Thind et al, 2011	Clinical and Experimental Dermatology	Wrong study design
Silveira et al, 2014	BMC Dermatology	Wrong study design
O'Connor et al, 2017	JAMA Dermatology	Wrong study design
Janda et al, 2020	The Lancet. Digital health	Wrong study design
Day et al, 2020	Military medicine	Wrong study design
Karlsson et al, 2015	Acta Dermato-Venereologica	Wrong study design
Seghers et al, 2015	Australasian Journal of Dermatology	Wrong study design
Hazenberg et al, 2010	Journal of Medical Engineering and Technology	Wrong study design
Borve et al, 2015	Acta Dermato-Venereologica	Wrong study design
Boissin et al, 2015	Burns	Wrong study design
Da Silva et al, 2018	Dermatology online journal	Wrong study design
Devrim et al, 2019	BMC pediatrics	Wrong study design
Danielsson et al, 2019	Health Technology Assessment Database	Wrong study design
Berglund et al, 2020	Journal of the European Academy of Dermatology and Venereology : JEADV	Wrong study design
Forsblom et al, 2013	Clinical Infectious Diseases	Wrong study design
G Bianchi et al, 2020	Journal of medical Internet research	Wrong study design
Congalton et al, 2015	Journal of the European Academy of Dermatology and Venereology	Wrong study design
Ferrandiz et al, 2012	Archives of Dermatology	Wrong study design
Ismail et al, 2018	International Journal of Women's Dermatology	Wrong study design
Gamus et al, 2019	International journal of medical informatics	Wrong study design
Paudel et al, 2020	Case reports in dermatological medicine Telemedicine journal and e-health : the official journal of the	Wrong study design
Georgesen et al, 2020	American Telemedicine Association	Wrong study design
Gagnon et al, 2015	Dermatology Times	Wrong study design
Philp et al, 2013	Pediatric Dermatology	Wrong study design
Mooney et al, 2011	Skin Research and Technology	Wrong study design
Do Khac et al, 2021	JMIR mHealth and uHealth	Wrong study design
Chambers et al, 2012 Garcia-Romero et al,	Journal of the American Academy of Dermatology Telemedicine journal and e-health : the official journal of the	Wrong study design
2011	American Telemedicine Association Annals of internal medicine	Wrong study design Wrong study design
Ahmed et al 2020		
	Journal of the American Academy of Dermatology	Wrong study design
Ahmed et al, 2020 Marwaha et al, 2019 NCT02122432, 2014	Journal of the American Academy of Dermatology ClinicalTrials.gov	Wrong study design Wrong study design

2			
3	Bowling et al, 2011	Wound Repair and Regeneration	Wrong study design
4		Journal of primary care & community health	Wrong study design
5	Veronese et al, 2021	Diagnostics (Basel, Switzerland)	Wrong study design
6	Ismail et al, 2018	International journal of dermatology	Wrong study design
7	NCT02905851, 2016	ClinicalTrials.gov	Wrong study design
8	Trinidad et al, 2020	Journal of the American Academy of Dermatology	Wrong study design
9	Tensen et al, 2019	Studies in health technology and informatics	Wrong study design
10	Karavan et al, 2014	Journal of telemedicine and telecare	Wrong study design
10	Viola et al, 2011	Archives of Dermatology	Wrong study design
12	van Netten et al, 2017	Scientific reports	Wrong study design
12	Cai et al, 2016	Burns : journal of the International Society for Burn Injuries	Wrong study design
	Hazenberg et al, 2010	Diabetes Technology and Therapeutics	Wrong study design
14	Jacoby et al, 2021	Journal of drugs in dermatology : JDD	Wrong study design
15 16 17	Pak et al, 2018	Wound repair and regeneration : official publication of the Wound Healing Society [and] the European Tissue Repair Society	
18 10	Kummerow Broman et al, 2019	JAMA surgery	Wrong study design
19 20	Munoz-Lopez et al, 2021	Journal of the European Academy of Dermatology and Venereology : JEADV	Wrong study design
21	Markun et al, 2017	Medicine	Wrong study design
22	Piette et al, 2017	Journal of telemedicine and telecare	Wrong study design
23	Tan et al, 2010	British Journal of Dermatology	Wrong study design
24	Watson et al, 2010	Archives of Dermatology	Wrong study design
25	Wiseman et al, 2016	Journal of vascular surgery. Venous and lymphatic disorders	Wrong study design
26	Wolf et al, 2013	JAMA dermatology	Wrong study design
27	Laggis et al, 2020	The American Journal of dermatopathology	Wrong study design
28	Kazi et al, 2021	Telemedicine journal and e-health : the official journal of the American Telemedicine Association	Wrong study design
29	Kanthraj et al, 2013	Indian Journal of Dermatology, Venereology and Leprology	Wrong study design
30	Shah et al, 2016	Journal of the American Academy of Dermatology	Wrong study design
31	Kim et al, 2018	Skin research and technology	Wrong study design
32	Nguyen et al, 2017	Journal of Clinical and Aesthetic Dermatology	Wrong study design
33	Rizvi et al, 2020	PloS one	Wrong study design
34	Mehrtens et al, 2019	Clinical and experimental dermatology	Wrong study design
35	Knudsen et al, 2012	Lakartidningen	Research letter or letter to the editor
36	Korman et al, 2020	Journal of the American Academy of Dermatology	Research letter or letter to the editor
37	Mercer et al, 2014	Journal of Cutaneous Medicine and Surgery	Research letter or letter to the editor
38	Grunig et al, 2015	JAMA Dermatology	Research letter or letter to the editor
38 39	Cartron et al, 2020	Dermatologic therapy	Research letter or letter to the editor
	McAfee et al, 2020	Journal of the American Academy of Dermatology	Research letter or letter to the editor
40 41	Wong et al, 2021	JAMA dermatology	Research letter or letter to the editor
41 42	Baranowski et al, 2020	Journal of the American Academy of Dermatology	Research letter or letter to the editor
42	Micheletti et al, 2014	Journal of the American Academy of Dermatology	Research letter or letter to the editor
43	Osei-Tutu et al, 2013	Journal of the American Academy of Dermatology	Research letter or letter to the editor
44	Nair et al, 2015	International Journal of Dermatology	Research letter or letter to the editor
45	Miller et al, 2021	Journal of the American Academy of Dermatology	Research letter or letter to the editor
46	Keleshian et al, 2017	Journal of the American Academy of Dermatology	Research letter or letter to the editor
47	HAYES; Inc et al, 2016	Health Technology Assessment Database	Research letter or letter to the editor
48	Jacob et al, 2017	Journal of telemedicine and telecare	Research letter or letter to the editor
49	Perkins et al, 2020	Journal of the American Academy of Dermatology	Research letter or letter to the editor
50	Halpern et al, 2010	British Journal of Dermatology	Research letter or letter to the editor
51	Newman et al, 2020	Journal of the American Academy of Dermatology	Research letter or letter to the editor
52	Hunt et al, 2020	Clinical and experimental dermatology	Research letter or letter to the editor
53	2018	Nursing	Research letter or letter to the editor
54	Taneja et al, 2021	Indian journal of dermatology, venereology and leprology	Research letter or letter to the editor
55	Echeverria-Garcia et al, 2019	Actas dermo-sifiliograficas	Research letter or letter to the editor
56	Henning et al, 2010	Archives of Dermatology	Research letter or letter to the editor
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58 50			

Demo et al, 2019	Clinical and experimental dermatology		Research letter or letter to the editor	or
Byamba et al, 2015	British Journal of Dermatology		Research letter or letter to the editor	or
Gupta et al, 2020	Journal of the American Academy of Dermatology		Research letter or letter to the editor	or
De Giorgi et al, 2017	Journal of the European Academy of Dermatology Venereology	and	Research letter or letter to the editor	or
Duong et al, 2016	Annales de Dermatologie et de Venereologie		Research letter or letter to the editor	or
Mortimer et al, 2021	Journal of the American Academy of Dermatology		Research letter or letter to the editor	or
Gravely et al, 2010	Journal of the American Academy of Dermatology		Research letter or letter to the edite	or
Choi et al, 2021	International journal of dermatology		Research letter or letter to the editor	
Motley et al, 2012	BMJ: British Medical Journal (Clinical Research Edition)		Research letter or letter to the editor	
Leavitt et al, 2016	Journal of the American Academy of Dermatology		Research letter or letter to the editor	
Cheng et al, 2020	Dermatitis : contact, atopic, occupational, drug		Research letter or letter to the editor	
Clark et al, 2021	Journal of the American Academy of Dermatology		Research letter or letter to the editor	
Fuesl et al, 2010	MMW-Fortschritte der Medizin		Research letter or letter to the editor	
English III et al, 2013	Journal of the American Academy of Dermatology		Research letter or letter to the editor	
Cotes et al, 2021	Journal of the American Academy of Dermatology		Research letter or letter to the editor	
Abi Rafeh et al, 2021	Journal of ute American Academy of Dermatology		Research letter or letter to the editor	
Okeke et al, 2020	The Journal of dermatological treatment		Research letter or letter to the editor	
Splete et al, 2014	Emergency Medicine (00136654)		Research letter or letter to the editor	
Khosravi et al, 2021	Clinical and experimental dermatology		Research letter or letter to the editor	
Sivesind et al, 2021	Journal of the American Academy of Dermatology		Research letter or letter to the editor	
Stoecker et al, 2013	JAMA dermatology		Research letter or letter to the editor	
,	Journal of the European Academy of Dermatology	and		
Skayem et al, 2020	Venereology : JEADV		Research letter or letter to the editor	
Su et al, 2020	Journal of the American Academy of Dermatology		Research letter or letter to the editor	or
Massone et al, 2021	Anais brasileiros de dermatologia		Research letter or letter to the editor	or
Li et al, 2021	The Journal of infection		Research letter or letter to the editor	
Afanasiev et al, 2021	Journal of the American Academy of Dermatology		Research letter or letter to the editor	
Varma et al, 2011	British Journal of Dermatology		Research letter or letter to the editor	or
Van Der Heijden et al, 2010	Journal of the European Academy of Dermatology Venereology	and	Research letter or letter to the editor	or
Motley et al, 2012	BMJ (Online)		Research letter or letter to the	
Villani et al, 2020	Dermatologic therapy		editor Research letter or letter to the	
			editor Research letter or letter to the	
Portnoy et al, 2018	The journal of allergy and clinical immunology. In practice		editor Research letter or letter to the	
Tschandl et al, 2018	British Journal of Dermatology		editor Research letter or letter to the	
Poolworaluk et al, 2020	Future healthcare journal		editor	
Anonymous et al, 2020	Journal of drugs in dermatology : JDD		Research letter or letter to the editor	
Tan et al, 2021	Annals of the Academy of Medicine, Singapore		Research letter or letter to the editor	
Silva et al, 2021	Anais brasileiros de dermatologia		Research letter or letter to the editor	
de Giorgi et al, 2016	International Journal of Dermatology		Wrong outcomes	
Senel et al, 2014	Journal of telemedicine and telecare		Wrong outcomes	
Goodier et al, 2021	Contact dermatitis		Wrong outcomes	
Foolad et al, 2017	International Journal of Dermatology		Wrong outcomes	
Wells et al, 2020	The Journal of clinical and aesthetic dermatology		Wrong outcomes	
Arzberger et al, 2016	Acta Dermato-Venereologica		Wrong outcomes	
Creighton-Smith et al, 2017	International Journal of Dermatology		Wrong outcomes	
Marwaha et al, 2019	Journal of the American Academy of Dermatology		Wrong outcomes	
Pasquali et al, 2021	Actas dermo-sifiliograficas		Wrong outcomes	
Vestergaard et al, 2020	Family practice		Wrong outcomes	
Kravets et al, 2018	Acta dermatovenerologica Alpina, Pannonica, et Adriatica		Wrong outcomes	
Speiser et al, 2014	American Journal of Dermatopathology		Wrong outcomes	
N/A	Journal of the American Academy of Dermatology		Wrong outcomes	
Whited et al, 2013	Journal of Telemedicine and Telecare		Wrong outcomes	
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A111-1-1-4-1-2021		XX
Abhishek et al, 2021	medRxiv	Wrong outcomes
Villa et al, 2020	Internal and emergency medicine	Wrong outcomes
Lubeek et al, 2016	Tijdschrift voor gerontologie en geriatrie	review
Ndegwa et al, 2016	Health Technology Assessment Database	review
Moreno-Ramirez et al, 2017	Acta dermato-venereologica	review
Moreno-Ramirez et al, 2017	Acta Dermato-Venereologica	review
Van Der Heijden et al, 2010	Huisarts en Wetenschap	review
Walocko et al, 2017	Dermatologic Clinics	review
Roman et al, 2014	Journal of the Dermatology Nurses' Association	review
Hart et al, 2011	Telemedicine journal and e-health : the official journal of the American Telemedicine Association	review
Elsner et al, 2020	Journal der Deutschen Dermatologischen Gesellschaft = Journal of the German Society of Dermatology : JDDG	review
Kaliyadan et al, 2020	Indian journal of dermatology	review
Burch et al,		review
Evans et al, 2017	Pharmazeutische Zeitung	Editorial
Anonymous. et al, 2016	Journal of AHIMA / American Health Information Management Association	Editorial
Luk et al, 2018	Hong Kong Journal of Dermatology and Venereology	Editorial
Queen et al, 2018	International wound journal	Editorial
Anguita et al, 2014	Nurse Prescribing	Editorial
Haworth et al, 2020	Clinical and experimental dermatology	Editorial
Romero-Aguilera et al, 2019	Actas dermo-sifiliograficas	Editorial
Barrio Garde et al, 2016	Piel	Editorial
Morand et al, 2010	Annales de dermatologie et de venereologie	Editorial
N/A	Journal of the American Academy of Dermatology	Abstract
N/A	Journal of the American Academy of Dermatology	Abstract
Bianchi et al, 2020	Journal of the American Academy of Dermatology	Abstract
Creadore et al, 2020	Journal of the American Academy of Dermatology	Abstract
N/A	Journal of the American Academy of Dermatology	Abstract
Tognetti L et al, 2020	Journal of the American Academy of Definatology	Abstract
SPLETE et al, 2014	Emorgonov Modicing (00136654)	Abstract
N/A	Emergency Medicine (00136654) Journal of the American Academy of Dermatology	Abstract
	Journal of the American Academy of Dermatology Journal of the European Academy of Dermatology and	
al, 2017	Venereology	Wrong intervention
Tandjung et al, 2015 Paradala Da La Morana	Journal of Evaluation in Clinical Practice	Wrong intervention
Paradela-De-La-Morena et al, 2015	European Journal of Dermatology	Wrong intervention
Horsham et al, 2015	British Journal of Dermatology	Wrong intervention
Saenz et al, 2018	International Journal of Telemedicine and Applications	Wrong intervention
Kochmann et al, 2016	Telemedicine journal and e-health : the official journal of the American Telemedicine Association	Wrong comparator
Markun et al, 2017	Medicine (United States)	Wrong comparator
Feigenbaum et al, 2017	Pediatric Dermatology	Wrong comparator
Massone et al, 2014	Journal of the European Academy of Dermatology and Venereology	
MacLellan et al, 2021	Journal of the American Academy of Dermatology	Wrong comparator
Koysombat et al, 2021	Journal of plastic, reconstructive & aesthetic surgery : JPRAS	Corrrespondence
Jakhar et al, 2020	Clinical and experimental dermatology	Corrrespondence
Alkmim et al, 2013	Journal of Telemedicine and Telecare	Corrrespondence
NCT02836665, 2016	<u>ClinicalTrials.gov</u>	Clinical trial - no associa
JPRN-UMIN000020873		manuscript Clinical trial - no associa
		manuscript
et al, 2016		I ommontary
Fogel et al, 2016	Journal of the American Academy of Dermatology	Commentary
	Journal of the American Academy of Dermatology Cutis Journal of the American Academy of Dermatology	Commentary Duplicate

Moreno-Ramirez et al, 2017	American Journal of Clinical Dermatology	Erratum
Trovato et al, 2011	Eplasty	Wrong patient popula
Bowns et al, 2016	Health Technology Assessment Database Telemedicine journal and e-health : the official journal of the	Wrong publication da
Gemelas et al, 2019	American Telemedicine Association ies excluded at the full-text screening stage.	Wrong setting
For	peer review only - http://bmjopen.bmj.com/site/about/guidelin	es.xhtml

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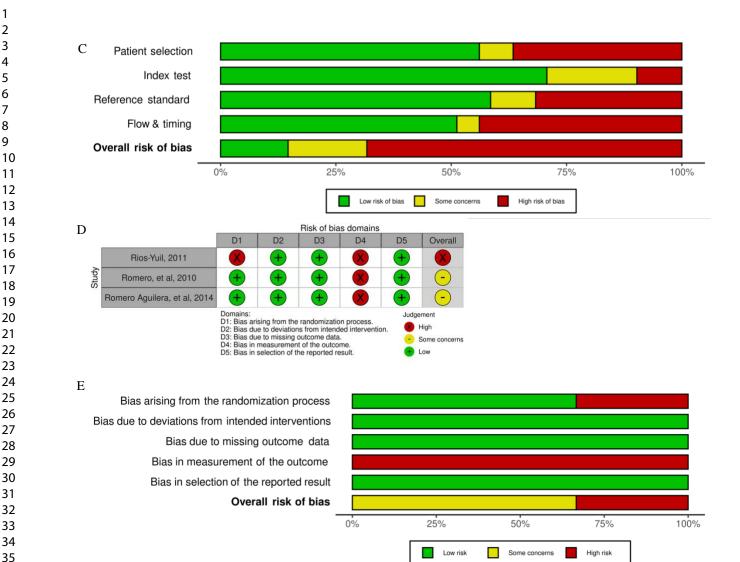
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Signalling Q1	<ul> <li>Was a consecutive or random sample of patients enrolled?</li> <li>In the study by Giavina-Bianchi et al., a consecutive sample of patients was enrolled, introducing less bias.</li> <li>Skewed patient demographics: e.g., over 70% female, select age groups, studies.</li> </ul>	Yes/No/Unclear
	<ul> <li>that do not disclose age range and or sex/gender of the patients.</li> <li>In the study by Carter et al., over 70% of the patients were female, which may introduce bias and reduce applicability.</li> </ul>	
Signalling Q2	Was a case-control design avoided? - Gabel et al. avoided a case-control design, which reduces the risk of bias.	Yes/No/Unclear
Signalling Q3	<ul> <li>Did the study avoid inappropriate exclusions?</li> <li>In the study by Giavina-Bianchi et al., complex, and severe cases were excluded, which may introduce bias and affect applicability.</li> </ul>	Yes/No/Unclear
Risk of bias	<ul> <li>Could the selection of patients have introduced bias?</li> <li>For example, Giavina-Bianchi removed the most complex/severe cases and then excluded any non-skin neoplasms, and then they further filtered to only include the 10 most common skin neoplasms.</li> </ul>	RISK: LOW/HIGH/ UNCLEAR
Concerns regarding applicability	<ul> <li>Is there concern that the included patients do not match the review question?</li> <li>'High' if the study only looked at a specific lesion category such as skin cancers only, or pigmented lesions only, or if they had a skewed patient demographics (e.g., 70% female, or geriatric population only). Our study is focuses on generalizability of teledermatology in all skin conditions.</li> </ul>	RISK: LOW/HIGH/ UNCLEAR
Domain 2: IND	EX TEST (Teledermatology consult)	
Signalling Q1	<ul> <li>Were the derms/physicians making the index diagnoses unaware of the reference diagnosis?</li> <li>Same dermatologist doing F2F and teledermatology consuls? Is there blinding of dermatologists to each other's diagnoses? In the study by Tan et al., the same dermatologist performed both the F2F and teledermatology consultations, which may introduce bias if they were not blinded to each other's diagnoses.</li> </ul>	Yes/No/Unclear
Signalling Q2	<ul> <li>Did the study require physicians to provide a specific primary diagnosis, or were they only required to provide a general grouping, e.g., inflammatory vs. skin neoplasm. Was analysis only performed for categories instead of complete primary diagnoses (such as skin neoplasm vs basal cell carcinoma)?</li> <li>Did physicians use standardized referral/consult sheet with set diagnoses? Did they group similar / synonymous diagnoses (e.g dermatitis / eczema together?</li> <li>Was a non-specialist in charge of comparing diagnoses and deciding if there was agreement?</li> <li>In the study by Warshaw et al., physicians were required to provide a categorical or pooled diagnosis (e.g., skin neoplasm instead of basal cell carcinoma), which may introduce bias and reduce applicability.</li> </ul>	Yes/No/Unclear
Risk of bias	Could the conduct (technology used for taking images/viewing images) or interpretation (what constituted primary diagnosis/ complete agreement) of the index test have introduced bias?	RISK: LOW/HIGH/ UNCLEAR
Concerns regarding applicability	Is there concern that the index test, its conduct, or interpretation differ from the review question?	RISK: LOW/HIGH/ UNCLEAR
	ERENCE TEST (F2F, in some cases histopathology)	· 
	Describe the reference standard and how it was conducted and interpreted:	Yes/No/Unclear

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Signalling Q2	What was the order of visits? What was the experience level and specialization of the F2F physician? Did the same dermatologist do both teledermatology and F2F consult? Is the reference standard likely to correctly classify the target condition?	Yes/No/Unclear
Risk of bias	<ul> <li>Could the reference standard, its conduct, or its interpretation have introduced bias?</li> <li>In studies where the reference standard was a consultation with a non-specialist, such as Costello et al., there is a risk of introducing bias.</li> </ul>	RISK: LOW/HIGH/ UNCLEAR
Concerns regarding applicability Domain 4: FLC	Could the reference standard, its conduct, or its interpretation have introduced bias? - Applicability was impacted by physician specialization. W AND TIMING	RISK: LOW/HIGH/ UNCLEAR
Signalling Q1	<ul> <li>Was there an appropriate interval between index test(s) and reference standard?</li> <li>Was the time interval greater than 2 weeks? In studies where the same dermatologist did F2F and teledermatology -&gt; Say 'No' regardless of the time between teledermatology and F2F consult.</li> <li>In the study by Gerhardt et al., there was a 30-day interval between teledermatology and F2F, which may introduce bias.</li> </ul>	Yes/No/Unclear
Signalling Q2	Did all patients receive a reference standard?	
Signalling Q3	<ul> <li>Did all patients receive the same reference standard?</li> <li>In studies like Sola-Ortigosa et al., all patients received a reference standard, either histopathology or F2F consultation.</li> <li>Did a paper use histopathology as the reference standard for cancer lesions but F2F for non-cancer lesions? Were all patients evaluated by physicians with similar level of experience?</li> </ul>	Yes/No/Unclear
Signalling Q4	<ul> <li>Were all patients included in the analysis?</li> <li>In studies like Gabel et al., all patients were included in the analysis, reducing the risk of bias.</li> </ul>	Yes/No/Unclear
Risk of bias	Could the patient flow have introduced bias?	RISK: LOW/HIGH/UNCLEA

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В							
В							
В			Ris	k of bias don	nains		
[	Alteriated 2017	D1	D2	D3	D4	Overall	
	Altieri, et al, 2017		+	+	•	<b>+</b>	
	Azfar, et al, 2014	+	+	+	+		
	Barbieri, et al, 2014		+			-	
	Barcaui, et al, 2018	•	+				
	Batalla, et al, 2015		+	(+) (X)		-	
	Borve, et al, 2012		+			8	
	Borve, et al, 2013		-	+		8	
	Carter, et al, 2017		-	+			
	Chen, et al, 2010 Clarke, et al, 2021				-		
				+			
	Costello, et al, 2019 Duong, et al, 2014	+	+ -				
	Gabel, et al, 2014		+	+	Ň		
	Gatica, 2015	+	+	-	+		
	Gerhardt, et al, 2021		-			-	
	Giavina-Bianchi, et al, Oct 2020		+	-			
	Giavina-Bianchi, et al, Nov 2020		+	-			
	Gonzalez-Coloma, et al, 2019	+			+		
	Goulart-Silveira, et al, 2019		+	+			
	Jones, et al, 2021	+	-	+	+	-	
Study	Keller, et al, 2020	+	+	+	+	+	
τ. Γ	Lamel, et al, 2012	-	-	+	+	-	
	Marchell, et al, 2017	<b>—</b>	+	+	+	+	
	Muir, et al, 2011		+	+			
	Nami, et al, 2015		+	+	+		
	Okita, et al, 2016	+	+	+	+		
	Patro, et al, 2015	+	+		+		
	Piccoli, et al, 2015		+	X			
	Ribas, et al, 2010	X	+	x	X	X	
	Rubegni, et al, 2011	+	+	+	+	+	
	Saleh, et al, 2017	+	+	+	+	+	
Ì	Senel, et al, 2013	×	+	+	X	×	
ĺ	Sola-Ortigosa, et al, 2020	+	+	×	X	×	
	Tan, et al, 2010	×	X	+	X	×	
	Tran, et al, 2011	+	+	×	+	X	
	Vano-Galvan, et al, 2010	+	+	+	+	×	
	Vestergaard, et al, 2020	+	+	+	X	×	
	Warshaw, et al, 2015	+	-	+	+	-	
	Zanini, 2013	-	+	+	-	-	
	Zink, et al, 2017, July	+	-	×	X	×	
	Zink, et al, 2017, Sept	+	+	+	+	+	
		Domains: D1: Patient se				udgement	
		D2: Index test D3: Reference D4: Flow & tin	e standard.			- Some concerns	



#### eTable 6. Risk of Bias (ROB) results.

(A) QUADAS-2 summary sheet. (B,C) QUADAS-2 RoB analysis of 41 observational studies. (D,E) ROB-2 analysis of three randomized controlled trials.

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#### eReferences.

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1 2 3		MOOSE
4 5 6	Item No	
7	Reporting o	f background sho
8 9	1	Problem definit
10	2	Hypothesis sta
11 12	3	Description of s
13	4	Type of exposu
14 15	5	Type of study of
16	6	Study population
17 18	Reporting o	f search strategy
19 20	7	Qualifications of
20	8	Search strateg
22 23	9	Effort to include
23 24	10	Databases and
25 26	11	Search softwar
20	12	Use of hand se
28 29	13	List of citations
30	14	Method of add
31 32	15	Method of han
33 34	16	Description of a
35 36	Reporting o	f methods should
37 38	17	Description of hypothesis to b
38 39	18	Rationale for th
40 41	40	convenience) Documentation
41	19	interrater reliab
43 44	20	Assessment of appropriate)
45	21	Assessment of regression on p
46 47	22	Assessment of
48		Description of s
49 50	23	models, justific results, dose-re
51		replicated
52 53	24	Provision of ap
54 55	Reporting o	f results should i
56 57	25	Graphic summ
58 59	26	Table giving de
60	27	Results of sense
	28	Indication of sta

## **MOOSE Checklist for Meta-analyses of Observational Studies**

Recommendation

Reporting	of background should include	
1	Problem definition	4
2	Hypothesis statement	4
3	Description of study outcome(s)	4-5
4	Type of exposure or intervention used	6-8
5	Type of study designs used	6-8
6	Study population	6-8
Reporting	of search strategy should include	
7	Qualifications of searchers (eg, librarians and investigators)	6
8	Search strategy, including time period included in the synthesis and key words	6-8
9	Effort to include all available studies, including contact with authors	6-8
10	Databases and registries searched	6-8
11	Search software used, name and version, including special features used (eg, explosion)	6-8
12	Use of hand searching (eg, reference lists of obtained articles)	6-8
13	List of citations located and those excluded, including justification	Supplemen
14	Method of addressing articles published in languages other than English	6-8
15	Method of handling abstracts and unpublished studies	6-8, Supplemen
16	Description of any contact with authors	6-8, Supplemen
Reporting	of methods should include	
17	Description of relevance or appropriateness of studies assembled for assessing the hypothesis to be tested	9-12
18	Rationale for the selection and coding of data (eg, sound clinical principles or convenience)	9-12
19	Documentation of how data were classified and coded (eg, multiple raters, blinding and interrater reliability)	9-12
20	Assessment of confounding (eg, comparability of cases and controls in studies where appropriate)	9-12
21	Assessment of study quality, including blinding of quality assessors, stratification or regression on possible predictors of study results	9-12
22	Assessment of heterogeneity	9-12
23	Description of statistical methods (eg, complete description of fixed or random effects models, justification of whether the chosen models account for predictors of study results, dose-response models, or cumulative meta-analysis) in sufficient detail to be replicated	9-12
24	Provision of appropriate tables and graphics	9-12, Supplemen
Reporting	of results should include	
25	Graphic summarizing individual study estimates and overall estimate	Fig 1-3, Supplemen
26	Table giving descriptive information for each study included	Tables 1, 2 Supplemen
27	Results of sensitivity testing (eg, subgroup analysis)	9-12

Reported on Page No

Fri (M	20	
14 15 16 17 18 19 20 21 22 23	24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41	41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59
12 —	13       14       15       16       17       18       19       20       21       22       23       (M	13       F         14       F         15       6         16       7         18       9         20       21         21       22         23       (M         24       20         25       26         27       28         29       30         31       32         33       34         35       36         37       38         39       40

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Item No	Recommendation	Reported on Page No
Reporting o	f discussion should include	
29	Quantitative assessment of bias (eg, publication bias)	9-12
30	Justification for exclusion (eg, exclusion of non-English language citations)	9-12
31	Assessment of quality of included studies	9-12
Reporting o	f conclusions should include	
32	Consideration of alternative explanations for observed results	13-17
33	Generalization of the conclusions (ie, appropriate for the data presented and within the domain of the literature review)	13-17
34	Guidelines for future research	13-17
35	Disclosure of funding source	18

*From*: Stroup DF, Berlin JA, Morton SC, et al, for the Meta-analysis Of Observational Studies in Epidemiology (MOOSE) Group. Meta-analysis of Observational Studies in Epidemiology. A Proposal for Reporting. *JAMA*. 2000;283(15):2008-2012. doi: 10.1001/jama.283.15.2008.

# PRISMA 2020 Checklist

Section and Topic	ltem #	Checklist item	Location where item is reported
6 TITLE	1		
7 Title	1	Identify the report as a systematic review.	p1
8 ABSTRACT	1		
9 Abstract	2	See the PRISMA 2020 for Abstracts checklist.	p3-4
	1		
Rationale	3	Describe the rationale for the review in the context of existing knowledge.	p5-6
13 Objectives	4	Provide an explicit statement of the objective(s) or question(s) the review addresses.	p5-6
14 METHODS	[		
15 Eligibility criteria	5	Specify the inclusion and exclusion criteria for the review and how studies were grouped for the syntheses. p8, Su	pplementary p15
16 Information 17 sources	6	Specify all databases, registers, websites, organisations, reference lists and other sources searched or consulted to identify studies. Specify the date when each source was last searched or consulted.	р7
18 Search strategy	7	Present the full search strategies for all databases, registers and websites, including any filters and limits used.	Supplementary p2
19 Selection process	8	Specify the methods used to decide whether a study met the inclusion criteria of the review, including how many reviewers screened each record and each report retrieved, whether they worked independently, and if applicable, details of automation tools used in the process.	p8
2 Data collection 22 process 23	9	Specify the methods used to collect data from reports, including how many reviewers collected data from each report, whether they worked independently, any processes for obtaining or confirming data from study investigators, and if applicable, details of automation tools used in the process.	p8
24 25 26	10a	List and define all outcomes for which data were sought. Specify whether all results that were compatible with each outcome domain in each study were sought (e.g. for all measures, time points, analyses), and if not, the methods used to decide which results to collect.	Supplementary p15
20 27 28	10b	List and define all other variables for which data were sought (e.g. participant and intervention characteristics, funding sources). Describe any assumptions made about any missing or unclear information.	p8 and Supplementary p15
29 Study risk of bias 30 assessment	11	Specify the methods used to assess risk of bias in the included studies, including details of the tool(s) used, how many reviewers assessed each study and whether they worked independently, and if applicable, details of automation tools used in the process.	p9
3 Effect measures	12	Specify for each outcome the effect measure(s) (e.g. risk ratio, mean difference) used in the synthesis or presentation of results.	p8-9
32 Synthesis 33 methods	13a	Describe the processes used to decide which studies were eligible for each synthesis (e.g. tabulating the study intervention characteristics and comparing against the planned groups for each synthesis (item #5)).	p8-9
34 35	13b	Describe any methods required to prepare the data for presentation or synthesis, such as handling of missing summary statistics, or data conversions.	p 8-9 Supplementary p2
36	13c	Describe any methods used to tabulate or visually display results of individual studies and syntheses. p 8-	Supplementary p2
38	13d	Describe any methods used to synthesize results and provide a rationale for the choice(s). If meta-analysis was performed, describe the model(s), method(s) to identify the presence and extent of statistical heterogeneity, and software package(s) used.	p 8-9 Supplementary p2
40	13e	Describe any methods used to explore possible causes of heterogeneity among study results (e.g. subgroup analysis, meta-regression).	Supplementary p2
41	13f	Describe any sensitivity analyses conducted to assess robustness of the synthesized results.	NA
<ul><li>42 Reporting bias</li><li>43 assessment</li></ul>	14	Describe any methods used to assess risk of bias due to missing results in a synthesis (arising from reporting biases).	p9
<ul><li>44 Certainty</li><li>45 assessment</li></ul>	15	Describe any methods used to assess certainty (or confidence) in the body of evidence for an outcome. For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml	NA

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### **PRISMA 2020 Checklist**

Section and Topic	ltem #	Checklist item	Location where item is reported
RESULTS	-		
Study selection	16a	Describe the results of the search and selection process, from the number of records identified in the search to the number of studies included in the review, ideally using a flow diagram.	Figure 1, p10
	16b	Cite studies that might appear to meet the inclusion criteria, but which were excluded, and explain why they were excluded.	Supplementary p
Study characteristics	17	Cite each included study and present its characteristics.	p10-11, Table 1
Risk of bias in studies	18	Present assessments of risk of bias for each included study.	p15, Supplemer eTable 5
Results of individual studies	19	For all outcomes, present, for each study: (a) summary statistics for each group (where appropriate) and (b) an effect estimate and its precision (e.g. confidence/credible interval), ideally using structured tables or plots.	p15, Supplemer eTable 5
Results of	20a	For each synthesis, briefly summarise the characteristics and risk of bias among contributing studies.	nentary eFigure 1
syntheses	20b	Present results of all statistical syntheses conducted. If meta-analysis was done, present for each the summary estimate and its precision (e.g. confidence/credible interval) and measures of statistical heterogeneity. If comparing groups, describe the direction of the effect.	p 11-13 Supplementary
)	20c	Present results of all investigations of possible causes of heterogeneity among study results.	p 11-13 Supplementary
	20d	Present results of all sensitivity analyses conducted to assess the robustness of the synthesized results.	NA
Reporting biases	21	Present assessments of risk of bias due to missing results (arising from reporting biases) for each synthesis assessed.	lementary eTable
Certainty of evidence	22	Present assessments of certainty (or confidence) in the body of evidence for each outcome assessed.	p 11-13 Supplementary
DISCUSSION			
Discussion	23a	Provide a general interpretation of the results in the context of other evidence.	p14
	23b	Discuss any limitations of the evidence included in the review.	p15-16
	23c	Discuss any limitations of the review processes used.	p16
	23d	Discuss implications of the results for practice, policy, and future research.	p17
OTHER INFORMA	TION		
Registration and protocol	24a	Provide registration information for the review, including register name and registration number, or state that the review was not registered.	p7
	24b	Indicate where the review protocol can be accessed, or state that a protocol was not prepared.	р7
	24c	Describe and explain any amendments to information provided at registration or in the protocol.	NA
Support	25	Describe sources of financial or non-financial support for the review, and the role of the funders or sponsors in the review.	p18
Competing interests	26	Declare any competing interests of review authors.	p18
Availability of data, code and other materials	27	Report which of the following are publicly available and where they can be found: template data collection forms; data extracted from included studies; data used for all analyses; analytic code; any other materials used in the review.	

44 From: Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ 2021;372:n71. doi: 45 10.1136/bmj.n71 For peer review only - http://bmjopen.bmj.com/site/about/guidelines.xhtml For more information, visit: <u>http://www.prisma-statement.org/</u>