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ORIGINAL ARTICLE

Interobserver Reliability of Store-and-Forward Teledermatology in a Clinical Practice Setting[☆]



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Abstract

Introduction and objectives: Although many studies have evaluated the diagnostic reliability of store-and-forward (SF) teledermatology, the reliability of the technique for the diagnosis of general skin conditions in a clinical practice setting has never been demonstrated. We evaluated the reliability of SF teledermatology in clinical practice by analyzing the diagnostic agreement achieved in a subgroup of patients from the DERMATEL-2 study.

Material and methods: Patients referred from primary care settings were randomized to 3 groups: SF, a combination of videoconferencing and SF technology (VC-SF), and a control group. This article focuses on the SF group. Clinical data were recorded and photographs taken by primary care physicians, who forwarded the data digitally. Each SF consultation package was assessed by 3 dermatologists (D1, D2, D3). Subsequently all the patients were assessed by a single dermatologist (D1) in a face-to-face (FF) consultation. Finally, 2 other dermatologists (D4, D5) assessed the agreement between the diagnoses obtained by SF and FF.

Results: In total, 457 patients (200 males and 257 females) aged between 2 months and 86 years were randomized (192 to SF, 176 to VC-SF, and 89 to the control group). The diagnostic categories were as follows: tumors (49.4%), inflammatory (25.7%), adnexal (11%), infectious (9.4%) and other processes (4.4%). Since 170 patients had SF consultations deemed valid for analysis, the study included a total of 510 SF assessments. Most of the images and clinical records were of high quality (71.2% and 91.2% respectively), and diagnostic confidence was high in 81.4% of the cases studied.

In 58.4% of cases the condition was managed exclusively by teledermatology. Levels of complete and aggregate interobserver agreement between SF and FF evaluators were 0.72 and 0.90, respectively, for diagnosis and 0.61 and 0.80 for treatment. Diagnostic agreement correlated with the image quality ($P < .001$), diagnostic confidence ($P < .001$), felt need for conventional consultation ($P < .001$), and the quality of the clinical record ($P = .013$).

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PALABRAS CLAVE

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Conclusion: The interobserver reliability of SF diagnosis in clinical practice is good. Dermatologists are able to predict errors in diagnosis by analyzing their own diagnostic confidence and evaluating the quality of the images.

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Fiabilidad de la teledermatología de almacenamiento en un escenario real**Resumen**

Introducción y objetivos: Aunque existen múltiples estudios de fiabilidad diagnóstica en teledermatología de almacenamiento (TDA), aún no se ha demostrado una fiabilidad elevada para enfermedad general cutánea en un escenario real. DERMATEL-2 fue un estudio aleatorizado de concordancia diagnóstica en TDA en condiciones de práctica clínica.

Material y métodos: Pacientes remitidos desde atención primaria fueron aleatorizados en 3 grupos: TDA; híbrida videoconferencia-almacenamiento (VC-TDA) y grupo control (GC). Este artículo se centra en el grupo de almacenamiento. Médicos de atención primaria tomaron datos y fotografías clínicas remitiéndolas a distancia. Cada consulta de TDA fue evaluada por 3 dermatólogos diferentes (D1,D2,D3). Todos los pacientes fueron finalmente vistos por el mismo dermatólogo (D1) en la consulta presencial (CP). Dos dermatólogos adicionales (D4, D5) evaluaron las concordancias TDA-CP.

Resultados: Se aleatorizaron un total de 457 pacientes 4-4-2: 192 TDA, 176 VC-TDA y 89 GC; 200 varones y 257 mujeres, 0-86 años. Se incluyó enfermedad tumoral (49,4%), inflamatoria (25,7%), anéxica (11%), infecciosa (9,4%) y otros (4,4%). Hubo 170 pacientes de TDA válidos para el análisis, rindiendo 510 teleconsultas-TDA. La imagen (71,2%), la historia clínica (91,2%) y la confianza diagnóstica (81,4%) fueron de calidad alta. En el 58,4% fue posible el manejo exclusivo *on-line*. Los acuerdos interobservador (completo/agregado) TDA-CP fueron 0,72/0,90 para el diagnóstico y 0,61/0,80 en el tratamiento. El acuerdo diagnóstico se correlacionó con la calidad de la imagen ($p < 0,001$), la confianza diagnóstica ($p < 0,001$), la necesidad de consulta presencial ($p < 0,001$) y la calidad de la historia clínica ($p = 0,013$).

Conclusión: La fiabilidad diagnóstica de la TDA en condiciones de práctica clínica es elevada. Los dermatólogos pueden predecir errores diagnósticos analizando su confianza diagnóstica y la calidad de las fotografías.

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Introduction

A growing number of patients, physicians, and institutions are using telemedicine services,¹ and the world telemedicine market is expected to grow from US\$9.8 billion in 2010 to some \$US27.3 billion in 2016.² Dermatology appears to be an ideal specialty for telemedicine.³ Indeed, it is the clinical specialty that currently accounts for the largest number of telemedicine studies.¹ Teledermatology can be carried out in real time using videoconferencing systems (VC) or asynchronously using store and forward (SF) systems, a modality in which clinical images are obtained by the physician, stored, and then forwarded to the specialist for later assessment. VC requires greater coordination and consumes more time and resources.^{4,5} It can also be more costly than conventional face-to-face (FF) consultation.⁶ While VC allows the specialist to interact directly with the patient, the reliability of the method (as measured by diagnostic agreement) can be similar to that of SF teleconsultation.^{4,7,8} Thus, medical professionals and healthcare providers increasingly consider SF to be the most cost effective and convenient system.⁹

The teleconsultation is a complex intervention that depends on multiple interactions and is influenced by local administrative and organizational variations. As a result, it is difficult in telemedicine to conduct studies that provide a high level of evidence, such as randomized clinical trials.

A systematic review concluded that teledermatology is far from being a mature technology,¹⁰ and that more randomized trials involving real patients are needed to provide high quality evidence.

To date, most of the research in teledermatology has assessed reliability on the basis of concurrence in diagnosis.¹¹ Most of these studies distinguish between complete agreement (concurrence on a single diagnosis) and aggregate agreement (concurrence on at least one diagnosis when a differential diagnosis is proposed) (Table 1). Although it can be high, diagnostic reliability does vary considerably, with the percentage of complete agreement ranging from 47% to 90% and for aggregate agreement from 60% to 99%.^{1,11} While many authors have studied the diagnostic reliability of SF, none of the studies have been randomized controlled trials and almost all were conducted in an experimental rather than a clinical setting.¹⁰

In routine clinical practice, it is the primary care physician or other health professional who, in a remote location, typically a primary care center, sees the patient, records the clinical history, and takes the photographs. The clinical data is then forwarded through an intranet or the Internet to the hospital-based dermatologist for assessment. However, in nearly all of the published studies on the reliability of SF, the clinical history and the photographs were taken on site in the hospital itself (not in a remote location) and they were not taken by primary care physicians, but rather

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