



Feasibility and cost of a telemedicine-based short-term plan for initial access in general dermatology in Andalusia, Spain

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Background: In developed countries, health care delivery in dermatology is hampered by the low availability of dermatologists.

Objective: To analyze the feasibility of a teledermatology-based action plan to provide initial dermatologic care in areas with low availability of dermatologists.

Methods: A cross-sectional study describing the feasibility and cost of a 12-month action plan based on a store-and-forward teledermatology (TD) connecting primary care centers and a TD center. Teleconsultations from patients complaining of any cutaneous condition were included. The primary outcome measure was the percentage of patients not referred to the local dermatologist.

Results: Among the total of 15,523 teleconsultations attended in the TD-based action plan, 3360 (21.65%) required a face-to-face visit with a local dermatologist. In 32.32% (n = 5017) of the cases, a therapeutic and follow-up plan report was issued. The most common conditions managed were melanocytic nevi (15.63%, n = 2426), followed by seborrheic keratosis (14.89%, n = 2312), and actinic keratosis (8.65%, n = 1342). The average response time was 14.52 days (95% CI 14.35-15.23). The additional total investment in this action plan was \$142,681.01, with a unit cost of 9.20\$/patient.

Limitations: Noncontrolled study.

Conclusions: Experienced dermatologists working with store-and-forward TD can deliver a fast and effective response in health care areas with access limitations. (JAAD Int 2021;4:52-7.)

Key words: accessibility; dermatology care; health care services; technology; teledermatology; telemedicine.

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INTRODUCTION

Teledermatology (TD) is an emerging technology that is becoming well established in Spain, particularly for screening well pigmented lesions and skin cancer, with more than 25% of dermatology centers in Spain having implemented a routine teledermatology model. Store-and-forward in urban settings is the most widely used modality, settings where dermatologists also see this technology as an effective option with high overall satisfaction, although with room for significant improvement in some areas.¹

Although Southern Spain is a well-served area in terms of health care delivery, there are health care areas where the number of dermatologists available in the public system is not enough to offer or deliver timely dermatologic care, indeed leading to waiting times for a first visit with the dermatologist up to 1 year. In an attempt to provide a first opinion from the dermatologist in these areas, the Health Administration of Andalusia launched a TD-based action plan aimed at offering a first dermatologist's opinion to patients who were waiting for a visit.

This study aimed to analyze the feasibility and costs of a TD-based action plan to provide initial dermatologic care in health care areas with low availability of dermatologists.

METHODS

Study design, population, and variables

A cross-sectional study was conducted, describing the feasibility and cost of an action plan based on a store-and-forward TD connection between primary care centers and the TD center of an academic dermatology department.

The study recorded patients' data attended by an action plan conducted between October 15, 2018 and October 14, 2019. Patients corresponded to 5 geographic areas from various administrative provinces in Southern Spain, with distances to the academic hospital ranging from 91.5 km to 368.6 km. From these primary care areas, teleconsultations of 15,523 patients complaining of some cutaneous disorder and still awaiting a first visit to the dermatologist were submitted to the TD center. Since 2004, this academic department has run a store-and-

forward TD program to manage initial access for patients with any dermatologic condition referred by their family physician or pediatrician. The methodology and results achieved by this program can be reviewed elsewhere.² Dermatologists at this department work in a TD center, a co-working area, equipped with high technology devices, where 2 to 3 fully dedicated dermatologists work in routine daily shifts to support the telemedicine programs conducted.

In each participating primary care center, a TD operator (a staff nurse) was trained to take clinical and dermoscopic images in a 2-hour workshop. Patients awaiting a first visit to the dermatologist were appointed to the TD office in primary care centers, where the TD operator took clinical

and dermoscopic images to be uploaded to the Telemedicine Corporative System.

A team of 9 staff dermatologists with 5 to 15 years of experience in TD, who had assessed more than 150,000 patients, handled the uploaded teleconsultations to make one of the following decisions: discharge report, face-to-face visit, or therapeutic recommendations to be applied by family physicians. These reports were available for the family physician in the patients' digital records (Fig 1).

For patients with benign lesions or any dermatologic condition not requiring active therapy, the dermatologist issued a discharge report with no therapeutic recommendations. However, for patients with clear-cut malignant lesions, concerning cutaneous growths, or any difficult-to-diagnose or difficult-to-treat dermatosis, the dermatologist uploaded a face-to-face visit recommendation. In these cases, the patient was appointed to be visited by the local dermatologist.

In patients with a clear-cut diagnosis of mild or moderate dermatosis suitable for first- or second-line topical or systemic therapy (eg, antibiotics, antihistaminic drugs, low-dose corticosteroids), the dermatologist issued a therapeutic and follow-up recommendation to be applied by the family physician. In case of limited information, the dermatologists in the TD center asked for additional information through the platform. They could also access digital clinical records or even phone the patients directly.

CAPSULE SUMMARY

- Teledermatology has been shown as an effective procedure to improve access to dermatology departments under routine conditions.
- A short-term teledermatology-based action plan to provide care in areas with low availability of dermatologists may be an effective and affordable option to offer care in the current landscape of "dermatologist deficit."

Abbreviation used:

TD: teledermatology

The primary outcome measure analyzed was the percentage of patients not referred to the local dermatologist. This rate encompassed patients discharged after their first teleconsultation and those for whom the digital area established a therapeutic plan to be applied by the family physician.

To calculate the final additional costs resulting from the accessibility action plan, the expenditures associated with any additional action required to manage these patients at the TD center of the academic hospital and the primary health care areas. Face-to-face visits were attended by local dermatologists working in their routine shifts, and consequently, this concept did not mean an additional cost. These additional resources included the dedication of 5 half-time nurses with the role of TD operators, reimbursement of the staff dermatologists in the TD center, and the acquisition of 5 devices for capturing clinical and dermoscopic images (Canon EOS1, DermLite-II). Official wages of the Health Service of Andalusia were applied for the cost identification.

RESULTS

Among the 15,523 patients managed through the 1-year action plan, the TD center dermatologists met the patients' care needs with no face-to-face visits to the local dermatologist in 77.41% (n = 12,017) of the patients attended. Discharge reports accounted for 45.09% (n = 7000) of this number, and therapeutic, and follow-up plan reports (32.32%, n = 5017) accounted for the rest. Additional information was required in 0.94% (n = 146) of the cases. The remaining 21.65% (n = 3360) of the patients were referred for an in-person dermatology visit at the local hospital.

Among the patients with a therapeutic recommendation to be applied by the family physician, the most common recommendations were immunomodulatory therapy for actinic keratosis (20.53%, n = 1030), followed by moderate-potency topical corticosteroids for eczema (atopic, seborrheic, dysidrotic, and contact eczema, 11.98%, n = 601), first-line topical therapy for mild acne (6.86%, n = 344), single or combined topical therapy for mild to moderate psoriasis (5.10%, n = 256), and topical keratolytics for viral warts (4.60%, n = 231).

The average response time to produce a report with the dermatologist's opinion was 14.52 days (95% CI 14.35-15.23).

A total of 59.45% (n = 9228) of the patients were diagnosed as having some type of skin growth (pigmented lesions, skin cancer, or other suspicious lesions, cysts or other benign proliferations), whereas 31.52% (n = 4893) of the patients showed some type of inflammatory or nontumoral dermatosis. Finally, in 9.03% (n = 1402) of the teleconsultations, a specific diagnosis was not recorded.

As for particular diagnoses, the most common conditions managed were melanocytic nevi (15.63%, n = 2426, common acquired melanocytic nevus, dysplastic nevus, congenital melanocytic nevus, blue nevus, Spitz-Reed nevus), followed by seborrheic keratosis (14.89%, n = 2312) and actinic keratosis (8.65%, n = 1342) (Table D). Nonmelanoma skin cancer diagnoses accounted for 6.00% (n = 931, basal cell carcinoma, squamous cell carcinoma). Among nontumoral dermatoses, eczema was the leading diagnosis (6.36%, n = 988), followed by acne (3.69%, n = 573).

Giving these 15,523 patients access to a timely first opinion and decision by a dermatologist in such a short period incurred an additional total investment of \$142,681.01, representing a unit cost of \$9.20 per patient attended, as shown in Table II.

DISCUSSION

Teledermatology has shown to be feasible to provide dermatologic care in underserved areas with the structural unavailability of dermatologists.^{3,4} Teledermatology performed by an experienced TD center has helped reduce 77% of the workload that local dermatologists received before the plan's launch. This represents a remarkable improvement because it means that these local dermatologists can allocate their availability to dermatologic conditions or lesions not amenable to remote management (eg, severe psoriasis, difficult to diagnose dermatoses, skin cancer).

Offering this initial dermatologic care in less than 2 weeks is also noteworthy, particularly for patients who had been waiting for a first dermatologist's visit for longer than 12 months. It is also worth stressing that these response times are provided by a TD center operating in extra work shifts. Routine TD access to the academic dermatology department in charge of this plan is shorter than 48 hours (current unpublished data).

The working model tested in this action plan involved a TD center located at an academic hospital

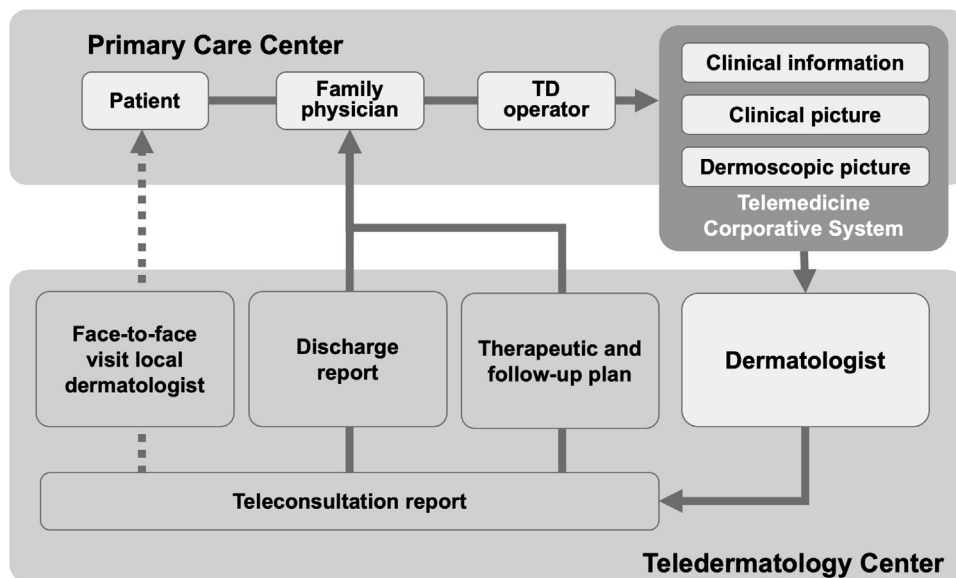


Fig 1. Patients' flowchart in the teledermatology-based action plan. *TD*, Teledermatology.

Table I. Diagnostic categories in a 1-year-long store-and-forward TD program

Diagnosis As yielded by the teledermatology center dermatologist	TC (n)	TC (%)
Benign lesions & cysts	3603	23.2%
Seborrheic keratoses, epidermal cysts, kin tags, etc.		
Melanocytic nevi	2426	15.6%
Common acquired melanocytic nevus, atypical nevus, Spitz nevus, blue nevus, etc.		
Precancerous conditions & chronic actinic damage	1968	12.7%
Actinic keratosis, cancerization field, actinic cheilitis, etc.		
Eczema & dermatitis	1134	7.3%
Atopic dermatitis, dyshidrotic eczema, seborrheic dermatitis, contact dermatitis, stasis dermatitis, etc.		
Nonmelanoma skin cancer	991	6.4%
Basal cell carcinoma, squamous cell carcinoma, Merkel cell carcinoma, dermatofibrosarcoma protuberans, cutaneous lymphoma, etc.		
Acna, rosacea & acneiform reactions	752	4.8%
Viral infections	660	4.3%
Other diagnoses & groups	550	3.5%
Vascular lesions	459	3.0%
Erythemasquamous dermatosis	389	2.5%
Hyper & hypopigmentations	378	2.4%
Alopecia & hair disorders	377	2.4%
Dermatosis undetermined (to study)	375	2.4%
No lesion	293	1.9%
Bacterial & fungal infections	272	1.8%
Itching & related conditions	232	1.5%
Nail disorders	192	1.2%
Reactive & inflammatory conditions	169	1.1%
Melanoma	118	0.8%
Hypertrophies & atrophies	58	0.4%
Lichen planus & lichenoid reactions	52	0.3%

Continued

Table I. Cont'd

Diagnosis As yielded by the teledermatology center dermatologist	TC (n)	TC (%)
Autoimmune & systemic conditions	17	0.1%
Bites & infestations	17	0.1%
Mucosal conditions	15	0.1%
Ulcers	12	0.1%
Genodermatosis	10	0.1%
Bullous & dyskeratotic disorders	4	0.1%
Total	1523	100.0%

TC, Patients attended through teleconsultation.

Table II. Final additional investment resulting from one year of the accessibility action plan

Costs allocated	Total cost (\$)	Unit cost (\$/patient)
TD center dermatologists	71,628.32	4.62
TD operators at primary care areas	54,402.69	3.51
Acquisition of additional equipment for TD	16,650.00	1.08
Costs allocated	142,681.01	9.20

TD, Teledermatology.

where dermatologists with an extra dedication to the action plan were assigned to assess teleconsultations and the related tasks (phone contact with family physicians about reports or particular patients, other incident management).

This action plan has provided a large sample of patients representing all typical dermatologic complaints in a general dermatology clinic. Among these complaints, roughly half (59.45%) of the consultations involved pigmented lesions, benign proliferation, cutaneous growths suspicious of skin cancer, or clear-cut skin cancer. These lesions can be managed readily and quickly through teledermoscopic images with high sensitivity and specificity.⁵ The issue about the appropriateness of teledermatology for the management of pigmented lesions and lesions suspicious of skin cancer is a hot topic widely addressed in the literature. Our dermatology department has broad experience in the management of pigmented lesions through teledermatology. The initial teledermatology program launched in our area in 2003 aimed to manage referrals of patients with pigmented and suspicious lesions. This use of teledermatology has been widely assessed by our research group in studies based on large sample sizes, in a clinical trial assessing the diagnostic performance of teledermoscopy, and even in a study showing a favorable impact on the initial prognosis of melanoma patients.^{2,5,6} In our experience, teledermatology (all the patients referred through TD in this program had dermoscopic pictures) offers a safe and effective procedure to

manage large workloads of referrals of patients with pigmented lesions and skin cancer.

As for the cost, each patient managed through this action plan represented a cost of \$9.20. This cost includes the direct cost of paying extra dermatologists at the digital TD center, paying TD operators at the primary care areas, additional workloads of local dermatologists attending patients referred for in-person visits, and the acquisition cost of teledermoscopy devices.

The results of this brief report are limited by the lack of a diagnostic gold standard for the diagnoses made. However, this study was not aimed at testing TD as a diagnostic tool. As for the economic data provided, they enabled the payers, the Andalusia Health Administration, to have an orientation to the additional costs involved in this plan, and do not represent a formal economic analysis of the interventions implemented.

To conclude, experienced dermatologists working with store-and-forward TD in a co-working digital area are capable of handling large workloads in the short-term to deliver a timely first dermatologist opinion in health care areas not underserved but with low availability of dermatologists. In the current landscape of "dermatologist deficit," TD centers might provide a structural model to manage low-complexity dermatologic complaints.

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Conflicts of interest

None disclosed.

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