



Teledermatology: Quality Assessment by User Satisfaction and Clinical Efficiency

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Abstract

Background: The Israel Defense Forces implemented a pilot teledermatology service in primary clinics.

Objectives: To assess user satisfaction and clinical short-term effectiveness of a computerized store and forward teledermatology service in urban and rural units.

Methods: A multi-center prospective uncontrolled cohort pilot trial was conducted for a period of 6 months. Primary care physicians referred patients to a board-certified dermatologist using text email accompanied by digital photographs. Diagnosis, therapy and management were sent back to the referring PCP. Patients were asked to evaluate the level of the CSAFTD service, effect of the service on accessibility to dermatologists, respect for privacy, availability of drugs, health improvement and overall satisfaction. PCPs assessed the quality of the teledermatology consultations they received, the contribution to their knowledge, and their overall satisfaction.

Results: Tele-diagnosis alone was possible for 95% (n=413) of 435 CSAFTD referrals; 22% (n=95) of referrals also required face-to-face consultation. Satisfaction with CSAFTD was high among patients in both rural and urban clinics, with significantly higher scores in rural units. Rural patients rated the level of service, accessibility and overall satisfaction higher than did urban patients. PCPs were satisfied with the quality of the service and its contribution to their knowledge. Rural physicians rated level of service and overall satisfaction higher than did urban physicians. Tele-referrals were completed more efficiently than referral for face-to-face appointments.

Conclusions: CSAFTD provided efficient, high quality medical service to rural and urban military clinics in the IDF.

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For Editorial see page 525

The globalization and technological advancements of recent years have been accompanied by increasing economic restrictions on medical care. In an attempt to circumvent this problem, telemedicine has emerged as a powerful tool for delivering

healthcare in under-served areas. Teledermatology is a pioneering technique aimed at increasing access of under-served populations to dermatology specialist healthcare in a cost-effective manner. Examples include the provision of telemedicine by Moscow to Azerbaijan [1], by the British Armed Forces in Bosnia [2], teledermatology in vast areas of New Zealand [3], and the U.S. Military experience with telemedicine [4-6]. Teledermatology was found to be reliable, accurate and mostly cost-effective in different settings [7]. A wide range of diagnoses has been referred to teledermatology consultation and their accuracy has been compared to that of face-to-face consultations. Most skin disorders were adequately diagnosed and managed, with the highest concordance in cases of eczemas and follicular eruptions [8].

Health services in the Israel Defense Forces are based largely on primary care medicine provided by general practitioners stationed in the various units, and specialist centers that service large geographic areas. The demand for dermatologists' services constantly exceeds supply [9]. Many units, especially those in remote rural areas engaged in intensive security activity, suffer from under-service and patients are often required to travel long distances to specialist clinics. Teledermatology services for soldiers in the IDF would offer the advantages of shorter waiting lists for conventional consultation, reduced need for long distance travel, and fewer lost working hours.

Based on the above, the authors hypothesized that a teledermatology service in the IDF would result in high user satisfaction of both patients and primary physicians, and would provide satisfactory dermatologic consultation to the majority of referred patients. The service could also enhance the dermatologic knowledge of the primary military physician who usually has little expertise in this field.

We describe a pilot program to assess the implementation of a Computerized Store and Forward Tele-Dermatology service in urban and rural IDF units, using user satisfaction as an accepted criterion of quality of service. The program is the first large-scale multi-center teledermatology service in Israel. The

PCP = primary care physician

CSAFTD = computerized store and forward teledermatology

IDF = Israel Defense Force

study was aimed at determining satisfaction with the service on the part of both patient and physician, and not at establishing the concordance between tele and face-to-face dermatologic diagnosis. This key hypothesis had been tested previously and was found to be adequate by other studies [8], enabling implementation of the pilot CSAFTD service in the IDF.

Materials and Methods

A multi-center prospective uncontrolled cohort trial was designed to assess the quality of a CSAFTD service in the Israel Defense Forces, as measured by short-term clinical outcome and user satisfaction. The 6 month study was conducted between June and December 2003. Primary care physicians were randomly chosen to participate in the study after pre-stratification to unit type, geographic location and unit size. The PCPs selected were invited to participate, and if they declined the study group addressed another random PCP of the same region and unit type. All participating PCPs were general practitioners with no special training in dermatology. One medical staff member in each primary clinic was given a short course in digital photography by professional military photographers and dermatologists, and was instructed to follow a standardized scheme for dermatologic photography.

PCPs offered patients presenting with dermatologic complaints either the CSAFTD service or a regular face-to-face referral. Cases of pigmented lesions were excluded from the study as a risk management measure in view of the use of non-professional photographers in the primary clinics; these patients were always referred to a face-to-face examination.

Four board-certified military dermatologists responded to the CSAFTD referrals in three military specialist clinics. Referral rate to CSAFTD was calculated as the percentage of referrals to CSAFTD out of the total number of referrals to a dermatology specialist from the participating clinic during the trial. Of the two types of tele-health delivery systems – store and forward, in which the referral and response are asynchronous, and live synchronized videoconferencing – we chose the former. The participating dermatologists were asked to measure and calculate the average time needed for answering a teledermatology consultation (from referral to receipt of the response) compared to a routine face-to-face referral.

Clinical outcome data were collected and analyzed using the IDF computerized patient record system. One month after CSAFTD referrals, record was made of whether diagnosis and treatment were reached by tele-consultation only or a face-to-face referral was required, and whether laboratory tests or other procedures not performed in the primary clinic were required for each case. One month after the tele-referral, patients were asked to complete an anonymous questionnaire ranking the following items on a 5-point scale from low (0) to very high (5): level of the CSAFTD service, effect of the service on accessibility to dermatologists, respect for privacy during the photography session, availability of drugs prescribed via CSAFTD, their assessment of improvement in their health, and overall satisfaction with the service. PCPs were asked to review the record of

each of their referrals one month after the consultation and to complete a similar 5-point questionnaire on the quality of the responses they received from the specialists in the CSAFTD system, the contribution to their personal dermatologic knowledge, and their overall satisfaction with the service. The study was fully funded by the Israel Defense Forces Medical Corps.

Statistical analyses were performed using the SAS package for MS-Windows (SAS Institute Inc., Cary, NC, USA). Fisher's exact chi-square test was used to assess differences between scores on the questionnaires. $P < 0.05$ was considered statistically significant.

Equipment

One digital camera (Nikon CoolPix 4500, Japan) was allocated to each participating primary clinic. Referrals were sent to the specialists via the military network (Zahalnet and Ainet) using standard personal computers. Standard electronic mail (Outlook Exchange 2002 by Microsoft) handled the CSAFTD correspondence between primary clinics and specialists. The patient records were reviewed using the electronic patient clinical records system of the IDF.

Procedure

Patients with a dermatologic condition that required a specialist, excluding those with pigmented skin lesions, were invited to participate in the pilot program by their PCP. Eligible patients gave oral informed consent. Each patient was examined by a PCP, who recorded the findings of the medical examination and the patient's history on a prepared questionnaire. Digital photographs of skin lesions were taken by the trained medic according to the standard protocol for dermatologic photography described earlier. The images were approved by the PCP and emailed along with the questionnaire to a board-certified military dermatologist, who replied by email with a diagnosis, suggested therapy and a plan for management. If the dermatologist considered it necessary, the patient could be summoned for a face-to-face evaluation before initiation of treatment or for follow-up.

Results

Eighteen primary care physicians located in different military units around the country participated in the trial: 10 PCPs (55%) from rural field units and 8 (45%) from urban units. One PCP declined to participate due to unreliable intranet access in the unit. During the 6 month study period, 435 patients were processed by CSAFTD: 319 men (73%) and 116 women (27%); average age was 22.4 years (range 18–39 years, SD 5.5). Rural units referred 140 (35%) of the patients, and urban units 258 (65%). The average referral rate to teledermatology in the 18 participating primary clinics was 38.8% (range 12.1–85.3%, SD 31%). The average CSAFTD referral rate was 72% in rural clinics and 19.8% in urban clinics. Average patient waiting time for a CSAFTD response was 65 working hours (SD 4.5 hours). The average time required for a dermatologist to counsel a CSAFTD referral was 50% shorter than needed for a face-to-face appointment.

Table 1. Range of diagnoses referred to CSAFTD service (n=435)*

Diagnosis	No. of patients	Percent
Tinea versicolor	60	13.8%
Onychomycosis	58	13.3%
Acne	55	12.6%
Eczema	42	9.7%
Tinea corporis	36	8.3%
Contact dermatitis	31	7.1%
Folliculitis	31	7.1%
No diagnosis	23	5.3%
Other	21	4.8%
Pityriasis rosea	17	3.9%
Cellulitis	14	3.2%
Insect bite	14	3.2%
Psoriasis	11	2.5%
Herpes simplex	8	1.8%
Urticaria	8	1.8%
Lichen planus	6	1.4%
Total	435	100.0%

* The most common diagnoses are printed in bold

Clinical outcome

The range of dermatologic conditions diagnosed at both rural and urban primary clinics is summarized in Table 1. Most common diagnoses were fungal infections and eczematous eruptions. Of the 435 patients referred to the CSAFTD service, 413 (95%) were treated following tele-consultation alone and 95 (22%) required further face-to-face consultation prior to initiating a treatment plan. The specialists' ability to diagnose and recommend treatment varied according to the skin disorder, but most disorders could be readily assessed by digital imaging. Diagnoses that required systemic treatment (such as onychomycosis) or specific laboratory confirmation (like patch test for contact dermatitis) could not be concluded with CSAFTD alone and required either face-to-face referral or laboratory investigation [Table 2].

Patients' and primary physicians' satisfaction

A total of 392 patients (90% of the 435 CSAFTD cases) completed questionnaires [Table 3]. Overall satisfaction with CSAFTD was high in both rural and urban clinics: 343 of 386 (89%) of patients who answered that question scored 4 or 5 (high/very high). The effect of CSAFTD on patients' accessibility to a dermatologist was scored 4 or 5 by 305 of 387 patients (79%)

Table 2. Diagnoses and need for face-to-face referral of CSAFTD consultations in 435 patients

Final diagnoses	No. of referrals	Tele-diagnosis only		Face-to-face appointment needed		Lab work needed	
		%	No.	%	No.	%	No.
Tinea versicolor	60	95%	57	5%	3	10%	6
Onychomycosis	58	91%	53	9%	5	95%	55
Acne	55	93%	51	7%	4	96%	53
Eczema	42	81%	34	19%	8	33%	14
Tinea corporis	36	94%	34	6%	2	31%	11
Contact dermatitis	31	42%	13	58%	18	84%	26
Folliculitis	31	97%	30	3%	1	94%	29
Pityriasis rosea	17	94%	16	6%	1	6%	1
Cellulitis	14	93%	13	7%	1	21%	3
Insect bite	14	93%	13	7%	1	14%	2
Psoriasis	11	64%	7	36%	4	45%	5
Herpes simplex	8	100%	8	0%	0	13%	1
Urticaria	8	13%	1	88%	7	100%	8
Lichen planus	6	33%	2	67%	4	83%	5
No definite diagnosis	23	9%	2	91%	21	87%	20
Other diagnoses*	21	24%	5	76%	16	95%	20
Total no. of referrals	435	78%	339	22.1%	96	60.5%	263

* Scabies, sunburn, herpes zoster, inflammatory linear verrucous epidermal nevus, vitiligo, erythema multiforme, and normal dermatologic examination.

who answered that question. Similar high scores were given for all other questionnaire items [Table 3]. A significant difference was found between rural and urban patients in their evaluations of the level of the CSAFTD service, the effect on accessibility to the dermatologist, the availability of drugs prescribed using CSAFTD, self-assessment of health improvement, and overall satisfaction [Table 3]. All the items except for one (availabil-

Table 3. User satisfaction with the CSAFTD service

Items on questionnaires	Urban clinics		Rural clinics		P	Total	
	No. of questionnaires for each item	% of answers scored 4 or 5 out of 5	No. of questionnaires for each item	% of answers scored 4 or 5 out of 5		No. of questionnaires	% of answers scored 4 or 5 out of 5
Patients							
Level of CSAFTD service	256	85%	136	95%	0.017	392	88%
Effect of CSAFTD on patients' accessibility to a dermatologist	252	74%	135	88%	<0.005	387	79%
Respect for privacy in photography session	240	96%	113	98%	NS	353	97%
Availability of drugs prescribed using CSAFTD	254	89%	115	72%	<0.001	369	84%
Self-assessment of health improvement	245	64%	119	87%	<0.005	364	72%
Overall satisfaction	250	86%	136	95%	<0.005	386	89%
Primary physicians							
Quality of response from dermatologist	258	87%	132	90%	NS	390	88%
Contribution to personal dermatologic knowledge	212	63%	128	57%	NS	340	61%
Overall satisfaction with CSAFTD service	267	84%	130	93%	<0.001	397	87%

ity of drugs) were scored higher by rural units than by urban units.

Participating PCPs completed 397 questionnaires [Table 3], hence evaluating 91% of the 435 CSAFTD cases. PCPs were overall highly satisfied with the CSAFTD service: 345 of 397 questionnaires (87%) showed a score of 4 or 5 on that item. PCPs also gave high scores to the quality of responses from dermatologists, with scores of 4 or 5 in 343 of 390 (88%) of cases. Contribution to dermatology knowledge was scored 4 or 5 in 207 of 340 cases (61%). A significant difference between rural and urban physicians was found regarding the question of overall satisfaction, which was graded higher by rural PCPs.

Discussion

The study demonstrated that CSAFTD referrals based on a structured questionnaire accompanied by digital images allow the dermatologist to diagnose and recommend treatment in the majority of cases. The rate of usage varied significantly and some clinics did not utilize the service to the full potential reported in the literature [10]. This can be attributed to the physician's apprehension about new technology, and the increased time required for completing a detailed questionnaire, arranging for digital photographs, and scheduling another appointment with the patient following the specialist's reply.

The clinical range of patients participating in the tele-diagnoses was as expected for a young cohort, reflecting the known distribution of dermatoses worldwide. Hence, teledermatology was not perceived as a tool for consulting only on rare or difficult cases, but was used by the PCP for common everyday delivery of dermatologic healthcare. These findings support the integration of the service into routine practice.

As hypothesized, users of the system – both patients and PCPs – were highly satisfied with the level of service and the improved accessibility to dermatologists. The users who were most satisfied with the service were those with the least access to specialists (i.e., those in rural units), which argues for its wide implementation in these units.

The questionnaires of the patients who required a face-to-face appointment after a CSAFTD referral were not analyzed separately in this study. However, data from patient feedback questionnaires collected routinely at the large IDF dermatology clinics consistently showed low user satisfaction compared to other specialties and compared to the primary clinics [9].

Teledermatology is perceived by primary physicians as an empowering tool that allows for better medical service and enhances their knowledge base – a perception borne out by the findings of high satisfaction with the service among PCPs in this study: 87% [Table 3]. The lower scores on the item "Contribution of CSAFTD service to personal dermatologic knowledge" (61%, Table 3) might indicate that in some cases PCPs had the dermatologic knowledge required for treating their patients but could not prescribe the needed workup or treatment. In these cases, CSAFTD service was not used as a true consultation tool,

but merely as an administrative authorization mechanism that might not have been needed if the PCP had the authority to treat the patient independently.

It must be noted that a positive bias in PCP attitude and satisfaction might have been introduced due to the non-obligatory design of this study, but this was considered negligible since only one of the randomly selected PCPs declined to participate. Other limitations of this study were the assessment of quality solely by user satisfaction, and the lack of long-term follow-up of patients. These issues should be addressed in future studies.

This CSAFTD program was designed for the military setting in which patients, especially in rural units, have relatively low access to specialists and the primary physicians are general practitioners with no dermatology expertise. These conditions are not exclusive to the military and are found in many communities. The rapid processing of tele-referrals by the dermatologist as compared to traditional face-to-face appointments suggests another advantage of the service in urban areas where accessibility is less of a challenge but availability is sometimes limited. Urban locations could therefore benefit from using CSAFTD for better utilization of specialists' time and to reduce waiting time. We recommend the expansion of the service to other primary clinics in the IDF, especially in rural units, and in selected civilian settings.

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