

Implementing and Optimizing Inpatient Access to Dermatology Consultations via Telemedicine: An Experiential Study

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Abstract

Background/Introduction: *In-house dermatology consultation services for hospitalized patients are not universally available in acute care hospitals. We encountered an unanticipated access gap for in-person dermatology consultations in our tertiary care hospital that routinely cares for complex high acuity patients with multiple comorbidities. To bridge this gap in specialist expertise in a timely manner, we expeditiously designed and implemented a telemedicine-supported inpatient dermatology consultation service.*

Methods: *We conducted a retrospective review of 155 tele-dermatology consultations conducted between November 2017 and March 2019 as well as periodic prospective multidisciplinary process improvement meetings to optimize service-associated process maps and workflows.*

Results: *Tele-dermatology consultations changed the working diagnosis of the primary team in 52.3% of cases and most commonly recommended medical management (61.9% of cases). In total 100% of patients accepted telemedicine support and rated their experience as positive. The first three periodic*

process improvement meetings led to significant improvements in tele-dermatology-related process maps and workflows.

Discussion: *Diagnostic concordance rates between the primary team and the tele-dermatologist were similar to those reported in the literature for in-person dermatology consultations. Important process improvements include establishing central responsibility of preparing and overseeing the consultation process, mandating the presence of a primary team representative during consultation and patient chart review by the tele-dermatologist before tele-consultation.*

Conclusion: *Inpatient tele-dermatology consultation services can be instituted timely and continuously improved to reliably and effectively bridge access gaps, improve diagnostic accuracy and differentiate therapeutic approaches while maintaining patient satisfaction.*

Keywords: *telemedicine, tele-dermatology, e-health, dermatology, telehealth*

Introduction

Along with many other medical subspecialties, dermatologists are in increasingly short supply, a phenomenon exacerbated further by geographical inhomogeneities in dermatologist distribution.¹

The clinical practice of dermatology overall has shifted toward outpatient care with increasingly limited access to in-patient services across U.S. hospitals.² This creates an access gap for in-hospital dermatological care.^{3,4} In an attempt to address this lapse in care, Fox et al., with the support of the American Academy of Dermatology, created the Society of Dermatology Hospitalists that consists of close to 100 dermatologists interested in advancing evidence-based inpatient care.⁵

As defined by the World Health Organization, telemedicine is the delivery of health care services by health care professionals using information and communication technologies for valid information exchange pertaining to diagnosis, treatment, and prevention of diseases as well as enhancing research and continuing education of health care providers

in the interest of providing optimal care to individuals and communities.⁶ Telemedicine has the potential to become a central tool in the dermatologists' clinical repertoire as most dermatological conditions can be evaluated remotely using high-resolution video equipment and trained bedside support to optimize examination conditions and perform simple dermatological examination maneuvers.

There are three modalities that are currently employed by health care professionals for the practice of tele-dermatology: (1) store and forward only (most frequently used modality), (2) live interactive only, and (3) hybrid approach encompassing both modalities.^{7,8} The use of tele-dermatology aims to fulfill the supply and demand gaps in many rural and remote areas, urban areas, health maintenance organizations, and military services⁸⁻¹⁰ while providing effective dermatological management guidance to physicians in primary patient sites.¹¹ Tele-dermatology has a wide range of applications. There was a 48% increase in tele-dermatology use in nongovernmental programs reported by a 2018 study.¹² According to a survey conducted at the annual conference of the Association of Professors of Dermatology, 47% of programs were using telemedicine as part of their residency curriculum and many more were interested in implementing it in the future.¹³

After encountering an unanticipated loss of existing and long-standing inpatient dermatologist coverage in our hospital we decided to rapidly design and implement a live tele-dermatology consultation service. Herein we describe our experience with implementation and process improvement of the technical setup, process map, and workflows. We also report utilization, patient demographics, clinical outcomes, and basic patient satisfaction metrics.

Methods

STUDY SETTING

We performed a retrospective and descriptive study of tele-dermatology consultations combined with periodic prospective process improvement evaluations for a 17-month period (November 2017–March 2019) at Westchester Medical Center/New York Medical College. This study was approved by the institutional review board and the institutional quality and safety department (Approval 12-283).

WORKFLOWS

The tele-dermatology consult service is being coordinated through the institutional eHealth Center, which synergistically coordinates a variety of other telemedicine-supported programs. The basic final workflow is that the primary team calls the eHealth coordinator to request a tele-dermatology consultation. The coordinator then sets up a consultation day

and time with the office-based outpatient dermatologist who after the loss of inpatient dermatology coverage has been contracted to perform the tele-consultations from his office. The eHealth coordinator brings the mobile telemedicine cart to the patient room, sets it up, and meets a representative of the primary team to jointly conduct the virtual consultation. All necessary equipment is set up on a mobile cart equipped with full Health Insurance Portability and Accountability Act (HIPAA)-compliant high-definition audio and video capabilities, including zoom and pan-tilt functionality that can be controlled remotely by the tele-dermatologist in the office. During the interaction, the primary team representative presents the clinical case description while the tele-dermatologist examines the patient, clarifies any relevant missing information and discusses treatment recommendations with the patient and primary team. Any bedside dermatological examination maneuvers are conducted by the member of the bedside team under supervision and guidance by the tele-dermatologist. The tele-dermatologist then enters a tele-consultation note into the medical record.

DATA ANALYSIS

Descriptive statistics on patient demographics, admission diagnosis, primary medical service, tele-dermatology consult indication, consulting medical team information, post-consultation diagnosis, tele-dermatology management recommendations, and outcomes were calculated through Microsoft Excel. Patient acceptance and satisfaction was measured through standardized questions asked and recorded by the eHealth coordinator at the end of the tele-dermatology consultation.

PROCESS IMPROVEMENT

At intervals of every 25 consults, multidisciplinary team meetings were held, including the tele-dermatologist, internal medicine attending and resident representatives, eHealth coordinators, administrators, and leadership, to review and optimize the associated process maps and workflows.

Results

Patient characteristics and outcomes are summarized in *Table 1*. Among a total of 155 consults, 90 patients (58.1%) were male and 65 patients (41.9%) were female. The average patient age was 51.7 years. The majority of dermatology consults originated from internal medicine (80.7% [125 consults]), followed by pediatrics (11.0% [17 consults]), with general surgery, psychiatry, and obstetrics accounting for the remaining 8.3% (13 consults). The utilization rates of tele-dermatology consultations per month are shown in *Figure 1*.

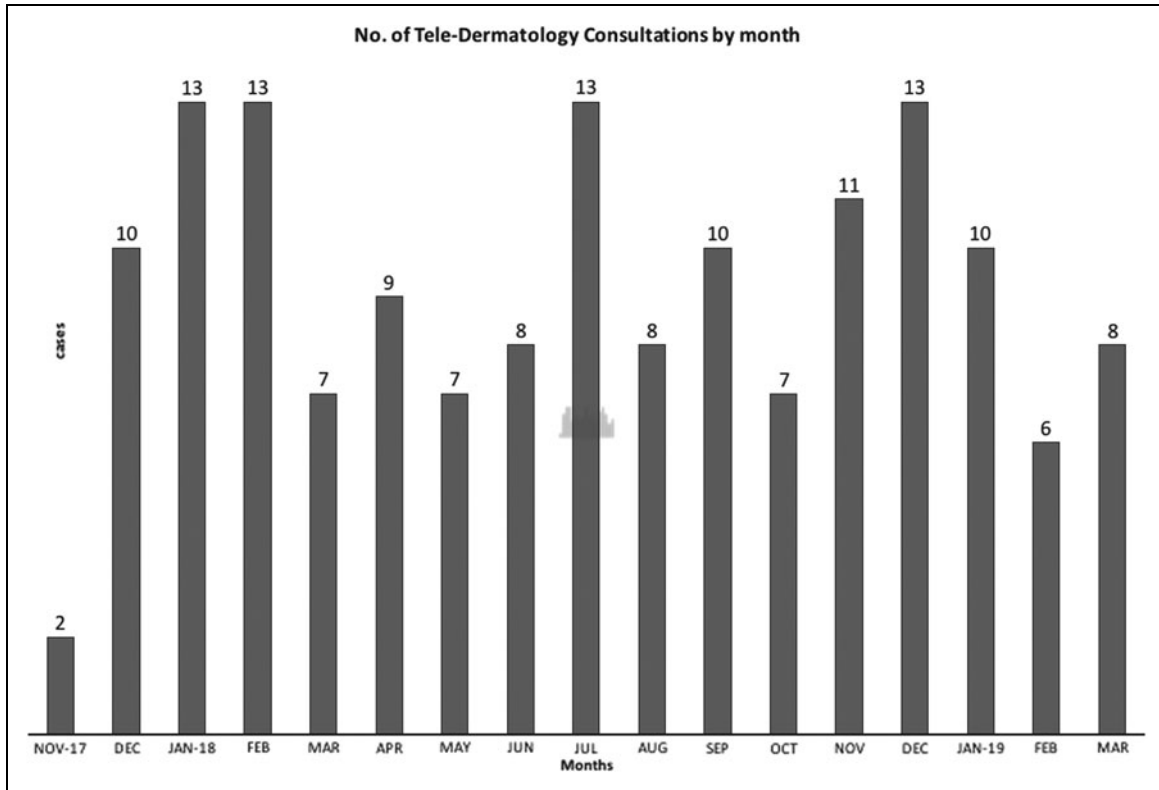


Fig. 1. Number of tele-dermatology consultations by study month.

On average, tele-dermatology consultations were performed within one business day of being requested (average 0.76 days or 18.2 h from request to chart documentation of consultation).

28.4% of patients receiving a tele-dermatology consultation were admitted with an initial working diagnosis, including common pathognomonic skin manifestations. Among all consults, 80.7% (125 consults) were due to underlying systemic diseases or newly discovered lesions suspicious for malignancy, whereas the remaining 19.3% were related to drug reactions. Consultation with the tele-dermatologist changed the working diagnosis of the primary team in 52.3% of cases (81 of 155 consults). Diagnosis changes occurred in 58.4% of patients with presumed systemic diseases, 33.3% of patients with presumed drug reactions, 59.4% of patients with presumed infectious etiologies, and 50.4% of patients with presumed noninfectious etiologies.

Tele-dermatology consultations recommended medication management in 61.9% of cases, a combination of diagnostic biopsy and medication management in 18.1% of cases, biopsy alone in 11.6%, and observation alone in 8.4% of cases. 73.6% (114 patients) were seen only once by tele-

dermatology consultation during their hospitalization and were recommended to follow-up with their primary care physician, whereas 26.4% (41 patients) received a follow-up consultation for continued surveillance, monitoring of treatment effectiveness or further examination and assessment. The dermatological condition improved after tele-dermatology consultation in 88% of cases, whereas 12% required further evaluation.

During our study period, only 1.9% (3) of consultation sessions needed to be rescheduled due to technical difficulties.

The average time spent on the remote video session part of the tele-dermatology consultation was 6.52 min, not counting the preconsult chart review and postconsult chart documentation times by the tele-dermatologist.

In total 100% of patients accepted telemedicine support for their dermatological consultation. All 100% of patients rated their experience as positive. Even the three patients who had their consultations rescheduled due to technical difficulties reported positive experiences.

We conducted a series of six process improvement meetings to date. Several important process and workflow changes have occurred as a result of the multidisciplinary discussions and data reviews:

Table 1. Patient Characteristics and Outcomes

CHARACTERISTIC	<i>n</i>	%
Gender		
Male	90	58.1
Female	65	41.9
Consulting service		
Medicine	125	80.7
Pediatrics	17	11.0
Psychiatry	9	5.7
Obstetrics	2	1.3
Surgery	2	1.3
Working diagnosis during admission		
Dermatological	44	28.4
Nondermatological	111	71.6
Type of consult		
Systemic disease	125	80.7
Drug reaction	30	19.4
Infective etiology	32	20.7
Noninfective etiology	123	79.3
Primary team working diagnosis vs. tele-dermatology diagnosis		
Same	74	47.7
Different	81	52.3
Changed diagnosis		
Systemic disease	73	58.4
Drug reaction	10	33.3
Infective etiology	19	59.4
Noninfective	62	50.4
Tele-dermatologist recommendations		
Medications	96	61.9
Biopsy	18	11.6
Medications+Biopsy	28	18.1
Observation	13	8.4
Outcomes		
Improved	136	87.7
Did not improve	19	12.3
Number of tele-dermatology consultations		
One consult only	114	73.6
Required inpatient follow-up	41	26.4

continued →

Table 1. Patient Characteristics and Outcomes *continued*

CHARACTERISTIC	<i>n</i>	%
Issues		
No issues	152	98.1
Technical issue	3	1.9

1. First Process Improvement Session (after 25 consults). We changed from having hospital transport services move and set up the telemedicine cart to having an eHealth coordinator take over the central responsibility of preparing and overseeing the consultation process. This allowed us to have a limited number of coordinators gain expertise in cart setup and maintenance, as well as being in charge of bringing all participants together and optimizing environmental conditions for the tele-dermatology consult. This process includes cart startup and troubleshooting, patient positioning as well as optimizing lighting conditions. All three technical issues we encountered so far occurred during the first 25 consultations. Since delegating the responsibility for telemedicine cart setup and maintenance to the eHealth coordinators no further issues have occurred.
2. Second Process Improvement Session (after 50 consults). We implemented the mandatory presence of a representative of the primary team, preferentially a postgraduate medical trainee, during the tele-dermatology consultation. This allows for efficient communication and discussion of the treatment plan as well as case-based education by the tele-dermatologist. It also enables the tele-dermatologist to instruct the primary team member to perform direct dermatological physical examination maneuvers.
3. Third Process Improvement Session (after 75 consults). The tele-dermatologist changed his workflow by moving the review of the patient's history from the tele-dermatology consultation itself before the consultation. This increased efficiency of the consultation while still allowing for clarification of individual aspects of the history as necessary.

Discussion

Timely and accurate diagnoses are essential for effective high-quality patient care.

A study by Federman et al. reported significant incorrect diagnosis and inappropriate testing rates in patients with skin diseases seen by nondermatology physicians.¹⁴ When dermatologists do get consulted, a recent study found the rate of diagnostic concordance between primary care providers and dermatologists to be 56%, with lower concordance rates for certain conditions such as psoriasis and eczema.¹⁵ We found similar diagnostic concordance rates in our inpatient high acuity patient population. Interestingly, diagnostic concordance rates for drug reactions were higher than for systemic disease-related skin lesions. 28.4% of patients ultimately receiving tele-dermatology consultations were already admitted with admission diagnoses involving dermatological manifestations, illustrating the necessity for dermatology consultations. 29.6% of consultations resulted in a recommendation for skin punch biopsy. At our institution these biopsies are being performed by the general surgery service. For institutions where the dermatology service performs these biopsies autonomously the implementation plan of a tele-dermatology service also needs to address which service is going to perform these biopsies.

PROCESS IMPROVEMENT

The implementation of tele-dermatology consultation services to increase access to care has been described before.^{11,16} The American Telemedicine Association has published guidelines for tele-dermatology programs.¹⁷ In our experience, a rapid implementation to bridge access gaps for patients benefits especially from a rigorous process improvement component to optimize the service. We held collaborative multidisciplinary team meetings to discuss the initial process maps and workflows as well as the technical setup and any technical issues that occurred. These iterative process improvement meetings were held approximately after each additional 25 consultations and resulted in several process map and workflow changes. Importantly, we found that keeping the coordination of consultations and the technical telemedicine cart setup and maintenance within a small team improves efficiency and reliability. Postgraduate medical education is a core mission of a teaching hospital, so to strengthen the educational component of the service we mandated that the medical student, resident, or fellow be present for the tele-dermatology consultation. This was universally well received by trainees. Third, the tele-dermatologist suggested to review the patient's history before the video encounter rather than during the video encounter, to then be able to focus on the clarification of history items and the physical examination itself during the encounter.

Conclusion

Anticipated and unanticipated access gaps in inpatient dermatology consultations can successfully be bridged by implementing tele-dermatology consultation services. Tele-dermatology provides adequate physician-patient interaction and dermatological examination capabilities, improves diagnostic accuracy over care without dermatologist involvement and is very well accepted by patients. Through iterative process review and improvement we found that central oversight of the consult process by dedicated eHealth coordinators increases efficiency and reduces equipment failures. Presence of primary team representatives during the tele-consultation extends physical examination capabilities and enables case-based discussion and medical education through telemedicine.

Authorship

All authors participated in the writing process. K.D. and C.B. conceptualized and prepared the article draft. C.B., D.M., A.S., A.A., Z.A., A.E., B.H., and C.S. reviewed and edited the article. All authors approved the final article.

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