Concise report

CED
Clinical and Experimental Dermatology

Inpatient teledermatology improves diagnostic accuracy and management of erythroderma in hospitalized patients

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doi:10.1111/ced.14807

Summary

With the onset of the COVID-19 pandemic, healthcare providers have made increasing use of inpatient teledermatology; however, few studies have analysed the impact of teledermatology on patient outcomes. In this study, we investigated the diagnostic concordance between the primary team and teledermatologist, and we analysed the impact of this technology on the diagnosis and management of erythroderma, a condition with high morbidity and mortality. Overall, out of 2987 inpatient teledermatology encounters reviewed, we found 33 cases of erythroderma, and, of these, 78.8% had a change in diagnosis after teledermatology consult, 81.8% were recommended biopsy and all patients had a change in topical/systemic therapy. We hope to promote further study of the efficacy of teledermatology as it may begin to address large gaps in dermatological access to care particularly in regional and community hospitals.

Inpatient asynchronous or store-and-forward teledermatology has been studied to only a limited degree despite unprecedented use of teledermatology during the coronavirus pandemic and a high demand for inpatient dermatology services.[1] Involvement of dermatology hospitalists in inpatient settings has been shown to improve outcomes and reduce time to response; however, few studies have evaluated the impact of teledermatology on inpatient dermatological management, including its ability to increase efficiency and better outcomes.[1,2]

Erythroderma, a disease characterized by erythema with or without scaling over > 90% of body surface area, is a condition with high morbidity and mortality, which requires timely diagnosis and treatment.[3] Our study evaluated the diagnostic concordance and teledermatology impact on erythroderma diagnosis, investigations and treatment between referring hospitalists and the inpatient teledermatology teams at University of Pittsburgh Medical Center (UPMC).

Report

The study was approved by the institutional review board of University of Pittsburgh (STUDY20100029).

A retrospective review of 2987 asynchronous teledermatology encounters was conducted between the start of our service on 1 July 2014 and the cutoff date of 14 February 2021. At UPMC, store-and-forward teledermatology consultations are submitted by the primary team (consisting of a physician and mid-level provider) situated in 10 rural and urban hospitals (ranging between 122 and 404 beds)[4] without an in-person dermatology service; typically, the team sends photos with pertinent data via the electronic medical record (EMR). The teledermatology team reviews the data within 24 h

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Conflict of interest: the authors declare that they have no conflicts of interest.

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Accepted for publication 14 June 2021

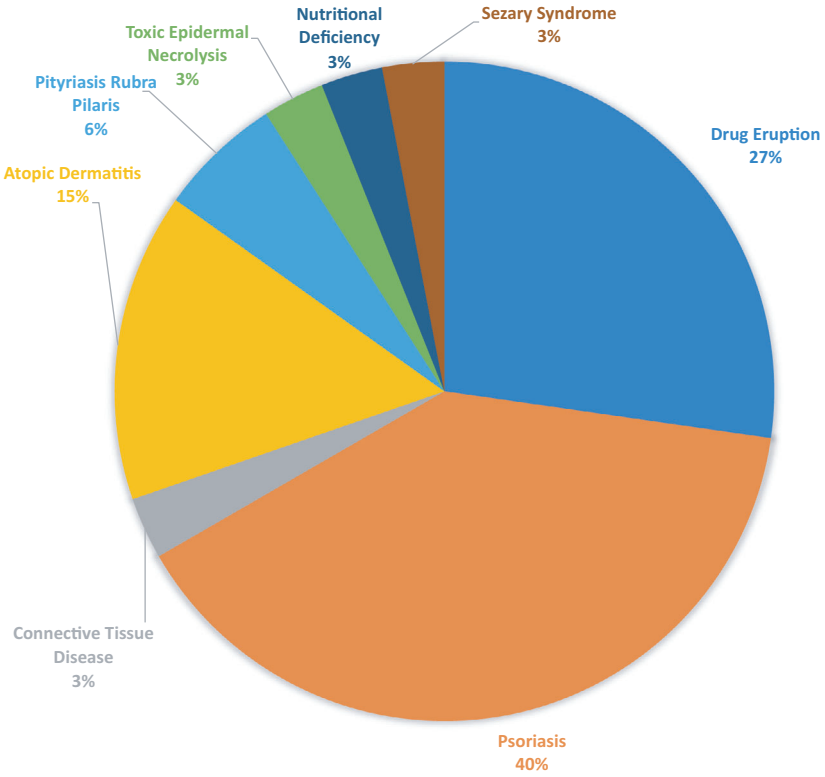

Figure 1 Causes of erythroderma among teledermatology consultations.

Table 1 Descriptive statistics and diagnosis/management concordance among primary and teledermatology teams.

	Erythroderma study cohort (n = 33)									
Baseline characteristic	Overall (n = 33)	Psoriasis (n = 13)	Drug eruption (n = 9)	Atopic dermatitis (n = 5)	PRP (n = 2)	TEN (n = 1)	CTD (n = 1)	ND (n = 1)	SS (n = 1)	P[a]
Age, years[b]	62.6 ± 15.3	54.9 ± 14.0	63.4 ± 14.5	71.4 ± 0.5	82.8 ± 4.5	66	84	55	51	
Sex, n (%)										
Female	17 (51.5)	8 (61.5)	2 (22.2)	2 (40)	2 (100)	–	1 (100)	1 (100)	1 (100)	–
Male	16 (48.5)	5 (38.5)	7 (77.8)	3 (60)	–	1 (100)	–	–	–	
Consensus between diagnoses, n (%) (95% CI)[c]										
Concordant	7 (21.2) (7.3–35.3)	2 (15.4) (0.0–35.0)	4 (44.4) (12.0–76.9)	1 (20) (0.0–55.1)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.50
Discordant	26 (78.8) (64.8–92.7)	11 (84.6) (65.0–104.2)	5 (55.6) (23.1–88.0)	4 (80) (44.9–115.1)	2 (100)	1 (100)	1 (100)	1 (100)	1 (100)	
Biopsy recommended, n (%) (95% CI)										
Yes	27 (81.8) (68.7–95.0)	7 (53.8) (26.7–80.9)	9 (100)	5 (100)	2 (100)	1 (100)	1 (100)	1 (100)	1 (100)	0.50
No	6 (18.2) (5.0–31.3)	6 (46.2) (19.1–73.3)	–	–	–	–	–	–	–	
Management change, n (%)[d,e]										
Yes	33 (100)	13 (100)	9 (100)	5 (100)	2 (100)	1 (100)	1 (100)	1 (100)	1 (100)	

CTD, connective tissue disease; ND, nutritional deficiency; PRP, pityriasis rubra pilaris; SS, Sézary syndrome; TEN, toxic epidermal necrolysis. [a]P value was calculated to determine differences in percentage concordance or biopsy recommendation between diagnoses. [b]Mean ± SD. [c]Consensus between the diagnoses of the teledermatology and primary teams; changes in diagnosis were defined as the lack of the final diagnosis in the primary team's differential, suspected, or concerning diagnosis. [d]Change in systemic/topical therapy management; changes in therapeutic management were defined as any topical/systemic modification that was not included in the primary team's initial consultation. [e]15/33 patients had follow-up in person after discharge.

and manages consultations remotely via phone dialogue and EMR, then the mid-level provider or general surgery team takes any requested biopsies. Patients with pre-established diagnoses of erythroderma or repeat encounters were excluded, generating a total of 33 patients with a diagnosis of erythroderma (Fig. 1).

Descriptive statistics are shown in Table 1. Percentage agreement was used to detect concordance between teledermatology diagnosis after biopsy and that of the initial referring provider; χ^2 tests of homogeneity were used to populate *P* values.

Most referrals ($n = 19$, 57.5%) used nonspecific language, such as 'rash,' whereas 42.4% ($n = 14$) included specific diagnoses [e.g. 'psoriasis' or 'SJS' (Stevens–Johnson syndrome)]. Of the 33 cases with erythroderma, 78.8% ($n = 26$) had a change in diagnosis following teledermatology and 81.8% ($n = 27$) were recommended biopsy (Table 1). The teledermatology service suggested systemic and/or topical therapeutic changes in all cases. Diagnostic concordance between the primary team and teledermatologist was low (21.2%), with the highest concordance for drug eruption (44.4%) followed by atopic dermatitis (20%) and psoriasis (15.4%). All other causes of erythroderma had a change in diagnosis ($n = 6$).

This study suggests that erythroderma diagnosis, investigations and treatment are frequently changed following teledermatology consultation. We believe that these data not only suggest the utility of inpatient teledermatology for erythroderma but also reflect appropriate consultation by the primary teams for investigations of this condition. As prior studies have demonstrated the reliability of teledermatology in the triage of inpatient consultations, we hope this study also demonstrates the clinical impact of this technology.[5]

The limitations of our study include the analysis of data and diagnoses limited to the EMR, the retrospective observation and the sole inclusion of cases for which teledermatology was requested.

Future studies should evaluate outcomes of patients with and without teledermatology consultation for erythroderma in the inpatient setting to support the use of this service.

Learning points

- With the onset of the COVID-19 pandemic, healthcare providers have increasingly used inpatient teledermatology; however, few studies have analysed the impact on patient outcomes.
- This study evaluated the diagnostic and management concordance between the primary team and teledermatologist for erythroderma.
- Overall, out of 2987 inpatient teledermatology encounters, there were 33 cases of erythroderma.
- Of these, 78.8% had a change in diagnosis after teledermatology consult, 81.8% were recommended biopsy, and all patients had a change in topical/systemic therapy.
- The data potentially suggest not only the utility of teledermatology for erythroderma but also appropriate consultation by the primary team.
- We hope to promote further study of the efficacy of teledermatology as it may begin to address large gaps in care, especially within rural and community hospitals.

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