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Authors
Zakaria, Adam
Amerson, Erin H

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Effect of teledermatology triage on primary care and dermatology provider workloads: a retrospective cohort analysis

Adam Zakaria[1] BA, Erin H Amerson[1,2] MD

Affiliations: [1]Department of Dermatology, School of Medicine, University of California San Francisco, San Francisco, California, USA, [2]Department of Dermatology, Zuckerberg San Francisco General Hospital and Trauma Center, San Francisco, California, USA

Corresponding Author: Erin Amerson MD, 1701 Divisadero Street, San Francisco, CA 94115, Email: Erin.Amerson@ucsf.edu

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To the Editor:

Teledermatology (TD) is a tool that facilitates timely access to dermatology care by triaging patients with complex dermatologic disease to dermatology clinic and patients with straightforward dermatologic disease to their primary care provider with dermatologist recommendations [1,2]. For example, in a previous study we found that implementation of a TD triage system at Zuckerberg San Francisco General Hospital (ZSFG) led to a reduction from 84.6 days to 6.7 days in average new patient wait times for dermatology clinic [3]. However, one consistently posited concern regarding TD is that it may increase overall provider workloads by transferring dermatology tasks to primary care providers (PCPs), [4-6]. To evaluate this theoretical concern, we compared the number of dermatology-related PCP and dermatology clinic visits among newly referred dermatology patients within a conventional care model and TD triage model at ZSFG.

A store-and-forward TD program was implemented at ZSFG in 2015 to triage all non-emergent dermatology referrals to dermatology clinic or primary care with management recommendations. We reviewed patient charts to characterize care paths of newly referred patients triaged through TD between June and December 2017 and extrapolated those findings to a theoretical conventional care model. Dermatology visits and PCP visits within 6 months of referral that addressed the patient's dermatologic complaint in the visit note were included. Given that TD case review is approximately twice as efficient as in-person ZSFG clinic evaluation [3], TD case review was counted as equivalent to half of a dermatology visit. The per-patient means for PCP visits, dermatology visit equivalents, and overall visit equivalents were compared with two-tailed z-tests ($P < 0.05$). The study was IRB-exempt.

The analysis captured 2,098 patients, with 42% identifying as non-White and 75% having government-sponsored insurance. Patients in the TD model required a mean of 2.30 (1.51, SD) visit equivalents with 1.32 (0.63) PCP visits and 0.98 (0.97) dermatology visit equivalents (**Figure 1**), whereas patients in the conventional care model would have attended 2.33 (1.26) visit equivalents with 1.07 (0.33) PCP visits and 1.25 (1.23) dermatology visit equivalents (**Figure 2**). Statistically significant differences existed in mean number of PCP visits ($P<0.001$) and dermatology visit equivalents ($P<0.001$), but not in mean number of total visit equivalents ($P=0.52$).

Although the TD triage system increased dermatology-related PCP visits, it was associated with a non-significant decrease in total dermatology-related visit equivalents. This suggests that implementation of TD triage was not associated with an increase in overall provider workload within our system.

Although TD triage was not associated with significantly more efficient care relative to conventional care, our study likely underestimates the efficiency of TD triage for several reasons. First, we did not account for improved dermatology problem management and fewer referrals over time

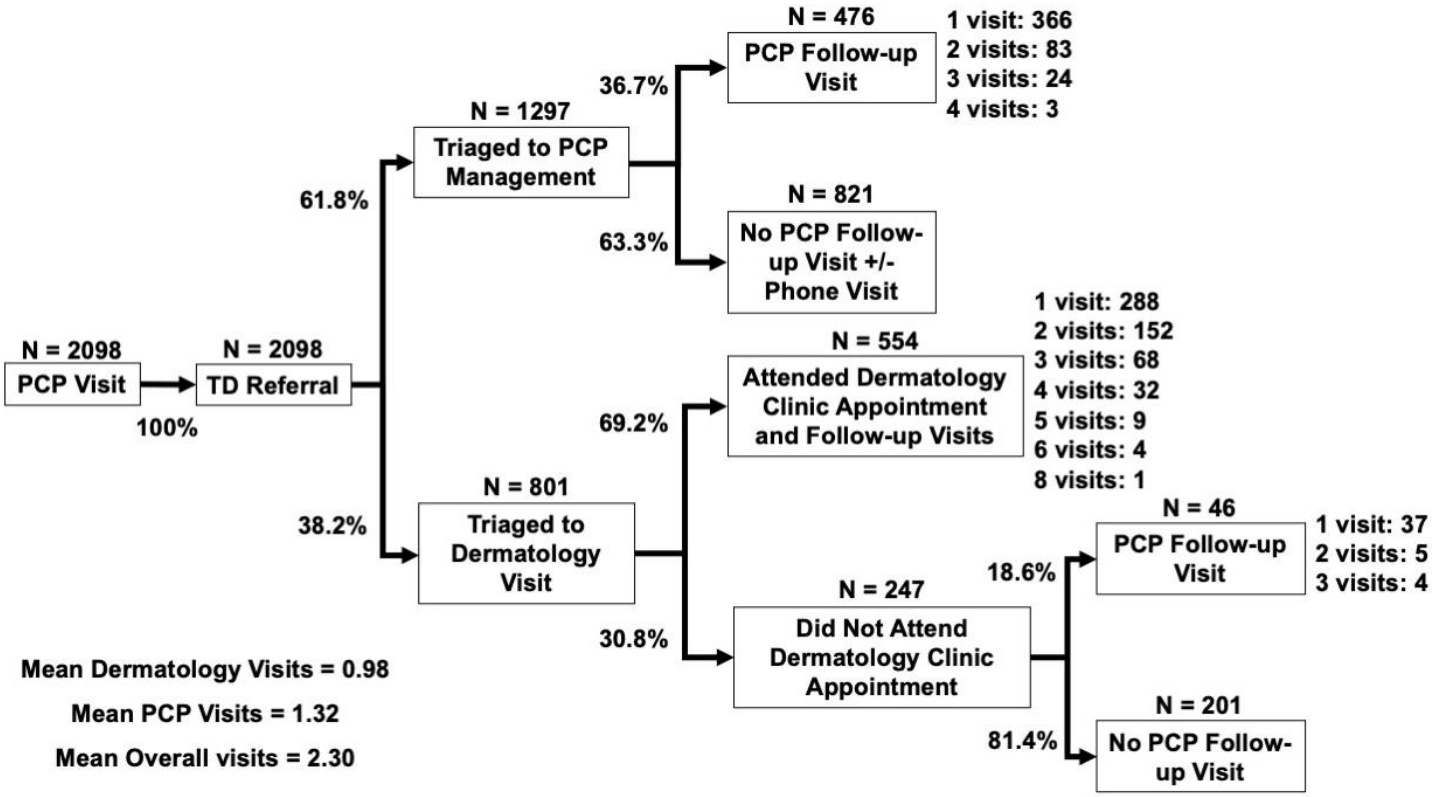

Figure 1. *Patient flow within the teledermatology triage model.*

as PCPs learn from the TD system [7]. Second, we used visit numbers to indirectly estimate dermatology-related workload rather than directly measuring time spent managing dermatology problems. Since PCPs often manage multiple medical problems in the same visit, ascribing a full visit to dermatology care likely overestimates true PCP workload. This would lead to relatively greater overestimation in the TD triage model given that PCPs account for a greater proportion of overall workload. The main study limitations include not accounting for PCP phone visits and extrapolation from the TD model to the conventional care model due to data availability.

Our findings suggest that TD triage is at least noninferior to traditional models in overall health care system efficiency within a large safety-net hospital system. Areas of future investigation include analyzing the appropriateness of TD triage decisions.

Potential conflicts of interest

The authors declare no conflicts of interest.

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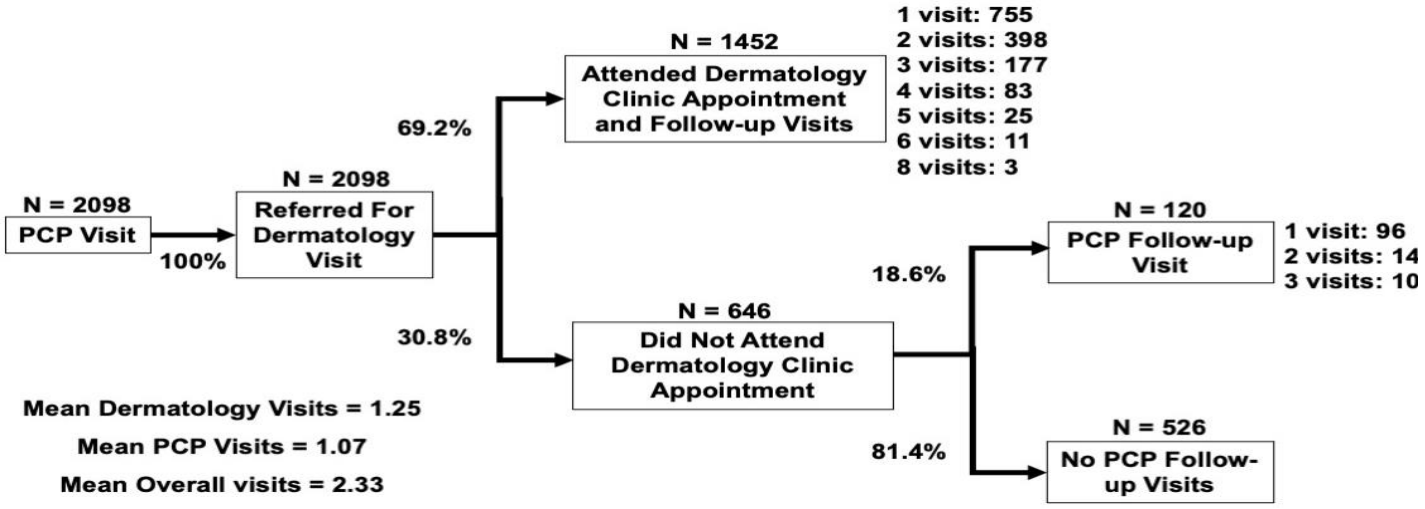

Figure 2. *Patient flow within the conventional care model.*