Pilot Study Using Teledermatology to Manage High-Need Patients With Psoriasis

Patient empowerment has been found to be a key factor for achieving improved health outcomes in psoriasis.1 Telemedicine has revolutionized some aspects of health care delivery by transforming relationships between patients and physicians, shifting the power of consultation so that patients may become more informed and assertive.2 However, the greater confidence of dermatologists when making the diagnosis by in-person examinations3 may have impeded the routine use of teledermatology until now. The present study provides baseline data on the feasibility of teledermatology services for high-need patients with psoriasis, preparing the way for further effectiveness studies.

Methods. After approval was granted by the institutional review board at the Medical University of Graz, Austria, and informed written consent was obtained, patients with psoriasis who met the inclusion criteria (men or women, age ≥18 years, eligible for etanercept treatment,4 and able to use mobile phones) were prospectively enrolled in the 12-week pilot study. Etanercept treatment was administered according to standard protocol.4 Patients were given and trained on a general packet radio service/universal mobile telecommunications system (GPRS/UMTS)–enabled Smartphone (Nokia 6630; Nokia, Helsinki, Finland) with a 1.3-megapixel camera and special software that integrated both a section for capturing images and a section for the input of historical information, including occurrence of adverse effects or skin lesions in regions inaccessible to the camera (eg, the scalp) or not usually photographed (eg, the genitalia). Patients photographed their skin lesions according to the anatomic areas of Psoriasis Area and Severity Index (PASI) or Palmoplantar PASI (PASI/PPPASI).3 The data were transmitted through GPRS/UMTS to a Web server at weeks 0, 1, 2, and every 2 weeks thereafter. Treatment instructions were sent via e-mail-to–short message service techniques to the patients’ phones within 24 hours.

Data from routine outpatient consultations at weeks 0, 1, 6, and 12 were compared with those obtained by 2 teledermatologists (TD1 and TD2) with particular attention to the accuracy of PASI/PPPASI scores and therapeutic outcome assessments (≥50% reduction from baseline PASI/PPPASI scores [PASI/PPPASI 50] at week 12).4

Based on the face-to-face assessments (FTF), PASI/PPPASI 50 responders were continued on etanercept treatment regimens.

Results. All eligible patients (6 men and 4 women; median age, 40 years; age range, 25-67 years) agreed to participate in the study. Eight patients had plaque psoriasis, and 2 presented with palmoplantar psoriasis. Each of the 10 patients transmitted 8 “mobile visits” (total, 80 visits) including 32 to 64 images each (total, 486). Image quality was very good for an average of 86% of the images (range, 66%-95%); satisfactory for 12% (range, 5%-28%); and poor for 2% (range, 0%-6%).

The PASI/PPPASI scores correlated significantly between the FTF and the 2 teledermatologists (r=0.71-0.96 for TD1 and r=0.78-0.98 for TD2) (Table) as well as between the 2 teledermatologists (r=0.93) (P<.001). The interrater variability (mean PASI/PPPASI deviation from FTF) was very low for both teledermatologists, with values ranging from 0.86 to 3.39. For patient outcomes, TD1 agreed 8 of 10 times with FTF (κ=0.52), and TD2 agreed with FTF 9 of 10 times (κ=0.78). Therapeutic outcome marginally differed in 2 patients. In one case, FTF assessed a PASI/PPPASI 50, while the teledermatologists found a 44% (TD1) and 24% (TD2) PASI/PPPASI improvement from baseline to week 12. In the other case, TD1 calculated a PASI/PPPASI 50, while TD2 found a 47% and FTF a 44% PASI/PPPASI improvement. Palmoplantar psoriasis ratings were completely concordant.

Comment. For the first time, to our knowledge, we have assessed the feasibility of a patient-driven mobile home-monitoring system for high-need patients with psoriasis, which actively integrates them into their treatment process. We have demonstrated a strong correlation between severity measurements obtained by an FTF physician and teledermatologists (Table) and a good con-

### Table. Comparison and Correlation of Disease Severity Measurements Obtained by FTF Consultation and 2 Teledermatologists in 10 High-Need Patients With Psoriasis Receiving Etanercept

<table>
<thead>
<tr>
<th>Visit</th>
<th>FTF PASI/PPPASI, Median (Range)</th>
<th>Correlation With FTF, P Value</th>
<th>Interrater Variability</th>
<th>TD1 PASI/PPPASI, Median (Range)</th>
<th>Correlation With FTF, P Value</th>
<th>Interrater Variability</th>
<th>TD2 PASI/PPPASI, Median (Range)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>18.85 (5.2-34.8)</td>
<td>0.90 &lt;.001</td>
<td>3.39</td>
<td>15.85 (5.7-29.6)</td>
<td>0.95 &lt;.001</td>
<td>2.97</td>
<td>16.50 (5.0-29.6)</td>
</tr>
<tr>
<td>1</td>
<td>13.70 (5.2-29.4)</td>
<td>0.96 &lt;.001</td>
<td>2.11</td>
<td>14.50 (5.6-23.4)</td>
<td>0.98 &lt;.001</td>
<td>2.57</td>
<td>12.95 (4.4-27.2)</td>
</tr>
<tr>
<td>6</td>
<td>5.05 (2.2-22.2)</td>
<td>0.88 &lt;.001</td>
<td>1.50</td>
<td>6.55 (3.3-20.0)</td>
<td>0.78 .008</td>
<td>1.27</td>
<td>5.85 (3.2-23.9)</td>
</tr>
<tr>
<td>12</td>
<td>3.55 (1.3-20.0)</td>
<td>0.71 .002</td>
<td>1.11</td>
<td>3.75 (2.1-19.0)</td>
<td>0.80 .005</td>
<td>0.86</td>
<td>4.75 (1.5-20.1)</td>
</tr>
</tbody>
</table>

Abbreviations: FTF, face-to-face; PASI, Psoriasis Area and Severity Index; PPPASI, Palmoplantar PASI; TD, teledermatologist.

a Disease severity measurements are reported as combined scores established from 8 patients with plaque psoriasis and 2 patients with palmoplantar psoriasis.
b Spearman rank correlation coefficient.
c For correlation coefficient.
d Mean PASI/PPPASI deviation from FTF.
correlation of PASI/PPASI 50 assessments and management decisions. Because severity scorings differed mainly in diverse estimations of the involved area and induration of the lesions, one may speculate that the divergence might have resulted from the inability of the teledermatologists to see the entire body and palpate the lesions, or it might have resulted from some flaws of the PASI scoring system for which an interrater variability of up to 8.1 PASI scores has been described.5

In our study, the interrater variability was very low (Table), indicating that mobile teledermatology is a feasible method for monitoring disease severity in patients with psoriasis. Larger controlled studies are required to evaluate the impact of remote follow-up care on patient empowerment and its influence on the therapeutic outcome.

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Financial Disclosure: None reported.

Additional Contributions: We are indebted to Joanneum Research (research institution in Austria).


**Risk of Hepatic Hemangiomas in Infants With Large Hemangiomas**

While most infantile hemangiomas are benign and uncomplicated, a minority may have associated internal involvement that can lead to significant morbidity.1,2 Multiple cutaneous hemangiomas have been recognized as potential markers of underlying hepatic hemangiomas.3,4 Two recent retrospective studies suggest that infants with large (≥5 cm in diameter) and/or segmental cutaneous hemangiomas are at risk for hepatic hemangiomas.2,3 These reports have led many clinicians to screen infants with large cutaneous hemangiomas for hepatic hemangiomas. An algorithm for the evaluation and management of hepatic hemangiomas in asymptomatic infants with multiple (≥5) cutaneous hemangiomas, based on retrospective data, has recently been published.5 However, controversy remains regarding the number of cutaneous hemangiomas that should serve as the threshold at which to perform such screening.6 Definitive guidelines regarding the workup for hepatic hemangiomas in asymptomatic infants with large cutaneous hemangiomas, particularly within the first few months of life, are lacking in the literature. The true prevalence of this association is also unknown because, to our knowledge, no prospective studies of infants with large cutaneous hemangiomas have been undertaken. To assess this risk, we report results from a multicenter, prospective study in which infants with large cutaneous hemangiomas were systematically evaluated for hepatic hemangiomas.

**Methods.** Infants aged between 1 and 6 months referred to a pediatric dermatologist with fewer than 5 and at least 1 large hemangioma (>30 cm²) were consecutively enrolled between 2006 and 2008 at 4 Hemangioma Investigator Groups sites. This study was a nested study within a larger study looking at infantile hemangiomas with a risk of morbidity related to either size of the hemangioma or number (≥5). Institutional review board approval was obtained at each site. A standardized questionnaire was completed on each infant. The hemangiomas were classified based on morphologic characteristics and size, with size determined by measuring 2 perpendicular surface diameters with a flexible measuring tape. Physical examination and abdominal ultrasonography were performed on each infant.

**Results.** Demographic and clinical characteristics are summarized in the Table. A total of 60 infants with at least 1 large hemangioma (>30 cm²) were enrolled. The mean (SD) hemangioma size was 73.6 (38.4) cm². At the time of enrollment, all infants were clinically asymptomatic without signs of hepatomegaly, abdominal distention, or congestive heart failure. No hepatic hemangiomas were identified on ultrasonography.

**Comment.** To our knowledge, this is the first attempt to prospectively assess the risk of hepatic hemangiomas in infants with large cutaneous hemangiomas, an associa-