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SkinSpecs: A solution that addresses an unmet need for tracking chronic skin diseases in the office and at home

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Background/Objectives: Chronic skin diseases are challenging and frustrating for both patients and physicians. Patients often have difficult-to-capture flares in between visits and they are seeing multiple providers for their skin condition. While there are many emerging tools for monitoring individual neoplasms, our field lacks an objective and efficient tool to robustly document and longitudinally monitor changes in chronic skin conditions. This study identifies an unmet need in dermatology, performs an in-depth stakeholder analysis and proposes a mobile-based imaging solution that has the potential to drastically change our current workflow and disease monitoring strategies to potentially improve patient care and outcomes.

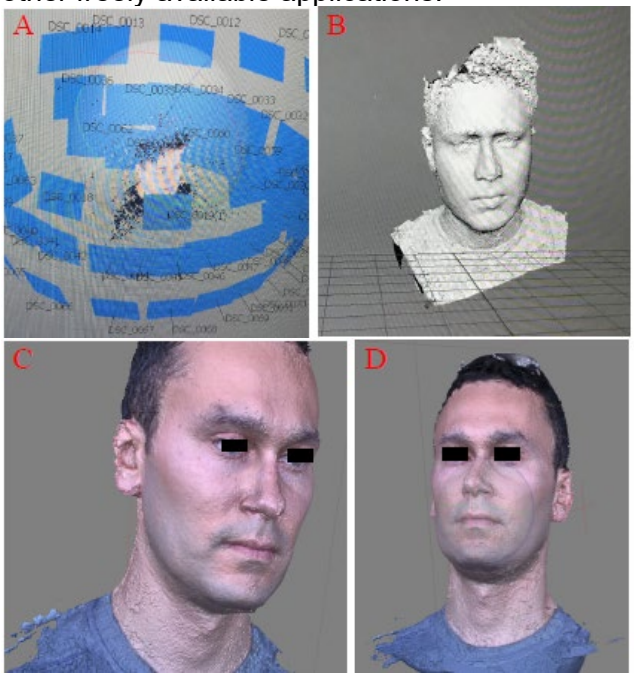
Methods: Stanford Dermatology department attending physicians (n=14), residents (n=14) and patients (n=8) were surveyed to assess the need in our field for a new way to document and follow chronic skin diseases over time. SkinSpecs is an imaging-based solution that uses a smartphone camera to capture a short (~30 second) 180°-360° video of the full distribution of skin disease (no special setup required). This video was rendered using modified Agisoft photogrammetry software to create a 3D model of the patient that can be viewed on any device.

Results: Dermatologists use subjective measures to document chronic skin conditions (such as psoriasis): Most dermatologists' documentation of rashes relies on "gestalt" (70% of providers), descriptive exam (80%), and BSA (90%). Notably, prior literature showed that BSA is poorly estimated by physicians1-2. Validated scoring systems (such as PASI) or photographs are rarely used for documentation of rashes (7% and 18% respectively). At a follow up visit, dermatologists lack confidence in assessing disease change if patient was seen by another provider: While most dermatologists (82%) are confident in the assessment of disease change in their long-term patients, only 33% of providers are confident in their assessment of disease based on prior documentation by another provider. Dermatologists want a better workflow for documenting chronic skin diseases in the office and in between visits: Sixty percent of providers stated they need a better way of documenting chronic skin conditions in the office, and 60% stated they would like their patients to document their skin condition at home. Patients want to document their skin disease at home: 100% of patients said it was important or very important to track their chronic disease at home and they are willing to spend 10-15 minutes weekly-monthly for documentation, with a preference of using a

smartphone. Dermatologists preferred a 3D reconstruction (SkinSpecs) over written description, standard photographs or video capture for documenting and tracking chronic skin conditions: SkinSpecs is favorably used by dermatologists, with high satisfaction with resolution, breadth of visual information, time and ability to pick up incidental findings.

Conclusion: We identified a need and proposed a solution to objectively and robustly capture skin disease, with an office and home workflow that is acceptable for providers and patients. This fast, scalable method is deployable on smartphones and could be utilized to augment clinical decision making.

Figure 1: SkinSpecs algorithm from video to 3D reconstruction. **A:** Extraction of relevant frames from video for 3D reconstruction. **B-D:** 3D reconstruction model of a subject, can be manipulated using Adobe Acrobat Reader or other freely available applications.



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