|| Print ISSN: 2589-7837 || Online ISSN: 2581-3935 ||
International Journal of Medical Science and Diagnosis Research (IJMSDR)
Available Online at www.ijmsdr.com
NLM (National Library of Medicine ID: 101738824)
Review Article
Volume 10, Issue 3; 2026; Page No. 1-7

Structured SOAP Notes in Dermatology: The Case for AI-Assisted Clinical Documentation in Indian Practice

Anushtha Rakesh Chillure[1], Krishna Mahesh Poddar[1], Pankaj Uday Raut[1], Abhishek Tomar[1], Priya Raut (Sawle)[2]

[1]Dimension NXG Private Limited, Thane, Maharashtra, India
[2]Consultant, Department of ENT

Received: 24-04-2026 / Revised: 22-05-2026 / Accepted: 27-06-2026
Conflicts of Interest: Nil
Corresponding author: Dr. Priya Raut (Sawle)
DOI: https://doi.org/10.32553/ijmsdr.v10i3.1128

Abstract

Indian dermatologists face a severe documentation crisis driven by exceptionally high outpatient volumes that compress single-encounter consultation windows. Because dermatological conditions require meticulous longitudinal records, unstructured or handwritten charts fail to preserve objective anatomical markers over time. This paper evaluates the utility of the Subjective, Objective, Assessment, and Plan (SOAP) framework in clinical dermatology and explores the feasibility of utilizing automated ambient artificial intelligence (AI) to generate structured morphological summaries. A targeted database methodology was implemented to identify secondary evidence tracking clinical data management. Peer-reviewed clinical validation studies, randomized controlled trials of conversational voice scribes, and institutional documentation audits were systematically synthesized through a specialty-specific lens to assess how automated entity extraction handles visual signs and localized workflow barriers. International validation trials show that automated ambient scribing applications significantly reduce documentation time and lower physician task scores. However, evaluation via the Physician Documentation Quality Instrument (PDQI-9) reveals a 31% binary hallucination rate in machine-generated summaries, emphasizing the need for active clinician oversight. Within Indian clinical settings, these systems face key operational hurdles including compressed timelines, multi-language conversational registers, and highly fragmented paper-based charting infrastructures. Manual data entry using comprehensive templates is unfeasible within high-speed outpatient departments. Ambient clinical intelligence offers a practical methodology to capture complete visual parameters at operational scale. Clinical translation requires specialized validation on regional code-switched dialogues and targeted adaptations for visual diagnostic workflows.

Keywords: Medical Records; Dermatology; Artificial Intelligence; Documentation; India; Burnout.

Introduction

Visual documentation crisis in dermatology:

Outpatient departments (OPDs) specializing in dermatology across India operate at an operational scale and velocity that present a fundamental barrier to comprehensive clinical recording. Consider a representative clinical scenario: a patient presents with a widespread, highly active cutaneous eruption, a six-month history of unmonitored topical corticosteroid application, and a sequence of prior self-treatments guided by local chemists. In a busy Indian dermatology OPD, the consulting physician frequently faces extreme volume pressures, leaving limited time to complete the

evaluation before proceeding to the next case. Under these conditions, the record produced, if one is generated at all, is typically restricted to a handwritten prescription slip detailing only the final therapeutic agents.

This systemic limitation means that critical clinical coordinates are lost from the medical file: primary lesion morphology is unrecorded, the precise anatomical distribution is unquantified, and the background history of steroid exposure that alters the differential diagnosis remains undocumented. When the patient returns for a follow-up assessment weeks later, the clinician lacks a clear, objective baseline to evaluate treatment response. This chronic information deficit is not an individual failure of clinical attention. It is a direct consequence of inadequate documentation infrastructure, and it represents a highly correctable vulnerability (8).

Indian dermatologists contend with massive patient volumes that make comprehensive handwritten recordkeeping structurally impossible. A cross-sectional study evaluating specialist infrastructure across nine government super-specialty clinics documented that average consultation times fall as low as 2.2 minutes in high-volume departments (1). Because dermatology is predominantly an outpatient specialty centered on long-term disease management, including conditions like psoriasis, atopic dermatitis, recalcitrant tinea infections, and complex pigmentary disorders requiring serial comparison over months, it is uniquely ill-served by brief, unstructured records.

A localized time-motion analysis from a dermatology OPD in Kerala compared electronic medical record (EMR) entry with legacy paper-based workflows. The study found that new EMR-based assessments required 19.15 minutes per patient compared to 15.70 minutes for paper consultations, showing that manual structured typing demands an extensive time investment that the current OPD architecture cannot sustain (2). The resulting under-recording of detailed clinical signs erodes continuity of care, undermines medico-legal protection, and compromises the quality of institutional healthcare data.

Methodology

To establish a rigorous contextual framework for this specialty perspective, a targeted secondary data identification process was executed up to May 2026. Systematic literature scans were conducted across digital biomedical databases, including PubMed, Scopus, and Google Scholar, to isolate relevant documentation evaluation literature. The search strategy focused on clinical validation trials of ambient voice scribes, randomized controlled trials tracking physician documentation workflows, prospective time-motion analyses in multi-ethnic settings, and institutional medical chart audits.

Data parameters extracted for qualitative synthesis included note-writing duration changes, clinician burnout indices, automated text hallucination frequencies, and conversational word error rates in code-switched linguistic environments. This clinical evidence was critiqued through a specialty-specific lens to assess its relevance to high-velocity dermatological care and to inform the localized technical requirements outlined within this paper.

The Specialty-Specific Necessity of the Soap Structure

The Subjective, Objective, Assessment, and Plan (SOAP) format, originating from Lawrence Weed's problem-oriented medical record model, divides clinical documentation into four logical categories that align closely with the requirements of a dermatological encounter (3). The Subjective section captures the patient-reported narrative, including precise symptom onset, pruritus severity scales, longitudinal timelines, and prior systemic or topical interventions.

The Objective section represents the most critical, yet frequently inadequately completed, component of the dermatological chart. It requires explicit textual recording of primary lesion morphology (such as macules, papules, plaques, nodules, vesicles, or bullae), secondary cutaneous changes (including scaling, crusting, lichenification, or excoriation), size in millimeters, color, arrangement, configuration, distribution, and anatomical location with laterality. The Assessment section formulates the differential diagnosis and establishes clear clinical reasoning, while the Plan records targeted therapeutics, laboratory investigation requests, and explicit follow-up parameters.

The demands of the Objective section are uniquely critical in dermatology because cutaneous findings are highly visual, fluid, and transient. An active psoriatic plaque that has partially resolved following systemic therapy cannot be reconstructed from memory weeks after the initial visit. Similarly, a melanocytic lesion suspicious for early-stage melanoma that is not systematically characterized at the baseline visit may be clinically unrecognizable or uninterpretable at a subsequent evaluation.

A published clinical audit utilizing the validated CRABEL scoring framework across distinct specialties at a major Indian tertiary teaching institution revealed that chart deficiency scores were highest in the subsequent visits domain (4). This indicates that follow-up note quality is significantly weaker than initial intakes. In clinical dermatology, where serial comparison directly dictates therapeutic adjustments, such as monitoring Psoriasis Area and Severity Index (PASI) alterations, tracking morphological transitions in fungal margins, or detecting malignant evolution, this specific documentation gap erodes care quality.

Crucially, to validate the accuracy of the baseline record before introducing any software components, academic departments must deploy these clinical audits to quantify their current chart vulnerabilities. Establishing a clear baseline via clinical record auditing methodologies allows an institution to confirm historical chart gaps and ensure that any subsequent technological implementation directly measures its clinical improvement against a known baseline.

Structured documentation also carries significant regulatory implications as India's healthcare environment develops. A closed-loop audit evaluating template adherence at a public medical unit demonstrated that baseline parameter compliance rose from 35.8% to 90.2% following the mandatory introduction of a structured form (4). This principle extends directly to dermatology: an electronic SOAP template that structurally requires the completion of morphological and distributional fields before a chart can be archived changes documentation completeness from an act of individual motivation into a standard output of the workflow.

Quantitative and Qualitative Evidence for Ambient Scribing

Given that the intense volume-time constraints of Indian dermatology clinics mean practitioners cannot manually write comprehensive SOAP notes within highly compressed consultations, alternative text-entry mechanisms are required. Ambient clinical artificial intelligence involves software platforms that passively capture verbal physician-patient interaction via a microphone, apply natural language processing models to extract domain-specific entities, and automatically generate structured, domain-mapped draft notes for clinician review and electronic signature.

The international empirical data supporting ambient scribing has matured significantly. A multi-center randomized controlled trial evaluated automated generative ambient tools across 238 outpatient physicians representing 14 distinct medical specialties (5). The

intervention cohort utilizing fully automated ambient applications demonstrated a statistically significant 9.5% reduction in absolute note-writing duration compared directly to standard charting controls.

Furthermore, both automated intervention groups experienced improvements in validated professional burnout indices via the Mini-Z 2.0 scale and exhibited measurable drops in overall physician task load index scores (5). Parallel prospective tracking of large-scale enterprise ambient deployments has confirmed equivalent time-saving dividends and reduced cognitive fatigue (7,8).

From a qualitative perspective, a validation trial utilizing the Physician Documentation Quality Instrument (PDQI-9) across clinical encounters found that machine-generated ambient notes scored significantly higher than standard manual notes in overall information thoroughness ($p < 0.001$) and structural organization ($p = 0.03$), while manual notes retained superior scores for concise brevity and localized accuracy (6).

Crucially for dermatology, automated text generation models are prone to clinical hallucinations, which are plausible but ungrounded medical assertions. Binary error tracking within the PDQI-9 analysis detected clinically plausible hallucinations in 31% of machine-generated ambient notes, compared to a 20% baseline error rate in expert manual reference records, a statistically significant variation ($p = 0.01$) (6).

This finding demonstrates that automated SOAP notes are not final documentation products that can be archived without oversight. They function as highly structured drafts that require active clinician verification and refinement before integration into a patient's longitudinal record.

Operational Hurdles and the Audio-Visual Paradox

The principal objection to implementing ambient AI tools within Indian dermatology centers is well-founded: if automated note software generates clinical hallucinations in nearly one in three encounters, requiring detailed manual editing by the physician, the net efficiency gain may be insufficient to justify adoption within a compressed outpatient window. Large-scale trial data confirms that general-purpose large language models applied to dermatology routinely invent or misalign clinical data points that were never voiced during the live interaction (6).

The clinical safety and operational utility of any ambient tool depend entirely on the acoustic accuracy of speech recognition models handling localized accents, the domain specificity of the clinical entity extraction models when processing dense dermatological jargon, and the thoroughness of the physician's review before final electronic signing.

However, the alternative to this technology, which in current Indian practice means highly abbreviated, unstructured, or entirely absent documentation, carries a definitive patient safety cost. An isolated handwritten note consisting only of a diagnosis and a drug name, such as recording a tinea infection alongside an itraconazole prescription, fails to record basic morphological margins, distribution scales, corticosteroid exposure histories, or objective follow-up metrics. When an alternate physician or covering clinician reviews this brief record during a subsequent visit, clinical continuity is structurally broken.

The patient safety risks associated with incomplete charts are not hypothetical; they represent the baseline condition across the majority of high-volume dermatology clinics. A highly structured, machine-generated SOAP draft that can be verified and corrected by the consulting dermatologist in 60 to 90 seconds represents a clinically superior outcome to an absent or highly abbreviated record, even when

accounting for the baseline hallucination rates documented in the literature.

A major logical disconnect emerges, however, when evaluating ambient AI within a visual specialty like dermatology: an audio-based scribe is inherently blind and cannot see the patient's skin. If a dermatologist evaluates an atopic dermatitis patch or a psoriasis plaque silently during a brief encounter without explicitly vocalizing the physical findings, a passive microphone setup will capture absolutely nothing for the Objective portion of the note.

To bridge this fundamental audio-visual paradox and ensure safe clinical workflows, clinicians must adopt a deliberate "vocal examination" technique. This requires the practitioner to verbally narrate physical signs out loud during the active examination, stating the exact lesion morphology, dimensions, configuration, and laterality, thereby converting visual clinical data into an acoustic format that the ambient microphone can register. Alternatively, these systems must be technically bridged with multimodal photographic software interfaces capable of linking structured text directly to validated image-annotated datasets (12).

The feasibility constraint in India is also heavily shaped by linguistic variables. A broader analysis of the macro-technological evolution of clinical charting in India highlights that regional clinical dialogues are rarely conducted in formal, monolingual English, as observed in contemporary health informatics structural reviews. Contextualizing published speech recognition benchmarks, conversational automatic speech recognition (ASR) pipelines experience word error rates exceeding 21% when exposed to multi-language code-switched dialogues (9).

A word error rate of 21.77% means approximately one in five words is completely corrupted. This level of machine degradation is entirely incompatible with capturing highly precise anatomical markings, complex lesion vectors, and specific drug dosages required for safe dermatological diagnostics.

A real-world time-motion analysis at Singapore General Hospital demonstrated ambient scribe feasibility across multilingual Asian cohorts using English, Mandarin, and Malay dialogues (10). However, Tamil consultations were entirely unobserved during the active evaluation period despite residing within the platform's nominal capabilities, illustrating a persistent gap in clinical validation for South Asian speech profiles. Concurrently, bilingual technical configurations implemented in adjacent regions have highlighted operational realities outside monolingual baseline frameworks (11). An ambient documentation tool that cannot accurately process conversational regional medical dialogues cannot generate a reliable or safe dermatological SOAP note. This represents a quantifiable technical limitation that must be addressed through targeted, non-proprietary model training before wide-scale clinical adoption can occur.

A Targeted Action Plan for Indian Clinical Dermatology

Resolving the documentation deficit in Indian dermatology requires an integrated approach that goes beyond static electronic templates. A blank digital form inside an intense, high-velocity clinic results in the same incomplete recording behavior as a blank paper prescription slip. Addressing this crisis requires three converging actions:

- **Baseline Documentation Quality Auditing:** Academic dermatology departments must formally evaluate their current chart quality using validated assessment frameworks. The institutional chart auditing scoring methodology, previously deployed to benchmark clinical notes across tertiary medical centers, is directly applicable to outpatient dermatology clinics (4). Measuring

this baseline is a prerequisite to justify and guide institutional workflow changes.

- **Specialty-Specific Linguistic Training:** Technology developers building ambient tools for the Indian medical market must treat domain-specific, regional language speech processing as a core technical requirement framework, as highlighted in recent language engineering assessments (9). An ambient tool operating exclusively in standard English excludes the majority of public sector consultations. Developing and validating open-access language models optimized for conversational medical terminology is essential to accurately map regional code-switched dialogue into structured text.
- **Prospective Localized Field Trials:** Academic medical centers should prioritize prospective, local evaluation studies of ambient AI scribing within active dermatology clinics (10,11). Methodological blueprints can be drawn from international time-motion and bilingual prospective studies. What is required now is a field trial designed specifically around the parameters of an Indian dermatology OPD: 2-to-7-minute consultation speeds, conversational multi-language registers, hybrid paper-digital tracking systems, and direct clinical quantification of machine hallucination rates across common conditions like inflammatory dermatoses and superficial fungal infections.

The SOAP framework is a highly structured solution to a universal problem: the need to record clinical decision-making in a clear format that can be effectively utilized by other practitioners. Indian dermatologists encounter this challenge at a scale and velocity that makes comprehensive manual charting unfeasible. Automated ambient intelligence represents a practical technological path to achieve structured, complete clinical notes at high operational volume. Because the specific evidence base required to universally recommend these tools in local practice does not yet exist, building this validation data through focused field trials represents the immediate next step for the clinical community.

Declarations

- **Conflict of Interest:** [Omitted for peer review]
- **Funding:** [Omitted for peer review]
- **Author Contributions:** [Omitted for peer review]
- **Patient Consent:** Not applicable. This narrative review does not contain original case details or human subjects data.

References

1. Pandey A, Singh A, Singh S, Kumar A. Patient-doctor ratio across nine super speciality clinics in government hospital: a cross sectional study. Int J Community Med Public Health. 2019;6(10):4421-4425. doi:10.18203/2394-6040.ijcmph20194505.
2. Kaliyadan F, Venkitakrishnan S, Manoj J, Dharmaratnam AD. Electronic medical records in dermatology: practical implications. Indian J Dermatol Venereol Leprol. 2009;75(2):157-161. doi:10.4103/0378-6323.48661. PMID:19293503.
3. Podder V, Lew V, Ghassemzadeh S. SOAP Notes. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2024 [cited 2026 Jun 11]. Available from: https://www.ncbi.nlm.nih.gov/books/NBK482263/.
4. Aslam MA, Chhutani D, Kumar V, Mahapatra S, Aggarwal P. Adherence to guidelines in orthopaedic operation notes: a quality improvement initiative. Cureus. 2025 May 22;17(5):e84632. doi:10.7759/cureus.84632. PMID:40546492. PMCID:PMC12182270.

5. Lukac PJ, Turner W, Vangala S, Chin AT, Khalili J, Shih YT, et al. Ambient AI scribes in clinical practice: a randomized trial. NEJM AI. 2025;2(12):ai250100. doi:10.1056/AIoa2501000.
6. Han B, Barnes T, Reddy CD, Shin AY. Evaluating large language model–generated clinical summaries through a dual-perspective framework: retrospective observational study. JMIR AI. 2026 Feb 10;5:e85221. doi:10.2196/85221. PMID:41667124. PMCID:PMC12933168.
7. Morse J, Gilbert K, Shin K, Cooke R. A custom-built ambient scribe reduces cognitive load and documentation burden for telehealth clinicians. arXiv [Preprint]. 2025 [posted 2025 May]. arXiv:2507.17754. doi:10.48550/arXiv.2507.17754.
8. Razaghi M, Hafez A, Farina JM, Scalia IG, Pereyra M, Abdelfattah FE, et al. Transforming clinical documentation with ambient artificial intelligence (AI) scribes: a narrative review of technology, impact, and implementation. Cardiovasc Diagn Ther. 2026 Jan 19;16(1):11. doi:10.21037/cdt-2025-454. PMID:41815573. PMCID:PMC12973079.
9. Chadha HS, Shah P, Dhuriya A, Chhimwal N, Gupta A, Raghavan V. Code switched and code mixed speech recognition for Indic languages. arXiv [Preprint]. 2022 [posted 2022 Mar 30; updated 2022 Jun 13]. arXiv:2203.16578. doi:10.48550/arXiv.2203.16578.
10. Tan JYE, Mohammad Rafi IB, Sng GGR, Tung JYM, Lim DYZ, Ong JCL, et al. Impact of an ambient AI scribe among clinicians and patients: real-world prospective observational time-motion study. JMIR Med Inform. 2026;14:e85580. doi:10.2196/e85580.
11. Khan UT, Khan AT, Aljaadi W, Alhadlaq R, Baqashmer Z, Alsafi Y, et al. A bilingual Arabic-English ambient AI scribe for clinical documentation: prospective evaluation study. JMIR Med Inform. 2026;14:e83335. doi:10.2196/83335.
12. Madarkar SS, Madarkar M, Venkatesh M, Bansal D, Prakash T, Mopuri KR, et al. DermaCon-IN: a multi-concept annotated dermatological image dataset of Indian skin disorders for clinical AI research. arXiv [Preprint]. 2025. arXiv:2506.06099. doi:10.48550/arXiv.2506.06099.