FAP NextGen: Design of a Governance-Focused Digital Platform for Family Adoption Programme Documentation and Reflective Learning: A Viewpoint

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Abstract

Background: The Family Adoption Programme (FAP) engages Indian undergraduate medical students in longitudinal learning with allotted families. Published implementation surveys show wide variation between colleges in family allotment, visit scheduling, and supervision, and repeated calls for standardized documentation. **Material & Methods:** Approach: This is a viewpoint describing the design and development of a software artifact. It is not an intervention or outcome study. FAP NextGen was built through iterative, design-science-informed development, with features admitted only if they met four pre-specified criteria: regulatory necessity, mapping to a defined user role, governance requirement, and low-resource feasibility. Functional verification used invited **Result:** walkthroughs with faculty and student volunteers on fictitious records only. Design outputs: The platform couples longitudinal family-student documentation with a structured reflective cycle, faculty oversight, and consent, role-based access and audit logging as first-class features; an optional large-language-model scaffold is confined to formative writing guidance behind a safety filter. Walkthroughs confirmed that the specified workflows behaved as intended and prompted iterative correction. They were functional verification, not usability evaluation, and produced no metrics. **Conclusion:** What is offered here is an architecture, not an evaluated intervention. Independent usability, security, AI-validation, legal, and cost studies must precede any institutional adoption.

Keywords: Artificial intelligence, Ayushman Bharat Digital Mission, Competency-based medical education, Data governance, Digital health, Family Adoption Programme, Reflective learning.

Introduction

Background: The Family Adoption Programme (FAP) is now a defining longitudinal community-learning activity in Indian undergraduate medical education. The National Medical Commission (NMC) expects students to remain connected with allotted families, understand social determinants of health, and develop social responsibility through repeated community contact.[1] within the competency-based medical education (CBME) framework.[2] National education policy emphasizes experiential learning and digital readiness;[3] this maps onto CBME competencies in family diagnosis, communication, health education, and social accountability,[2] and onto calls for training tied to real health-system needs.[4]

Two problems are documented rather than assumed. First, a survey of 52 medical colleges found wide variation in family allotment (one to five families per student), visit scheduling, and supervision, with no standard record-keeping framework described;[5] commentary in this journal has called for mandatory faculty development to standardize implementation and data collection;[6] and faculty report that FAP adds to an already heavy workload.[7] Second, the weaknesses of paper logbooks-illegibility, loss, delayed review, weak longitudinal linkage, limited auditability are well described, as are the conditions under which electronic logbooks and portfolios support reflection.[8,9,10] What is not documented is any systematic Indian quantification of FAP documentation practice itself; claims about paper reliance are therefore inferences, and closing that gap is part of the rationale for a platform able to generate such data.

India's health system is meanwhile moving toward consent-based information exchange. WHO frames digital health as a health-system strengthening strategy,[11] the Ayushman Bharat Digital Mission (ABDM) gives medical colleges reason to train students in responsible digital workflows,[12] and the Digital Personal Data Protection Act, 2023 and ICMR ethical guidance require purpose limitation, consent, reasonable security safeguards, data minimization, and institutional accountability.[13,14]

This viewpoint sets out the design rationale, architecture, and governance model of FAP NextGen, and specifies how it should be evaluated.

Material & Methods

Design and Development Approach

This article is a viewpoint and design description, not an intervention or outcome study. It claims no demonstrated educational effectiveness and reports no field results from real students, patients, or families; all development and verification used fictitious accounts, family profiles, and visit records.

Development framework and feature-selection criteria

Development followed the design-science paradigm, in which a purposeful artifact is built and evaluated against a defined problem,[15] delivered in short iterative build-and-review cycles. No formal usability-engineering standard and no certified secure-development lifecycle were applied; that omission is a limitation, not a choice. The platform was conceived by the authors, who are Community Medicine faculty, and written by the corresponding author, with initial development from September to December 2025 and iteration since.

A feature was admitted only if it met all four pre-specified criteria: (i) required by NMC FAP or CBME documentation expectations;[1,2] (ii) mapped to a defined task of one of four user roles - student, faculty mentor, department administrator, institutional reviewer; (iii) necessary for consent, access control, or auditability under the Act;[13] and (iv) implementable on modest devices and intermittent connectivity. Features failing any criterion, such as gamification and peer-visible feeds, were deferred, and a module entered verification only when its core functions were complete and internally consistent. Educational functions were aligned with situated learning, so that students act as supervised participants rather than record keepers.[16]

Reflective learning and the artificial intelligence component

Students describe the encounter, examine why it matters, identify social and behavioral determinants, and prepare an action plan, following Gibbs' reflective cycle and later work on reflection in medical education,[8,17] implemented as discrete fields rather than one free-text box.

The platform trains and hosts no bespoke medical model. It calls general-purpose large language models through a provider-agnostic adapter currently OpenAI GPT-4o mini and GPT-4.1 mini, Anthropic Claude 3.5 Haiku and Claude 3.7 Sonnet, and Google Gemini 1.5 Flash and Pro. Selection rested not on comparative medical benchmarking, which was not performed, but on four deployment criteria: a documented commercial API supporting a data-processing agreement; an inexpensive small-model tier affordable at student scale; acceptable handling of Indian English and code-mixed text; and at least two independent vendors, so an institution is not locked in. Model choice is a configuration setting. Formative feedback on student writing is the use case for which an evidence base is accumulating.[18,19]

On data protection, the model receives only the student's own draft with a fixed role-scoped system prompt; family names, addresses, contact numbers, household identifiers, and any ABHA identifiers sit in separate database fields and never enter the prompt payload. Requests are proxied through an authenticated server-side function, so provider keys remain institution-held and are never exposed in the browser. No prompt or completion is written to the record tables; only a non-content audit entry-role, timestamp, model, outcome is retained. Residual risk remains, because a student may type an identifier into free text; automated pre-transmission redaction is planned, and until it ships the controls are instruction, faculty review, and the option to disable the feature. Beyond that boundary, retention and logging follow each provider's API terms, which an institution must bind through a data-processing agreement before deployment-a layer outside institutional control, stated as a limitation, consistent with WHO guidance on large multi-modal models in health.[20]

Three safeguards operate at the output boundary: a deterministic filter blocks definitive-diagnosis phrasing before display, every output carries a fixed non-diagnostic disclaimer, and the model cannot finalize, grade, or act autonomously. These are structural containment measures and must not be read as evidence of clinical safety: the filter is pattern-based, unvalidated, and will not detect plausible but incorrect content. Hallucination and automation bias- which persist even among clinicians trained in AI literacy.[21] Over-reliance and substitution of generated text for the student's own thinking are real risks, mitigated here only by keeping output formative, faculty-visible, and labeled. Accuracy, bias, and language-suitability benchmarking is outstanding.

Technical architecture, data governance, and ethics

FAP NextGen is a progressive web application over a managed PostgreSQL backend. Authentication uses email-and-password sign-in with signed session tokens; authorization is enforced at the database layer through row-level security policies keyed to role and assignment, so scoping cannot be bypassed from the client. Traffic is TLS-encrypted in transit and the platform provides encryption at rest. Activity is written to append-only audit tables, and administrative export is a separate, logged privilege. Backup and restore follow a documented runbook combining scheduled managed backups with versioned logical dumps, rehearsed on a staging database. Data reside in the cloud region selected at project creation; a deploying institution should select an Indian region and record residency in its privacy notice. Fields are structured so that HL7 FHIR mapping is feasible,[22] but ABDM and FHIR support is design readiness only: no gateway credentials have been obtained and no exchange performed. Table 1 summarizes these layers and controls; Figure 1 shows the governed data flow.

Table 1. Architecture and capability matrix for FAP NextGen

Layer	Core capability	Technology / governance control	Intended educational or public-health gain (untested)
Student field workflow	Family allotment, visit entry, risk documentation, follow-up plan	Responsive web forms, validati on rules, longitudinal record linking, offline - tolerant progressive web app	Continuity of learning and standardized FAP documentation
Reflective learning	Structured Gibbs-based reflection with optional formative AI prompts	Role-scoped prompts, rule-based output filter, non - diagnostic disclaimer, faculty visibility, feature can be disabled	Supports reasoning about social determinants and action planning
Faculty supervision	Review dashboard, feedback, completion tracking	Role-based faculty views, audit trail	Timelier mentoring and batch-level academic monitoring
Data protection	Consent, privacy notice, access control, export control	Database-level row-level security, TLS in transit, encryption at rest, append -only audit tables, logged administrative export, documented backup and restore runbook	Auditable institutional data governance
Interoperability readiness	Planned mapping to ABDM and HL7 FHIR structures	Standards-aware field design; no gateway credentials, no exchange performed	Design readiness

Note: ABDM: Ayushman Bharat Digital Mission; AI: artificial intelligence; FHIR: Fast Healthcare Interoperability Resources; TLS: transport layer security. Gains in the final

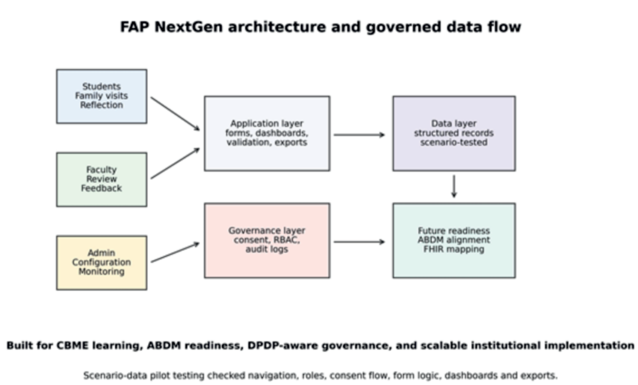

Figure 1. FAP NextGen architecture and governed data flow

Figure-1 shows how student, faculty, and administrator workflows connect with the application, governance, and data layers. The architecture is designed for CBME learning, planned ABDM readiness, consent- and audit-based governance under the Digital Personal Data Protection Act, 2023, and future FHIR mapping. No live ABDM or FHIR exchange has been implemented. ABDM: Ayushman Bharat Digital Mission; CBME: competency-based medical education; FHIR: Fast Healthcare Interoperability Resources.

Governance derives from the Act and ICMR guidance.[13,14] No independent legal review and no Data Protection Impact Assessment have been carried out; both are prerequisites before deployment. Because this work used only fictitious records and involved no human participants, it did not require research-ethics approval; ethics approval or waiver and informed consent will be obtained before any evaluation with real participants.

Functional verification with faculty and student volunteers

Verification was functional, not evaluative: it asked whether the software did what had been specified, not whether users found it usable; usability evaluation is deferred to the studies proposed below. Participants were purposively invited: approximately five Community Medicine faculty, including those coordinating FAP, and more than fifteen student volunteers who had completed at least one FAP posting, across at least six sessions between January and June 2026.

Scenarios were written before testing by working backwards from the four role workflows: for each role, the expected sequence of screens and end state were specified, one scenario per workflow branch, plus deliberate error paths (incomplete forms, access attempted outside assignment, duplicate visits). Each carried a pre-stated pass condition: whether repeated visits stayed linked to the correct family and student, whether role boundaries held, whether incomplete entries were detected, whether consent was recorded, and whether dashboards and exports returned the intended views. Issues found, including form-validation gaps, role-scoping edge cases, and consent-capture wording, were logged, corrected, and re-checked. No failure rates, task times, or usability scores were collected. Because the developer helped run these sessions, the findings carry evaluator bias and are developer-observed rather than independently confirmed.

Results

Design Outputs and Verification Findings

The outputs are design artifacts and verification findings, not measured educational outcomes. For household and visit documentation, verification confirmed that repeated visits stayed linked to the correct family and student account, and prompted tighter form validation. For guided reflection, it confirmed that incomplete reflections and missing visit details were detected and returned to the student. Faculty dashboards returned the expected views of progress, feedback, and pending entries.

Role scoping was a specific focus: verification confirmed that a student reached only assigned families, faculty only assigned student work, and administrators only aggregated or need-based views, with consent capture and export logging behaving as specified. Interoperability remains design-level only; no exchange with any external system has been attempted.

Discussion

FAP NextGen is best understood not as the digitization of a paper logbook but as an attempt to digitalize the educational process around it. Everything that follows is plausible rather than demonstrated: each proposition is a hypothesis for evaluation.

The first hypothesized gain is continuity: a structured longitudinal record could hold family history, follow-up plans, risk factors, feedback, and reflections together, instead of leaving continuity to student discipline and periodic checking. The second is supervised digital-health readiness, in which students meet digital identity, consent, longitudinal records, and data stewardship through supervised community work rather than abstract theory.[23] The third is institutional visibility: dashboards could surface incomplete documentation and delayed follow-up, and aggregated indicators could support program monitoring without exposing unnecessary personal detail, which may matter most where implementation varies widely.[5,6] The fourth is governance readiness though features alone do not create compliance, and each institution must still define its data-fiduciary role, retention policy, grievance process, and breach-response pathway.

Table 2 sets out how FAP NextGen differs from the alternatives in current use. Each solves part of the problem offline familiarity, submission and feedback, or speed of setup but none combines repeated family-visit linkage with role separation, consent capture, and auditability.[8-10] What distinguishes FAP NextGen is architectural integration rather than novelty in any single feature, and that remains an untested design advantage.

Table 2. How FAP NextGen compares with existing FAP documentation approaches

Feature	Paper FAP logbook	Generic LMS/ e-portfolio	Spreadsheet/ online forms	FAP NextGen
Purpose -built for FAP tasks	No	No	No	Yes
Longitudinal family–student linkage	Manual	Limited	Manual	Built-in
Structured reflective cycle (Gibbs)	No	Partial	No	Built-in
Formative AI scaffold with output filter	No	No	No	Yes (unvalidated)
Faculty supervision dashboard	No	Partial	No	Yes
Role-based access, consent, audit logging	No	Partial	No	Yes
ABDM / HL7 FHIR mapping	No	No	No	Planned; not demonstrated
Offline / low-resource support	Inherent	Varies	Varies	Progressive web app (in development)
Indicative cost	Low	License-dependent	Low	Not yet evaluated

Note: ABDM: Ayushman Bharat Digital Mission; AI: artificial intelligence; FHIR: Fast Healthcare

Interoperability Resources; LMS: learning-management system. Entries describe typical capability rather than any single named product; "Partial" indicates achievable only with substantial configuration. The FAP NextGen column records design status, not demonstrated superiority.

The possible harms deserve equal weight. A digital-first workflow can exclude students and families with poor connectivity, shared or low-specification devices, or limited digital literacy, disadvantaging exactly the households FAP is meant to reach. Structured forms can increase documentation burden rather than reduce it, and dashboards can shift work onto mentors who already report strain.[7] An AI scaffold can foster dependence, flatten the student's voice, and, through automation bias, be accepted uncritically.[21] Centralizing family-level data also raises the consequences of a breach well above those of a departmental paper logbook. Each should be measured, not assumed away.

Limitations

Verification was small, informal, and functional; it involved a purposive volunteer group in a single institution and generated no quantitative data. The corresponding author both wrote the software and helped run the walkthroughs, so building and judging the system were not independent activities; this dual role is a recognized source of evaluator bias, and the findings should be read as developer-observed rather than independently confirmed. No independent usability testing, security or penetration assessment, or validation of the AI component has been performed, and legal review and a Data Protection Impact Assessment remain outstanding. The platform has not been used with real students, faculty, families, or patients under ethics approval, so no claim can be made about reflection depth, competency, empathy, faculty workload, or public-health surveillance. Device availability, internet reliability, electricity, language support, procurement, training, and long-term maintenance will differ substantially between colleges, and feasibility shown in one setting will not transfer automatically to another.

Future Research Agenda

Evaluation should proceed in three stages with pre-specified primary outcomes. Phase 1, a single-center mixed-methods usability study run by evaluators independent of the development team, should take the System Usability Scale score as its primary outcome, with task completion, time on task, and think-aloud interviews as secondary. Phase 2, a cluster-randomized or stepped-wedge comparison of digital and paper workflows allocated by batch, should take documentation completeness as its primary outcome, with feedback turnaround time and blinded ratings of reflective-writing quality as secondary. Phase 3, a multicenter implementation study, should take sustained adoption as its primary outcome alongside cost per student, faculty time, family acceptability, and equity of access.

The AI component requires a study of its own: blinded expert rating of output accuracy and appropriateness, bias and language-suitability testing across English and regional languages, and measurement of student over-reliance, for example by comparing reflections drafted with and without the scaffold. An independent cybersecurity and privacy assessment should precede field implementation. Observational phases should follow STROBE and randomized phases CONSORT; these are cited specifically as the reporting standards the proposed studies would be held to.[24,25]

Conclusion

FAP NextGen is presented as a design, not as an effective or deployment-ready product. Its contribution is an architecture in which longitudinal FAP documentation, structured reflection, faculty oversight, and consent-based governance are integrated rather than bolted together. Whether that architecture improves learning, supervision, or governance is unknown. Independent usability, effectiveness, security, and AI-validation studies, cost analysis, legal review, and a Data Protection Impact Assessment are required first.

Declarations

Acknowledgment: The authors thank the Community Medicine faculty and student volunteers of Shridevi Institute of Medical Sciences & Research Hospital who gave their time to the functional walkthroughs described in this article.

Ethics approval and consent to participate: This manuscript describes a digital architecture and informal functional verification using fictitious records. It does not report data from real human participants, patients, students, or families, and therefore did not require research-ethics approval. Before any real-world implementation or evaluation, institutional ethics committee approval or waiver and appropriate informed consent will be obtained in accordance with ICMR guidance, the Digital Personal Data Protection Act, 2023, and local institutional policy, and an independent legal review and Data Protection Impact Assessment will be completed.

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Conflicts of interest: The authors declare no conflicts of interest. The corresponding author developed the software described and also participated in its functional verification; this dual role is reported in the Limitations.

Clinical trial registration: Not applicable.

Data availability: Data sharing is not applicable because no real-participant dataset was generated or analyzed for this manuscript.

Software and code availability: FAP NextGen is available as a live web application at https://fap-nextgen-app.vercel.app/. Source code and technical material are available at https://github.com/hssling/FAP_NextGen. The platform is under active development and testing.

Recognition: The FAP NextGen prototype received third prize in the AI for All - India's Open Data and AI-Readiness Challenge, organized by Factly in collaboration with Meta and IndiaAI. This is reported as innovation recognition and not as evidence of educational effectiveness.

Use of artificial intelligence: Two distinct uses should be separated. Within the platform, configurable general-purpose large language models provide formative, faculty-supervised reflection prompts, as described in the Design and Development Approach. Separately, generative AI tools assisted with language editing, restructuring, formatting, and preparation of submission assets for this manuscript. The authors reviewed, verified, and approved all content and remain responsible for the final manuscript.

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