India Consumer Health Data Aggregator — Product Research Report and Playbook

Version 1.1 (research edition of Playbook v1.0) · 21 October 2026

Contents

Section	Title
—	Document control and verification status
1	Executive Summary
2	Market Opportunity and Product Thesis
3	India Health Data Landscape
4	Source-by-Source Data Map
5	ABDM and Consent Architecture
6	Unified Individual Health Graph
7	User Journeys and Experience Design
8	Insight and Summary Engine
9	Trust, Safety, Privacy, and Compliance
10	Technical Architecture
11	MVP Scope and Roadmap
12	Build vs Partner Decisions
13	Key Risks and Mitigations
14	Open Questions and Validation Plan
15	Appendix: A Source register · B Verification checklist · C Standards · D FHIR examples (corrected) · E Glossary

Document control and verification status

Item	Detail
Purpose	Working reference for product, engineering, clinical and compliance teams building a consent-based consumer health data aggregator ("Individual Health Data Aggregator") in India
Builds on	*India Consumer Health Data Aggregator Playbook v1.0* (21 Oct 2026). This edition restructures it into the requested 15-section report, adds the source-by-source data map, graph model, journeys and insight engine, and corrects several technical points (see box below).
Audience	Founders, PMs, solution architects, ABDM integration engineers, clinical safety officer, DPO/compliance counsel
Citation convention	[S#] refers to the Source Register in Appendix A.

Verification status — read before relying on this document. Live web access was **not available** when this edition was prepared: search, page fetch and general network calls all failed. The one exception was **GitHub**, which let the team read NHA's own public repositories (**NHA-ABDM/NHCX** and **NHA-ABDM/ABDM-wrapper**). Facts confirmed from those repositories are labelled **V** (verified in-session from an official NHA source). Other sources are labelled: **A** = URL supplied in the v1.0 playbook (author-supplied, not re-checked); **K** = official source named from the research team's knowledge (URL or document title to be confirmed). Claims that are time-sensitive or uncertain are marked ⚠️ **Validate** in the text. Appendix B lists them as a verification checklist. Before any external, investor, regulatory or compliance use, the checklist must be cleared against the primary source, and legal advice must be obtained on the regulatory items. All `[web:N]` placeholders from v1.0 have been removed. They were not resolvable citations.

Material corrections to Playbook v1.0 made in this edition

1. **Who plays the AA role.** In the Account Aggregator analogy, ABDM's **Consent Manager (HIE-CM)** plays the AA role: a consent conduit. The consumer aggregator plays the **FIU / personal-finance-app** role. It stores and analyses data, so it is a full **Data Fiduciary** under DPDP, not a "data-blind" conduit (§5.1).
2. **NHCX is a provider ↔ payer exchange.** Its participants are hospitals, insurers, TPAs and schemes. NHA's NHCX participant APIs list only **PAYER, PROVIDER and TPA** roles [S59]. A consumer app cannot simply "integrate with NHCX" to pull eligibility or claim status. Consumer claims data in the MVP must come from **document ingestion and insurer/TPA/employer partnerships**. NHCX becomes relevant through a provider-SaaS line, payer partnerships, or the NHCX **ABHA ↔ policy linking** capability (§3.4, §4.2).
3. **The consumer app should integrate as an ABDM PHR app as well as an HIU.** Users discover, link and pull their own records through the PHR / consent-manager-facing flows (purpose *self-requested*, `PATRQT`). The HIU consent-request flow is used for other purposes, such as a clinician view (§5.3) ⚠️ **Validate**.
4. **Use ABDM purpose codes and health-information types.** Free-text purposes such as `chronic_care_management` are replaced with ABDM purpose codes (e.g. `CAREMGT`, `PATRQT`) and HI types (e.g. `DiagnosticReport`, `Prescription`) (§5.4).
5. **Consent approval is asynchronous.** The v1.0 pseudocode fetched the consent artifact immediately after the request. In ABDM, approval arrives later by callback. The flow in §10.2–10.3 is corrected.
6. **FHIR coding errors fixed** (Appendix D). The discharge summary used LOINC 34117-2 ("History and physical note"); a discharge summary is **18842-5**. The lab DiagnosticReport code (comprehensive metabolic panel) did not match its HbA1c result.
7. **Terminology.** "PHI" is a US HIPAA term. This edition uses *personal health data* and *health data of a Data Principal* in line with DPDP.
8. **Licensing trigger.** Policy-renewal or product recommendations may trigger **IRDAI intermediary licensing** (§9.6, §12, §13).
9. **Provider cohort analytics moved to Phase 2.** Cohort analytics need a separate consent purpose and a provider-side legal basis. The MVP offers consumer-initiated, time-bound **"share with my doctor"** instead (§11).

1. Executive Summary

The problem. An Indian family's health data is scattered. There are paper and PDF lab reports on WhatsApp, prescriptions photographed on phones, discharge summaries in email, insurance policy schedules and e-cards from employers and retail insurers, TPA claim letters, pharmacy invoices from e-pharmacies, and step and sleep data locked in wearables. Out-of-pocket spending remains a large share of health expenditure: roughly two-fifths in recent National Health Accounts estimates [S41] ⚠️ **Validate latest figure**. The burden of diabetes and hypertension is very large: ICMR-INDIAB estimated about 101 million people with diabetes and about 315 million with hypertension [S40]. People pay for, carry and re-explain their health history at every encounter.

The opportunity. India now has public digital rails that make a consent-first aggregator buildable:

- **ABHA**: health identity and addressability.
- **ABDM's HIE-CM and Gateway**: consent-based discovery, linking and exchange between Health Information Providers (HIPs) and Health Information Users (HIUs), with **no central record repository** [S1][S2].
- **NRCES FHIR R4 profiles**: standard record formats [S6].
- **NHCX**: provider ↔ payer claims [S7][S8].
- **UHI**: discovery and booking [S13].
- **DPDP Act 2023 and DPDP Rules 2025**: the privacy baseline [S11][S12].

What to build. A **consumer-first "Health + Insurance Wallet"** that:

1. joins ABDM as a **PHR app + HIU** (and optionally an HIP for re-sharing user-uploaded records);
2. ingests the documents Indians actually hold (lab PDFs, prescriptions, discharge summaries, policy schedules, claim letters, pharmacy invoices) through **upload, camera, email-forward and WhatsApp-forward** channels with document AI and human-in-the-loop confirmation;
3. reads wearable data **on-device** through **Google Health Connect and Apple HealthKit**, rather than integrating dozens of vendor clouds;
4. normalizes everything into a **longitudinal Individual Health Graph**, where every fact carries provenance, consent ID and a trust tier (*verified clinical / document-derived / device-measured / user-entered / inferred / reference knowledge*);
5. produces a **Health Financial + Clinical Snapshot**: timeline, active problems and medicines, care gaps, trends, coverage and exclusions, waiting periods, claims, and net out-of-pocket spend. Insights are framed as decision support, never diagnosis.

What not to build. No scraping of hospital, insurer, pharmacy or app portals. No credential-sharing "screen-scraper" integrations. No unconsented secondary use. No individual-level data sales. No autonomous diagnosis or prescribing.

Top recommendations

#	Recommendation	Why
1	Lead with **document intelligence + ABDM PHR/HIU**, not ABDM alone	Many Indian records are still paper/PDF, and structured FHIR coverage from HIPs is uneven ⚠️ **Validate**. Documents deliver value on day one.
2	Make **insurance clarity** the paid wedge (coverage, waiting periods, exclusions, claim tracking, OOP spend)	The pain point is acute and money-linked. The IRDAI Customer Information Sheet gives a parseable structure [S18] ⚠️ **Validate**. It is differentiated from pure PHR apps.
3	Design for the **family** from day one (caregiver/proxy, minors, elderly parents)	Indian health decisions are family-led. DPDP has specific rules for children and for persons with disability [S11][S12].
4	Treat **consent as a product surface**, not a legal page	Trust is the moat. DPDP consent must be free, specific, informed, unconditional and unambiguous, with easy withdrawal [S11].
5	Build a **clinical safety case** before launching any risk flag	Telemedicine guidelines bar AI from counselling or prescribing [S21]. Software that drives clinical decisions may be a

#	Recommendation	Why
		medical device [S22] ⚠️ **Validate**.
6	Get **regulatory opinions early** on four points: IRDAI intermediary status, CDSCO SaMD classification, DPDP Significant Data Fiduciary exposure, ABDM HDM Policy retention	These decide product scope, not only paperwork.

DPDP timing note. The DPDP Rules 2025 were notified in November 2025 with phased commencement. As understood by the research team, Consent Manager provisions commence about 12 months after notification and most Data Fiduciary obligations about 18 months after (around May 2027) [S12] ⚠️ **Validate**. Build to the full standard now. The MVP will be in market as the obligations take effect.

2. Market Opportunity and Product Thesis

2.1 Demand drivers (India-specific)

Driver	Evidence (cite and validate)	Product implication
High out-of-pocket (OOP) spending	National Health Accounts estimates show OOP at roughly 39–40% of total health expenditure for 2021-22 [S41] ⚠️ **Validate latest NHA release**	Spend tracking and "net OOP after reimbursement" are meaningful features, not vanity metrics
Heavy NCD burden	ICMR-INDIAB (Lancet Diabetes & Endocrinology, 2023): about 101 M diabetes, about 136 M prediabetes, about 315 M hypertension [S40]	Chronic-care tracking (HbA1c, BP, lipids, weight) is the clinical anchor use case
Fragmented, paper-heavy records	ABDM exists because records sit with each provider; many reports are still issued as PDF/paper (industry observation) ⚠️ **Validate with pilot data**	Document AI is a core capability, not a fallback
Insurance complexity	Waiting periods, sub-limits, room-rent caps, co-pays, exclusions; IRDAI 2024 reforms on cashless timelines, PED waiting periods and the Customer Information Sheet [S18][S19] ⚠️ **Validate**	A "Am I covered?" explainer and claim tracker address real anxiety
Large public insurance base	PM-JAY covers about 12 crore families (about 55 crore people); extended in 2024 to all citizens aged 70+ (Ayushman Vay Vandana) [S43] ⚠️ **Validate**	Support PM-JAY entitlement awareness. Do not overpromise data access.
Digital public infrastructure	ABHA counts in the high tens of crores and tens of crores of linked records reported by PIB/ABDM dashboards [S14] ⚠️ **Validate current dashboard figures**	ABHA linking is a realistic onboarding step for many users. Linked-record depth varies widely.
Smartphone-first, multilingual users	22 scheduled languages; most new internet users prefer Indian languages (industry reports) ⚠️ **Validate**	Vernacular UI, voice and read-aloud summaries; Bhashini as a partner option [S58]
Family-led decisions	Caregivers (often adult children) manage elderly parents' care and insurance	Proxy/caregiver model with separate consent per family member

2.2 Target users and jobs-to-be-done

Segment	Primary job	Wedge feature	Willingness to pay (hypothesis)
Urban salaried individual (25–45)	"Keep my records and my company + personal insurance in one place"	Insurance wallet + document vault	Low–medium; prefers free with premium add-ons
Family caregiver (managing parents/children)	"Know my parents' medicines, reports, policy and what is covered before an admission"	Family profiles, medicine list, pre-admission checklist	**Highest**; buys a family plan
Chronic-condition patient (diabetes, hypertension, thyroid, cardiac)	"See whether I'm improving and never miss a test"	Trends, care-gap reminders, doctor-share	Medium; high retention
Employer HR / benefits platform	"Reduce claim friction and support preventive care"	Group policy explainer, claims assistance	B2B contract
Clinician (consented view)	"See the history in 30 seconds"	Time-bound patient-shared summary	Indirect (drives consumer value)
Insurer / TPA	"Get complete documents first time; engage members"	Pre-submission document completeness	B2B, later phase

2.3 Competitive landscape (positioning, not a market census)

Categories below are described from public positioning known to the research team. **Every player's ABDM integration status, features and traction must be validated** against the ABDM integrator list and company sources [S14] ⚠️ **Validate**.

Category	Examples	What they do well	Gap this product fills
Government PHR	ABHA app (NHA), Aarogya Setu PHR features	ABHA creation, linking, consent approval	Limited insights, insurance and family-finance view
Private ABDM PHR apps	e.g. Eka Care, DRiefcase, Bajaj Finserv Health (reported ABDM integrations)	Record vault, ABHA flows, some vitals	Insurance clarity, OOP spend, cross-domain graph
E-health marketplaces	Practo, Tata 1mg, PharmEasy, Apollo 24/7	Consults, pharmacy, diagnostics, own-service records	Data siloed to own services; commercial bias
Wellness/chronic-care	HealthifyMe, Ultrahuman, diabetes programmes (e.g. Sugar.fit, Fitterfly, BeatO)	Engagement, coaching, devices	Clinical records and insurance absent or thin
Insurance distribution/advice	Policybazaar, Ditto, Beshak and others	Policy comparison and advisory	Not a health record; regulated distribution model
Employer benefits/TPA apps	Plum, Loop, Onsurity; TPA apps such as Medi Assist	Group e-cards, claim intimation	Only their own policy; no clinical view

Positioning statement: *"The neutral, consent-first wallet that joins your medical records and your health money, for your whole family."* Neutrality is a design constraint (§2.5, §9.6). Marketplace revenue must never shape clinical or coverage insights.

2.4 Product thesis and core user promise

"One secure place for my family's health: records, medicines, tests, fitness, diet, insurance, claims and out-of-pocket spend — under my control."

1. See one timeline across providers and sources, each item labelled with where it came from.
2. Understand active conditions, medicines, allergies, vaccinations and due tests (care gaps).
3. Track vitals, activity, sleep, nutrition and chronic-condition trends.
4. Know what is covered, excluded, waiting-period restricted, or likely to need pre-authorisation, with the policy clause cited.
5. Track claims, reimbursements, rejections and net out-of-pocket spend.
6. Control who sees what, for what purpose and for how long, and withdraw at any time.

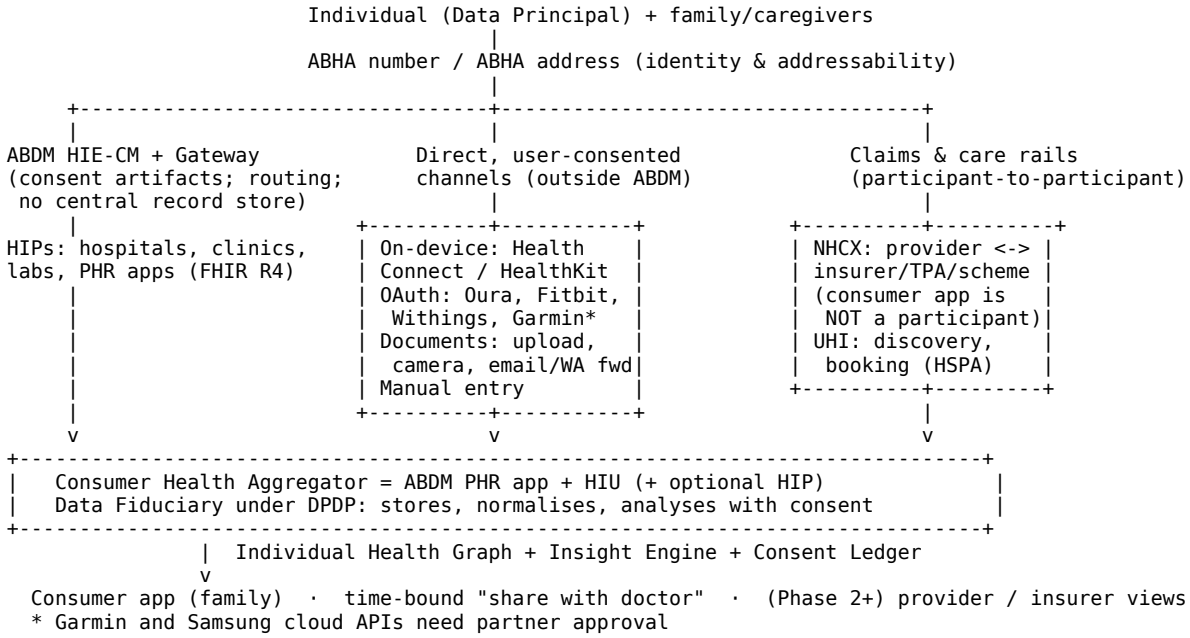
2.5 Monetization (carried forward from v1.0, with guardrails)

Segment	Primary model	Secondary model	Guardrail
Consumers	Freemium: free vault + ABHA; Premium (AI summaries, insurance intelligence, trends)	**Family plan** (likely the strongest converter, to be validated)	No paywall on consent withdrawal, data export or deletion; no dark patterns in upgrade flows [S45]
Employers	Annual benefits-navigation contract, per-employee pricing	Wellness/preventive modules	Employer sees **only aggregated, de-identified** metrics; never individual records
Insurers / TPAs	Document-completeness and member-engagement platform fee	Per-claim workflow pricing	Member data only with member's specific consent; no underwriting use without separate explicit consent and legal review
Providers (Phase 2+)	SaaS for patient-shared summaries and care-gap lists	Usage-based document AI	Consent-scoped; clinician remains decision-maker
Diagnostics / pharmacy	Referral or fulfilment fee	Co-branded preventive packages	Disclose conflicts; recommendations ranked by clinical need, never by commission
Data products	Aggregated, de-identified, consented analytics only	—	**No individual-level data sales, ever.** Research use requires separate consent and ethics review [S44]

Insurance-specific warning. Showing a user's own coverage is information service. **Recommending, comparing or facilitating purchase or renewal of insurance products** may require registration as an IRDAI-regulated intermediary (e.g. insurance web aggregator, corporate agent or broker) [S47] ⚠️ **Validate with insurance counsel before launching any "renew/upgrade" CTA**.

3. India Health Data Landscape

3.1 Ecosystem map (corrected)



3.2 Component roles

Component	Role	Relevance to the aggregator	Source
ABHA number	14-digit health ID, created via Aadhaar or other supported verification (e.g. mobile/driving licence) ⚠️ **Validate current methods**	Identity anchor for ABDM linking; not a record store	[S1][S2][S14]
ABHA address	Human-readable handle (e.g. `name@abdm`) used for consent and sharing	Primary key for ABDM consent; a user may hold more than one	[S1][S2]
HIP	Health Information Provider: hospital, clinic, lab, PHR app holding records and publishing care contexts	Source of verified clinical records	[S1]
HIU	Health Information User: requests records with a valid consent artifact	The aggregator, for consent-based pulls	[S1][S4]
PHR app	Patient-facing app: ABHA creation, care-context discovery and linking, consent approval, self-requested record access	The aggregator's consumer integration mode	[S2][S5] ⚠️ **Validate PHR-app API scope**
HIE-CM	Health Information Exchange–Consent Manager: creates, stores and enforces consent artifacts	Plays the AA-equivalent role; operated within ABDM today ⚠️ **Validate whether third-party CMs are permitted**	[S2][S5]
Gateway	Routes discovery, consent and data-flow messages between CM, HIP and HIU	All ABDM calls go through it	[S2][S5]
HFR / HPR	Health Facility Registry / Healthcare Professionals Registry	Verify the facility and clinician on a record; build the provider directory	[S2]
NHCX	National Health Claims Exchange for eligibility, pre-auth, claims and	Not directly accessible to a consumer app; see §3.4	[S7][S8][S59]

Component	Role	Relevance to the aggregator	Source
	communications between providers and payers (roles PAYER/PROVIDER/TPA)		
UHI	Open protocol for discovery, booking, fulfilment and follow-up (EUA ↔ HSPA)	Later-phase booking for care gaps	[S13]
NRCES	National Resource Centre for EHR Standards: publishes the ABDM FHIR R4 IG; SNOMED CT National Release Centre for India	Normalization target; terminology licence	[S6][S17][S50]

3.3 What a consumer aggregator can and cannot access

Data	Can access?	Condition / mechanism
Records at ABDM-integrated HIPs linked to the user's ABHA	**Yes**	User discovers/links care contexts and approves consent; data pushed encrypted to the aggregator's endpoint [S1][S4]
Records at providers **not** integrated with ABDM	**Only via the user**	User uploads, photographs or forwards documents; the provider can be invited to onboard as an HIP
Hospital/lab/insurer/pharmacy portals via the user's password ("screen-scraping")	**No**	Prohibited by this design. It violates platform terms and risks unauthorized access under the IT Act; it also undermines consent and auditability.
ABDM "central database"	**Does not exist**	ABDM is federated. Records stay with HIPs [S1][S2].
Insurance claim status via NHCX	**Not directly**	NHCX participants are providers and payers; consumer access needs a payer/TPA partnership or a future consumer rail ⚠️ **Validate**
Insurance policy data via the RBI Account Aggregator	**Possibly**	Insurance is an FIP category in the AA framework, but live insurance data flows are limited ⚠️ **Validate**. The aggregator would need to be an FIU [S9][S10][S46].
Wearable data	**Yes**	On-device (Health Connect/HealthKit) with OS permission, or vendor OAuth where available
Pharmacy orders/invoices	**Via the user**	No consumer APIs from major e-pharmacies (assumed; ⚠️ **Validate**). Use invoice upload or email-forward.
Mental-health notes from therapists	**Only with explicit, separate consent**	Higher confidentiality expectation under the Mental Healthcare Act 2017 [S23]

3.4 NHCX: what it is and is not for this product

- NHCX standardizes **eligibility checks, pre-authorisation, claim submission, queries and settlement communications** between **providers and payers (insurers, TPAs, government schemes)** using FHIR-based bundles [S7][S8]. IRDAI directed insurers to onboard NHCX ⚠️ **Validate circular reference and current onboarding counts**.
- **Verified from NHA's NHCX repository** [S59]:
  - The participant-list API accepts the roles **PAYER | PROVIDER | TPA**. Onboarding requires HFR registration and **ABDM M1** (ABHA creation/verification) integration.
  - Payloads are **JWE-encrypted (RFC 7516)**.
  - Use-case APIs include `coverageeligibility/check`, `preauth/submit`, `claim/submit`, `predetermination/submit`, `communication/request`, `paymentnotice/request`, `insuranceplan/request`, `task/submit` and `status`. All are asynchronous request/`on_` callback pairs.
  - Sandbox exit includes **NRCeS FHIR bundle validation** and a demo to NRCeS, IRDAI and NHA teams.
  - **A consumer PHR is not a participant role.**

- **Notable:** the NHCX participant service also exposes **“Link ABHA to policy”, “Get Policies” (by ABHA number, member ID or mobile) and “Delink ABHA”** APIs [S59]. A payer or TPA calls these to associate a member’s policies with their ABHA. This is the most promising **future** rail for a consumer wallet to discover a user’s policies. Today it is callable only by NHCX participants, and no consumer-facing access path is documented ⚠️ **Validate with NHA whether PHR/consumer access to ABHA-linked policies is planned**.
- **Implications:**
    1. In the MVP, consumer claims data comes from **claim documents** (intimation, query letters, settlement/rejection letters, discharge bills) and the **user’s own status updates**.
    2. In Phase 2, pursue **payer/TPA partnerships** to push claim-status events to the member’s wallet with the member’s consent.
    3. In Phase 3, if the company runs provider SaaS, it can take part in NHCX **as the provider’s technology partner**, and claim data then flows to the patient with consent.
    4. Normalize claim and policy documents to the NRCES/NHCX FHIR profiles (Claim, ClaimResponse, Coverage, InsurancePlan) so the move to rails needs no re-modelling [S6][S7].

3.5 Integration pathways summary

Capability	MVP pathway	Later pathway	Standard
Clinical history, labs, prescriptions, discharge summaries	ABDM PHR + HIU; document upload	More HIPs onboarded; provider partnerships	NRCES FHIR R4 [S6]
Linking across providers	ABHA care-context discovery and linking	—	ABDM APIs [S5]
Insurance policy terms	Policy schedule / CIS upload + document AI	Insurer/TPA/employer partnership APIs; possibly AA	Internal model mapped to FHIR Coverage/InsurancePlan
Claims	Claim-document upload + manual status	Payer/TPA event push; NHCX via provider SaaS	FHIR Claim/ClaimResponse
Wearables/vitals	Health Connect, HealthKit (on-device)	Selected vendor clouds (Oura, Withings, Fitbit)	Internal metric model, LOINC/UCUM
Diet	In-app logging over Indian food DB; photo logging	Partnerships with nutrition apps	IFCT-based nutrient model [S34]
Pharmacy	Invoice/prescription upload; email-forward	e-pharmacy partnerships (order history with consent)	Internal medication model; SNOMED CT
Booking care-gap services	Deep links to user's chosen provider	UHI EUA integration	UHI/Beckn [S13]
Clinician/facility verification	HFR/HPR lookup	—	ABDM registry APIs [S2]

4. Source-by-Source Data Map

Feasibility key:

- **High**: buildable now with public SDKs/APIs or files.
- **Medium**: needs approval, partnership or significant engineering.
- **Low**: depends on third parties without public access, or is legally constrained.

Consent key:

- **DPDP-C**: DPDP-grade consent with notice, purpose and withdrawal.
- **ABDM-CA**: an ABDM consent artifact is required.
- **OS-P**: an OS-level health permission is required.

4.1 Medical records

Source	Data available	Access mechanism	Format → normalization	Consent / privacy	Feas.	Regulatory / commercial constraint	MVP approach
ABHA (number/address)	Demographics, ABHA address(es), mobile; *not* records	ABDM M1 APIs (create/verify/link ABHA) via sandbox → production [S5] [S15]	JSON → `Person`, `Identifier`	DPDP-C; Aadhaar-based flows follow Aadhaar rules (no storage of Aadhaar number beyond permitted use) ⚠️ **Validate**	High	ABDM integration approval, security audit, sandbox exit [S4]	ABHA create/login in onboarding (skippable)
ABDM-integrated hospitals/clinics (HIPs)	Seven HI types in NHA's reference implementation: OPConsultation, Prescription, DischargeSummary, DiagnosticReport, ImmunizationRecord, HealthDocumentRecord, WellnessRecord [S60] (an Invoice type appears in later NRCES material ⚠️ **Validate**)	ABDM PHR discovery/link + data pull (self-requested) or HIU consent request [S1][S4]	Encrypted FHIR R4 bundles (NRCES profiles) → canonical graph; keep the raw bundle	ABDM-CA + DPDP-C; honour `dataEraseAt` and access mode	Medium	Coverage varies by HIP; many bundles carry PDFs inside `DocumentReference/Binary` rather than coded data ⚠️ **Validate**	Core MVP source; measure structured vs PDF share
ABDM-integrated labs (HIPs)	Lab reports (DiagnosticReport + Observations, often PDF)	Same as above	FHIR → `LabResult`; map local test names to LOINC	ABDM-CA + DPDP-C	Medium	Lab chains' ABDM participation varies ⚠️ **Validate per chain**	Core; fall back to PDF upload
Other PHR apps (as HIPs)	Records users stored in other apps	ABDM: if the other PHR acts as HIP, the user can link and pull	FHIR (often HealthDocumentRecord)	ABDM-CA	Medium	Depends on the other app's HIP integration	Supported automatically through the ABDM flow
Non-ABDM providers	Same clinical content on paper/PDF	**User upload, camera scan, email-forward, WhatsApp-forward**	PDF/image → OCR + clinical NER → canonical with confidence + page reference	DPDP-C; user is the source; label "document-derived"	High	OCR accuracy on handwriting is low (manual review queue)	Core MVP
Handwritten prescriptions	Drug names, doses, frequency, advice	Camera scan	Handwriting OCR (low confidence) → user confirmation	DPDP-C	Low–Med	Never auto-confirm; misread drug names are a safety risk	Capture image, assisted transcription, user confirms each line

Source	Data available	Access mechanism	Format → normalization	Consent / privacy	Feas.	Regulatory / commercial constraint	MVP approach
Discharge summaries	Diagnoses, procedures, meds on discharge, follow-up	ABDM (DischargeSummary) or upload	FHIR Composition or PDF → Encounter, Condition, Procedure, MedicationRequest, CarePlan	ABDM-CA / DPDP-C	Med	Free-text heavy; clinical NER needed	Core; human-review queue for low confidence
Imaging reports (X-ray, USG, CT, MRI)	Report text, impression; images rarely	ABDM DiagnosticReport (imaging) or upload	PDF → `DiagnosticReport(imaging)`; store impression text, no auto-interpretation	DPDP-C	Med	DICOM images are large; out of MVP scope	Store report + impression; no image viewer in MVP
Vaccination records	Child UIP vaccines, adult vaccines (incl. CoWIN certificates)	ABDM ImmunizationRecord, upload of cards/certificates	→ `Immunization` with vaccine code + dose	DPDP-C; parental consent for minors [S12]	Med	Paper immunization cards dominate for children	Upload + guided manual entry against the UIP schedule [S38]
Manual entry (history, allergies, family history)	Conditions, allergies, surgeries, family history	In-app forms, voice entry (vernacular)	→ canonical with `trust=user_entered`	DPDP-C	High	Accuracy depends on the user	Core; structured pick-lists (SNOMED-backed)

4.2 Health insurance

Source	Data available	Access mechanism	Format → normalization	Consent / privacy	Feas.	Regulatory / commercial constraint	MVP approach
Retail policy schedule + policy wording	Insurer, plan, policy no., insured members, sum insured, deductibles, co-pay, room-rent limits, sub-limits, waiting periods, exclusions, riders, renewal date, premium	User upload (PDF from insurer email/app), email-forward	PDF → **policy parser** → `InsurancePolicy`, `Coverage`, `Exclusion`, `WaitingPeriod` (FHIR Coverage/InsurancePlan-aligned)	DPDP-C	High	Wordings vary by insurer and product; clause-level citation essential	**Core MVP**: parse schedule + CIS; link clauses to the original page
Customer Information Sheet (CIS)	Standardised summary of key features, exclusions, waiting periods	Usually attached with the policy	Semi-structured → high-precision parser	DPDP-C	High	IRDAI mandates CIS in a prescribed format [S18] ⚠️ **Validate current format**	Prioritise the CIS parser; it is the best structure available
Employer group policy (GMC)	E-card, member ID, TPA, sum insured (often family floater), maternity/parents cover, room-rent caps	E-card/benefit booklet upload; HR portal export; employer partnership	PDF/image → `InsurancePolicy(group)`	DPDP-C; employer must not see individual data	High (upload) / Med (partnership)	Policy wording often not given to employees; benefit summary only	Upload e-card + benefit summary; B2B employer channel in Phase 2
Insurer apps/portals	Policy docs, claim status, network hospitals	**No public consumer APIs (assumed)**; partnership	—	DPDP-C + partner data-sharing agreement	Low (now)	Commercial negotiation; IRDAI rules on outsourcing/data sharing ⚠️ **Validate**	Do not scrape; user downloads PDFs and uploads them
TPA portals (e.g. Medi Assist, MDIndia, FHPL, Paramount)	Claim intimation, pre-auth status, query letters, settlement letters	Partnership; user upload of letters/SMS/email	PDF/email → `Claim`, `ClaimEvent`	DPDP-C	Low–Med	TPA contracts are with insurers; data-sharing terms needed	Email-forward of TPA mails; claim letter parser
Claim documents	Pre-auth approval/denial, final bill, discharge bill, settlement letter with deductions, rejection reason	Upload, email-forward	PDF → `Claim`, line-item `Deduction`, `DenialReason` (taxonomy)	DPDP-C	High	Reason text is unstructured; map to a denial taxonomy	**Core MVP**: claim tracker + deduction explainer
Cashless network hospital lists	Hospitals in the insurer/TPA network	Insurer/TPA websites publish lists (use only where terms permit), partnership	CSV/PDF → `NetworkListing` linked to HFR IDs	Public business data, no personal data	Med	Website terms may restrict automated reuse; prefer licensed feeds ⚠️ **Validate**	Phase 2 via partnership; MVP shows "check with insurer" + link
NHCX	Eligibility, pre-auth, claims, communications, insurance-plan exchange between	Participant onboarding, roles PAYER/PROVIDER/TPA only [S59]	NRCES/NHCX FHIR bundles, JWE-encrypted	Participant agreements	Low for consumer	Consumer app is not a participant (V)	Phase 3 via provider SaaS or payer partner; track ABHA-policy linking for consumer

Source	Data available	Access mechanism	Format → normalization	Consent / privacy	Feas.	Regulatory / commercial constraint	MVP approach
	provider and payer; ABHA ↔ policy linking						discovery
Account Aggregator (insurance FIP)	Policy holdings/details where insurers/repositories act as FIPs	Register as FIU; consent via an AA [S9][S10][S46]	ReBIT FI schemas → `InsurancePolicy`	AA consent artefact + DPDP-C	Low–Med	Coverage of health-insurance FIPs live on AA is uncertain ⚠️ **Validate**	Phase 2 discovery: assess FIP availability
e-Insurance Account (insurance repositories)	Dematerialised policies held in eIA	Consumer download; possibly via AA	PDF/statement	DPDP-C	Low–Med	Low adoption for health policies (assumed) ⚠️ **Validate**	Accept uploads
PM-JAY / state schemes	Entitlement (Ayushman card), empanelled hospitals; claims are handled provider ↔ scheme	Beneficiary portals/apps; ABHA linkage ⚠️ **Validate**	—	DPDP-C	Low	No consumer claim API known	Show eligibility info + card upload; signpost to official helpline
Premium payments	Premium amount, date, payer, tax-deduction eligibility (Sec 80D)	Upload premium receipt; bank SMS (not recommended)	→ `Premium`	DPDP-C	High	Tax advice boundaries; show information only	Upload premium receipts; renewal reminder

4.3 Fitness and vitals

Source	Data available	Access mechanism	Format → normalization	Consent / privacy	Feas.	Constraint	MVP approach
Google Health Connect (Android)	Steps, distance, exercise, heart rate, HRV, sleep sessions/stages, weight, body fat, BP, blood glucose, SpO2, nutrition, hydration, mindfulness, etc.	**On-device Android API**; per-data-type runtime permission; built into Android 14+ (app install on older versions) [S26] ⚠️ **Validate**	Records → `WearableMetric/Vital/Sleep/Activity` (LOINC/UCUM mapping)	OS-P + DPDP-C; Google Play Health Apps declaration; background read and history read (>30 days before grant) need extra permissions [S26] ⚠️ **Validate**	High	Play policy restricts use (no ads/data brokering)	**Core MVP** (Android-heavy India)
Apple HealthKit (iOS)	Similar set + State of Mind (iOS 17+)	**On-device only**; no Apple cloud API [S24]	HKSample → canonical	OS-P; App Review 5.1.3: no advertising or data-mining use, no personal health info in iCloud [S25] ⚠️ **Validate wording**	High	Apple's Health Records (FHIR) feature is not available in India (assumed) ⚠️ **Validate**	**Core MVP** (iOS)
Google Fit APIs	Legacy fitness data	Deprecated; migrate to Health Connect [S27] ⚠️ **Validate shutdown date (2026)**	—	—	Low	Being shut down	Do not build
Fitbit	Activity, sleep, HR, SpO2, weight	Fitbit Web API (OAuth 2.0) or via Health Connect [S28]	JSON → canonical	OAuth + DPDP-C	Med	Google is moving Fitbit APIs to a new Google Health API ⚠️ **Validate status**	Prefer Health Connect; direct API later
Garmin	Activity, sleep, stress, Body Battery, HR	Garmin Connect Developer Program (Health/Activity API), **approval required** [S29]	Push/pull JSON → canonical	OAuth + DPDP-C	Med	Business approval; usage terms	Phase 2
Samsung Health	Steps, sleep, HR, BP (Galaxy Watch), body composition	Samsung Health Data SDK (**partner approval**) or Samsung → Health Connect sync [S30] ⚠️ **Validate**	→ canonical	OS-P/partner	Med	Partner programme	Via Health Connect in MVP
Oura	Sleep, readiness, HRV, temperature trend, activity	Oura Cloud API v2 (OAuth 2.0) [S31] ⚠️ **Validate PAT deprecation**	JSON → canonical	OAuth + DPDP-C	High	Small India base	Phase 2
Withings (scales, BP)	Weight, body composition,	Withings Public API (OAuth)	JSON → canonical	OAuth	High	Small India base	Phase 2

Source	Data available	Access mechanism	Format → normalization	Consent / privacy	Feas.	Constraint	MVP approach
	BP, ECG summary	[S32]					
Indian wearables (Noise, boAt, Fire-Boltt, Amazfit/Zepp, Ultrahuman)	Steps, HR, sleep, SpO2 (accuracy varies)	Mostly **through Health Connect/HealthKit sync from the brand app**; direct APIs uncommon ⚠️ **Validate per brand**	→ canonical with `device_class=consumer_wearable`	OS-P	Med	Data quality varies; consumer wearables are not diagnostic devices	Via Health Connect/HealthKit; label as "device-measured, non-clinical"
BP monitors (Omron, Dr Trust, others)	Systolic/diastolic, pulse	Brand app → Health Connect/HealthKit where supported; else manual/photo of display	→ `Vital(BP)` LOINC 85354-9 panel / 8480-6 systolic / 8462-4 diastolic	OS-P	Med	Validate device sync per brand	Health Connect + manual entry with photo
Glucometers (Accu-Chek, OneTouch, Dr Morepen, BeatO)	SMBG readings	Brand app sync/Health Connect where supported; manual entry	→ `Vital(glucose)` with meal context	OS-P	Med	Many Indian meters have no export	Manual entry with fasting/post-meal tags
CGM (FreeStyle Libre, Ultrahuman M1)	Continuous glucose	**No public consumer API known** for LibreView ⚠️ **Validate**; CSV export from vendor apps; Health Connect where vendor writes	CSV → time series	DPDP-C	Low–Med	Vendor terms; clinical interpretation risk	Phase 2: CSV import; show trends only
Smart scales	Weight, BMI, body-fat estimates	Health Connect/HealthKit or vendor OAuth	→ `Vital(weight)`	OS-P	High	Body-fat estimates are approximate	Via Health Connect

4.4 Diet and nutrition

Source	Data available	Access mechanism	Format → normalization	Consent / privacy	Feas.	Constraint	MVP approach
IFCT 2017 (ICMR-NIN)	Nutrient composition of Indian foods (raw foods)	Published by ICMR-NIN (book/digital); licensing terms for commercial digital reuse ⚠️ **Validate** [S34]	Reference table → `FoodItem` nutrients	Reference data	Med	Covers raw ingredients, not cooked regional dishes	License/obtain permission; base nutrient layer
Indian recipe/dish databases (e.g. Indian Nutrient Databank and similar academic efforts)	Cooked-dish nutrients for regional dishes	Academic/open datasets ⚠️ **Validate licence and provenance**	Recipe → nutrients via IFCT	Reference data	Med	Portion sizes (katori, roti) need standardisation	Build a curated dish DB with dietitian review
ICMR-NIN Dietary Guidelines for Indians (2024) and Nutrient Requirements (2020)	RDAs/EARs, dietary guidance	Public documents [S34] ⚠️ **Validate**	Rules → `NutritionTarget`	Reference	High	Guidance must be presented as general, not prescriptive	Default targets; clinician can override
Indian nutrition apps (HealthifyMe etc.)	Food logs, calories, macros	**No public API known** ⚠️ **Validate**; may write nutrition to Health Connect/HealthKit	→ `NutritionLog`	OS-P	Low–Med	Commercial partnership needed for direct data	Read nutrition records via Health Connect/HealthKit where written
In-app food logging	Meals, portions, water, supplements	Native, vernacular dish search, voice, photo	→ `NutritionLog` with `trust=user_entered`	DPDP-C	High	Food photo AI accuracy is moderate	Simple logging for chronic-care users; photo logging later
Food delivery/grocery receipts (Swiggy, Zomato, Blinkit, Zepto, BigBasket)	Items, restaurant, time, cost	**No consumer APIs**; email-forward/upload of invoices	Email/PDF → item list → approximate nutrition	DPDP-C; highly sensitive inference (eating patterns) — opt-in only	Low–Med	Gmail API inbox access is a **restricted scope**: Google verification plus annual third-party security assessment (CASA) [S33] ⚠️ **Validate**. Prefer user-initiated forwarding to a	Phase 3, opt-in only; never infer from bank SMS

Source	Data available	Access mechanism	Format → normalization	Consent / privacy	Feas.	Constraint	MVP approach
						unique inbound address.	
Supplements/Ayurveda	Supplement names, dose	Manual entry, label photo	→ `Medication(type=supplement)`	DPDP-C	High	Interaction data for herbal products is sparse	Capture in the medicine list; flag "interaction data limited"
Packaged food labels	Nutrition facts	Label photo OCR	→ nutrients per serving	DPDP-C	Med	FSSAI labelling formats; front-of-pack rules still evolving ⚠️ **Validate**	Phase 3

4.5 Pharmacy and medication

Source	Data available	Access mechanism	Format → normalization	Consent / privacy	Feas.	Constraint	MVP approach
E-pharmacy invoices (Tata 1mg, PharmEasy, Apollo 24/7, Netmeds, Truemeds)	Brand, strength, quantity, date, price, prescriber (sometimes)	Upload, email-forward; **no consumer APIs known** ⚠️ **Validate**; partnership later	PDF → `MedicationDispense` → brand→molecule mapping	DPDP-C	High (upload)	E-pharmacy rules still in draft form (Draft Drugs and Cosmetics Amendment Rules, 2018) with litigation ⚠️ **Validate current status** [S52]	**Core MVP**: invoice parser feeds the medicine list and spend
Offline pharmacy bills	Same, often thermal-printed or handwritten	Camera scan	OCR (low quality) → user confirm	DPDP-C	Med	Faded thermal paper	Capture + confirm
Prescriptions (ABDM or paper)	Drug, dose, frequency, duration, advice	ABDM Prescription HI type; upload	FHIR MedicationRequest / OCR	ABDM-CA / DPDP-C	Med	Handwriting	Core
Brand→molecule mapping	Molecule(s), strength, form, schedule (H/H1/X)	Licensed commercial Indian drug database (e.g. CIMS/MIMS India) **or** curated build from public lists (CDSCO approvals, NLEM, Jan Aushadhi product list) [S35][S36]	→ internal `DrugProduct` → molecule → ATC/SNOMED CT	Reference	Med	No complete free Indian brand dictionary (assumed); licensing cost	**Partner/license** for MVP; supplement with curation
Drug-interaction knowledge	DDI severity, duplicate therapy, contraindications	Licensed clinical knowledge base (e.g. First Databank, Medi-Span, Lexicomp, DrugBank commercial)	Molecule-level rules	Reference	Med	Licence cost; must map Indian brands → molecules; clinical governance of alert thresholds	Phase 2 with clinician-reviewed severity filter; MVP shows duplicate-molecule detection only
Terminology	SNOMED CT (incl. India drug extension)	SNOMED CT free for use in India via NRCES as National Release Centre [S50] ⚠️ **Validate terms and drug-extension scope**	Codes	—	High	Affiliate licence registration	Use SNOMED CT + ATC
Medicine reminders/adherence	Taken/missed doses	In-app reminders; caregiver nudges; WhatsApp reminders via WhatsApp Business API (opt-in)	→ `AdherenceEvent`	DPDP-C; WhatsApp template-message and opt-in rules	High	Notification fatigue	MVP: reminders + refill-due estimate

4.6 Diagnostics

Source	Data available	Access mechanism	Format → normalization	Consent / privacy	Feas.	Constraint	MVP approach
Lab chains (Dr Lal PathLabs, Metropolis, Thyrocare, Agilus/SRL, Apollo Diagnostics, Redcliffe, Tata 1mg Labs)	Test results, reference ranges, flags, PDFs	ABDM HIP where integrated ⚠️ **Validate each**; otherwise PDF via email/WhatsApp/download	FHIR or PDF → `LabResult` (LOINC mapping, UCUM units, lab-specific reference range retained)	ABDM-CA / DPDP-C	High (PDF) / Med (ABDM)	Template diversity is huge; report layout drift	**Core MVP**: lab PDF parser with per-lab templates + generic table extraction; partner with 2–3 chains

Source	Data available	Access mechanism	Format → normalization	Consent / privacy	Feas.	Constraint	MVP approach
Preventive health check packages	Bundled panels (CBC, lipid, LFT, KFT, HbA1c, TSH, vitamin D/B12, urine)	Same	Same	Same	High	Same	Core; "health check summary" view
At-home tests (glucose, pregnancy, rapid antigen)	Self-reported results	Manual entry/photo	→ `LabResult(trust=user_entered)`	DPDP-C	High	Not lab-verified	Allow; label clearly
Hospital in-house labs	Same	ABDM where hospital is an HIP; else PDF	Same	Same	Med	—	Via ABDM/upload
Reference ranges & units	Lab-specific ranges	From the report	Store the lab's range; do **not** substitute a generic range for flags	—	High	Units differ (mg/dL vs mmol/L)	Unit normalisation with UCUM; keep the original

4.7 Mental wellbeing (explicit, separate opt-in)

Source	Data available	Access mechanism	Format → normalization	Consent / privacy	Feas.	Constraint	MVP approach
Self-reported mood/stress check-ins	Mood scale, tags, notes	In-app	→ `MoodLog`	**Separate opt-in purpose**; excluded from family/caregiver view and doctor-share by default; never used for marketing	High	Mental Healthcare Act 2017 confidentiality principles [S23]	Phase 2; local-first option
Validated screeners (e.g. PHQ-9, GAD-7)	Scores	In-app questionnaire	→ `Observation(screener)`	Separate opt-in; crisis routing when thresholds/self-harm item triggered	High	Licensing of instruments ⚠️ **Validate**; clinical escalation pathway required	Phase 2 with clinical safety sign-off
Sleep, HRV, mindfulness minutes	From wearables	Health Connect/HealthKit (incl. iOS State of Mind)	→ `Sleep`, `WearableMetric`	OS-P; treated as wellbeing context	High	Not diagnostic	MVP: show sleep; stress inference not in MVP
Therapy notes/journals	Free text	User-entered only; no therapist-system integration in MVP	Encrypted, optionally on-device only	Highest sensitivity; excluded from AI by default	Med	Professional confidentiality	Phase 3, on-device encrypted journal
Crisis resources	Tele-MANAS 14416 / 1-800-891-4416; emergency 112 [S39] ⚠️ **Validate numbers before release**	Static content	—	—	High	Must be correct and localised	**MVP**: always available from Help and from any crisis trigger

4.8 Family and context

Source	Data available	Access mechanism	Format → normalization	Consent / privacy	Feas.	Constraint	MVP approach
Dependents (children <18)	Child profile, vaccinations, growth, records	Parent creates; child ABHA where supported ⚠️ **Validate**	→ `Person(dependent)` + `Relationship`	**Verifiable parental consent** under DPDP s.9 and Rules [S11] [S12]; no tracking or targeted ads for children	High	Age-gating; transition at 18 (hand over control)	MVP
Adult dependents (elderly parents, spouse)	Same as individual	Invite flow: the adult consents **in their own right** (OTP on their phone) or appoints the caregiver	→ `CaregiverGrant`	The adult's own consent; for persons unable to consent, lawful guardian rules [S12] ⚠️ **Validate**	High	Never let one adult silently manage another adult's data	MVP: invite + assisted-consent mode
Family history / hereditary risk	Conditions in relatives	Manual entry	→ `FamilyHistory` (SNOMED)	DPDP-C; it is data about relatives, so collect minimally	High	Third-party data	MVP: simple first-degree relatives form
Lifestyle (tobacco, alcohol, activity)	Self-report	Questionnaire	→ `RiskFactor`	DPDP-C	High	Social-desirability bias	MVP
Occupation, travel, exposure	Shift work, dust/chemical exposure, travel to endemic areas	Questionnaire	→ `RiskFactor`	DPDP-C; optional	High	Minimise	Phase 2
Environmental (air quality)	Local AQI	Public AQI feeds (e.g. CPCB) by coarse location ⚠️ **Validate terms**	→ `EnvironmentContext`	Coarse location only, opt-in	Med	Location sensitivity	Phase 3 (asthma/COPD use case)

5. ABDM and Consent Architecture

5.1 Financial AA vs ABDM: map the analogy correctly

The most common design error is to treat the consumer app as the "health Account Aggregator". In the RBI framework the **AA is a data-blind consent conduit**: it cannot see or store the financial data it moves [S10][S46]. In ABDM, the **HIE-CM** plays that conduit role [S1][S2]. A consumer health aggregator that stores, normalises and analyses records is the equivalent of an **FIU / personal-finance app**. It is therefore a **Data Fiduciary** with full DPDP obligations [S11].

Dimension	Financial Account Aggregator	ABDM health exchange	Where the consumer health aggregator sits
Regulator / owner	RBI; AAs are NBFC-AAs under the 2016 Master Direction [S10]	National Health Authority (ABDM) [S1][S14]	DPDP (MeitY/DPB), ABDM policies, plus sector rules (IRDAI, CDSCO, NMC) depending on features
Consent conduit	AA (data-blind)	HIE-CM + Gateway [S2]	**Not the conduit**; it is a consent *requester* and consent *UI* (PHR)
Data holder	FIP (bank, insurer, MF, GSTN) [S9]	HIP (hospital, clinic, lab, PHR) [S1]	Can also be an HIP when re-sharing user-uploaded documents
Data requester	FIU (lender, wealth app)	HIU [S1]	**HIU** (and PHR app)
Consent standard	ReBIT consent artefact [S46]	ABDM consent artifact: purpose, HI types, care contexts, `permission{accessMode, dateRange, dataEraseAt, frequency}` [S60]	Must honour the artifact *and* run its own DPDP consent ledger for non-ABDM sources
Data format	ReBIT FI schemas	NRCES FHIR R4 [S6]	FHIR as the canonical exchange format; internal graph for analytics
Encryption in transit	Per-session keys	ECDH key agreement on **Curve25519**, HKDF-derived key, **AES-GCM**; bundles pushed to the HIU's data-push URL [S60]	Generate fresh key pairs per data request; never reuse
Retention	AA cannot store data	Federated; no central record store [S1][S2]; artifact carries `dataEraseAt` [S60]	Must purge or crypto-shred ABDM-sourced data at `dataEraseAt` or on revocation
Adjacent rails	—	NHCX (claims) [S59], UHI (discovery/booking) [S13]	Partnerships and provider SaaS give access to these rails
Product analogy	"My money across banks, investments, insurance"	"My records across hospitals and labs"	**"My health and my health money across records, devices, documents and insurance"**

Implication. Health data in India is more fragmented and more paper-based than financial data. ABDM covers only part of the record landscape. The product must combine ABDM with documents, devices and partnerships. The DPDP posture should be a **custodian with minimal retention**, not a data lake.

5.2 ABDM building blocks explained for the product team

Concept	Explanation	Product design consequence
ABHA number	A 14-digit identifier created with Aadhaar or driving-licence-based verification (per NHA's NHCX guide, which lists "Create ABHA number using Aadhaar / Driving License") [S59]	Offer creation in-app (M1). Never make ABHA mandatory for basic use.

Concept	Explanation	Product design consequence
ABHA address	A user-chosen handle (e.g. `name@abdm` in production; `name@sbx` in sandbox) [S60]. Consent and linking are addressed to it.	Store all addresses a user holds. Show which address each record came through.
Care context	A provider-side grouping of records (e.g. a visit or an admission) that the HIP links to the user's ABHA address. In v3 the HI type is declared on the care context [S60].	Discovery returns care contexts. The UI should show them as "visits".
Discovery and linking	User-initiated: the PHR asks an HIP to find the user's records (demographic match + OTP); HIP-initiated: the facility links at the point of care; **Scan & Share**: QR-based registration at a facility [S60]	Build a "Find my records" flow: choose a hospital or lab → OTP → link. Show progress and failures honestly.
Consent request	An HIU asks the CM for access with purpose, HI types, date range, expiry/erase date and frequency. The user approves in a PHR/ABHA app. The CM issues consent artifacts per HIP [S1][S4] [S60].	Requests should be narrow by default (purpose-specific, bounded date range, explicit erase date).
Purpose codes	Coded purposes, e.g. `CAREMGT` (care management, seen in NHA's reference implementation [S60]); others in ABDM specifications include `BTG` (break-the-glass), `PUBHLTH`, `HPAYMT` (healthcare payment), `DSRCH` (disease-specific research), `PATRQT` (self-requested) ⚠️ **Validate full list in current spec**	Map each product feature to one purpose. Self-access → `PATRQT`; doctor-share → `CAREMGT`; never request `DSRCH` without a separate research consent and ethics approval.
Access mode	`VIEW`, `STORE`, `QUERY`, `STREAM` [S60]	Request `STORE` only where the feature needs persistence (personal vault). The clinician view should use `VIEW`.
Health-information request and data push	The HIU requests data against a consent artifact with its public key; HIPs encrypt FHIR bundles and push them to the HIU's data-push URL; HIU acknowledges per care context [S1][S4][S60]	Idempotent, retry-safe ingestion with per-transaction keys; partial-delivery reconciliation.
Revocation and expiry	Users can revoke consents from the PHR/ABHA app; artifacts expire	Subscribe to consent notifications; on revoke or expiry, stop fetches and run the erasure workflow.
HFR / HPR	Registries of facilities and professionals [S2]; HFR registration is a prerequisite for NHCX participation [S59]	Verify facilities and clinicians on records ("Verified facility" badge).
Milestones	**M1**: ABHA creation, verification, link token. **M2**: linking and exporting health data (HIP). **M3**: consent request and importing data (HIU) [S60]	The aggregator needs M1 + M3 (and M2 if it acts as an HIP for user-uploaded records), plus PHR-app flows ⚠️ **Validate PHR-app certification path**.
API generation	NHA's reference implementation moved from V1 to **V3** gateway APIs (`/api/hiecm/gateway/v3/…`, `X-CM-ID: sbx|abdm`) in 2024 [S60]	Build directly on V3. Note that some NHCX docs still reference a `v0.5` sessions endpoint [S59]; confirm with NHA integration support.
Certification	Functional testing, **WASA security testing**, sandbox exit, production credentials [S59] [S4]	Plan security audit and demo as gating items on the critical path.

5.3 How the aggregator participates: integration modes

Mode	What it enables	Required milestones	MVP?
PHR app (consumer-facing)	ABHA create/login, discover and link care contexts, approve/deny/revoke consents, self-requested data pull	M1 + PHR-app integration with the CM ⚠️ **Validate PHR certification requirements**	**Yes**
HIU	Consent requests for defined	M3	**Yes**

Mode	What it enables	Required milestones	MVP?
	purposes (e.g. a clinician the user authorises; family caregiver flows), receipt of encrypted bundles		
HIP	Re-share user-uploaded documents (as `HealthDocumentRecord`) and app-generated wellness data (`WellnessRecord`) to other HIUs the user chooses	M2	Phase 2
NHCX participant	Eligibility/pre-auth/claim flows	Only as provider/payer/TPA or their tech partner [S59]	Phase 3 (provider SaaS)
UHI EUA	Book diagnostics or consultations to close care gaps	UHI onboarding [S13]	Phase 2–3

5.4 Consent architecture: two layers, one ledger

The product needs **two consent layers** recorded in **one immutable consent ledger**:

1. **ABDM consent artifacts.** These govern records pulled from HIPs. They are issued by the HIE-CM and honoured as-is.
2. **DPDP platform consents.** These govern every other source (documents, devices, manual entry) and every *processing purpose* (AI summaries, insurance analysis, reminders, research, product improvement). Each must be free, specific, informed, unconditional and unambiguous, with withdrawal as easy as giving consent [S11]. Notices must meet the content requirements of the DPDP Rules [S12] ⚠️ **Validate rule-level notice content**.

Purpose catalogue (each purpose is a separate toggle; *default* in brackets)

Purpose ID	Description	Lawful basis	Default	Notes
P1 `vault_storage`	Store my records and documents	Consent	Required for the core service	Explain storage location (India) and retention
P2 `abdm_self_access`	Fetch my ABDM records (`PATRQT/STORE`)	ABDM artifact + consent	Opt-in per HIP	Narrow date range
P3 `clinical_summary`	Generate timeline, summaries, trends, care gaps	Consent	Opt-in (recommended)	Includes AI processing disclosure
P4 `insurance_analysis`	Parse policies, explain coverage, track claims, compute OOP	Consent	Opt-in	
P5 `device_sync`	Read selected Health Connect/HealthKit types	OS permission + consent	Opt-in per data type	
P6 `reminders`	Medicine, test and renewal reminders (push, SMS, WhatsApp)	Consent	Opt-in per channel	WhatsApp opt-in recorded
P7 `doctor_share`	Time-bound share with a named clinician (`CAREMGT, VIEW`)	Consent	Per share	Expiry default 72h **(product choice)**
P8 `caregiver_access`	A named family member can view/manage	Consent of the person, or verifiable parental consent	Per grant	Scope: view / manage / emergency-only
P9 `mental_wellbeing`	Mood and screener data	Consent	Off	Excluded from P7/P8 unless explicitly included
P10 `product_improvement`	Use **de-identified** usage and extraction-error data to improve OCR/parsers	Consent	**Off**	Never raw clinical content without explicit consent
P11 `research`	Contribute de-identified data to approved studies	Consent + ethics approval	Off	Per-study consent [S44]
P12 `offers`	Partner offers (diagnostics, pharmacy)	Consent	Off	Never driven by clinical data without explicit consent; never for minors

Consent record (internal, DPDP-aligned; corrects the v1.0 object)

```
{
  "consent_id": "cn-2026-001234",
  "data_principal_ref": "person:7f3c…",
  "granted_by": {"type": "self", "person_ref": "person:7f3c…"},
  "purpose_id": "P2_abdm_self_access",
  "abdm": {
    "consent_request_id": "…",
    "consent_artefact_ids": ["…"],
    "purpose_code": "PATRQT",
    "hi_types": ["DiagnosticReport", "Prescription", "DischargeSummary"],
    "access_mode": "STORE",
    "date_range": {"from": "2023-01-01", "to": "2026-10-21"},
    "data_erase_at": "2027-10-21T00:00:00+05:30",
    "frequency": {"unit": "MONTH", "value": 1, "repeats": 0}
  },
  "sources": ["HIP:hfr-id-…"],
  "processing_allowed": ["store", "summarise", "trend", "care_gap"],
  "processing_prohibited": ["advertising", "model_training", "sale", "underwriting"],
  "notice_version": "notice-v3.2-hi-IN",
  "language": "hi-IN",
  "channel": "android_app",
  "status": "granted",
  "created_at": "2026-10-21T19:10:00+05:30",
  "withdrawn_at": null,
  "evidence_hash": "sha256:…"
}
```

The ABDM `purpose_code` and `access_mode` values follow NHA's reference implementation [S60]. `PATRQT` and the frequency unit values must be validated against the current ABDM V3 specification ⚠️ **Validate**.

5.5 Consent UX principles (Indian realities)

- **Plain language in the user's language.** Show a one-screen summary covering: who, what data, why, how long and how to withdraw. Offer an expandable full notice. Provide audio read-aloud for low-literacy users. Notices should be available in English and the Eighth Schedule languages where feasible [S12] ⚠️ **Validate rule requirement**.
- **No bundling.** The core vault must work without AI, insurance or offers consents. No pre-ticked boxes. No "accept all" that hides research or offers. Avoid the dark patterns identified by the CCPA guidelines, such as confirm-shaming, forced action and nagging [S45].
- **Assisted consent.** A family member may *help* an elderly parent, but the parent's OTP or biometric on their own device records the grant. The ledger logs `assisted_by`.
- **Consent dashboard.** Shows every active consent (ABDM and platform), its expiry, last access and data received, with one-tap withdrawal and an "erase data from this source" option.
- **Receipts.** Send a consent receipt by in-app inbox (optionally SMS/WhatsApp) for every grant, change or withdrawal.

5.6 Onboarding as an ABDM participant (organisational checklist)

Step	Activity	Owner	Evidence
1	Incorporate in India; appoint a grievance officer and DPO contact; adopt an ABDM-aligned privacy policy	Legal	[S11][S16]
2	Apply for ABDM sandbox (V3) registration; obtain client ID/secret	Engineering	[S59][S15]
3	Build M1 (ABHA), PHR-app flows, M3 (HIU); register bridge/callback URL	Engineering	[S60]
4	Pass functional test cases; FHIR bundle validation	QA / NRCES	[S59]
5	WASA security audit (CERT-In empanelled auditor recommended); fix findings	Security	[S59][S20] ⚠️ **Validate auditor requirement**
6	Sandbox exit; NHA demo; production credentials (`X-CM-ID: abdm`)	Programme	[S59][S60]
7	Production go-live with monitoring of HIP response rates and failure reasons	SRE / Product	—

6. Unified Individual Health Graph

6.1 Design principles

1. **FHIR at the edges, graph at the core.** Ingest and export FHIR R4 (NRCES profiles). Internally, keep a typed property graph (or relational + edge tables) tuned for timeline, trend and coverage queries.
2. **Every fact is an assertion with provenance.** A lab value is stored as "*Source X asserted HbA1c = 7.1% on date D, extracted with confidence c, verified by V*". It is never stored as bare truth.
3. **Trust tiers are first-class** and are shown in the UI:

Tier	Label in UI	Definition	Example
T1	**Verified clinical**	Received from an identified HIP via ABDM (or a signed partner feed), unchanged	HbA1c in a FHIR DiagnosticReport from a lab HIP
T2	**From your document**	Extracted from a user-supplied provider document; shows confidence and user confirmation status	HbA1c parsed from a lab PDF on WhatsApp
T3	**Measured by your device**	From a consumer device via Health Connect/HealthKit/OAuth	Resting heart rate from a smartwatch
T4	**Entered by you / your family**	Manually entered or self-reported	"Mother has diabetes"
T5	**Insight (computed)**	Derived by rules or models from T1–T4, with method and inputs listed	"HbA1c has risen across the last two tests"
T6	**Reference knowledge**	External guidelines, drug knowledge, policy clauses	NP-NCD screening guidance; IRDAI CIS clause

4. **Never silently overwrite.** Conflicts are preserved and surfaced.
5. **Consent-scoped by construction.** Every node and edge carries `consent_ids[]`. Queries filter by active consent and purpose.
6. **Erasable by design.** Per-person, per-source data-encryption keys allow crypto-shredding on withdrawal or `dataEraseAt`.

6.2 Common provenance envelope (on every node)

Field	Type	Description
`id`	UUID	Internal ID
`person_id`	UUID	Subject (Data Principal or dependent)
`trust_tier`	enum T1–T6	See table above
`source_type`	enum	`abdm_hip`, `document`, `device`, `manual`, `partner_api`, `derived`, `reference`
`source_ref`	string	HIP/HFR ID, document ID + page + bbox, device/app ID, partner ID
`raw_ref`	URI	Pointer to the encrypted raw FHIR bundle or document blob
`consent_ids`	UUID[]	Consents that authorise holding this node
`abdm_txn_id` / `care_context_ref`	string	For ABDM-sourced data
`ingested_at`, `effective_at`	timestamp	Ingestion time vs clinical/observation time
`extraction`	object	`{method: ocr+ner|fhir|api, model_version, confidence: 0–1, field_confidences}`
`verification`	enum	`unverified`, `user_confirmed`, `user_corrected`, `clinician_confirmed`, `source_verified`
`corrections[]`	array	Who changed what, when, old/new

Field	Type	Description
		values
`supersedes` / `conflicts_with`	UUID[]	Versioning and conflict links
`retention`	object	`{policy_id, erase_at, legal_hold: bool}`
`language`	BCP-47	Original document language

6.3 Entity catalogue

Update-frequency codes: **E** = event-driven (on ingestion), **D** = daily sync, **C** = continuous/near-real-time device sync, **M** = manual.

A. Identity, family and consent

Entity	Key fields	Source systems	Update	Data-quality rules	Linkage keys
Person	name (+ local-script name), DOB/age, sex/gender, mobile, email, preferred language, city/PIN (coarse), blood group	Onboarding, ABHA profile, documents	M / E	ABHA demographics take precedence for name/DOB; mismatch with documents triggers identity check (avoid mixing family members' records)	`person_id`; ABHA number (hashed); mobile (hashed)
Dependent / Relationship	relationship type, guardian flag, minor flag, date of majority, access scope	Onboarding	M	Minor flag auto-computed from DOB; at age 18, trigger hand-over of control	`person_id` ↔ `related_person_id`
ABHA Identity	ABHA number (encrypted), ABHA address(es), KYC status, linked HIPs	ABDM M1/PHR	E	One ABHA number per person; many addresses allowed; never store Aadhaar number	ABHA number (hashed), ABHA address
Consent Record	see §5.4	Consent service, HIE-CM	E	Immutable append-only; status transitions validated	`consent_id`, ABDM artifact IDs
Caregiver Grant	grantor, grantee, scope (view/manage/emergency), categories excluded (e.g. mental), expiry	Consent service	E	Requires grantor authentication (or verifiable parental consent)	grant ID

B. Care delivery

Entity	Key fields	Source systems	Update	Data-quality rules	Linkage keys
Facility	name, HFR ID, type, address, city, network-hospital flags	HFR, documents	E	Fuzzy-match document facility names to HFR; mark unmatched as "unverified facility"	HFR ID; normalised name + PIN
Clinician	name, HPR ID, registration no./council, specialty	HPR, documents	E	Match registration numbers on prescriptions to HPR where possible	HPR ID; registration no.
Encounter	type (OP/IP/ER/tele/lab visit), start/end, facility, clinician, reason, care-context ref	ABDM (OPConsultation, DischargeSummary), documents	E	**Duplicate rule**: same person + facility + encounter class + date (±1 day for IP) → merge candidate	care-context ref; facility + date
Diagnosis / Condition	code (ICD-10 / SNOMED CT), text, clinical status, verification status, onset, recorded date, asserter	ABDM, discharge summaries, prescriptions, user	E / M	User-entered conditions stay T4 until corroborated; "rule out"/"?" phrases parsed as provisional, never as confirmed	SNOMED/ICD code + person
Symptom	description, onset, severity, duration	User (Q&A), documents	M	Never auto-promote to diagnosis; red-flag terms trigger safety	—

Entity	Key fields	Source systems	Update	Data-quality rules	Linkage keys
				guidance (§9.4)	
Procedure	code, date, facility, outcome	Discharge summaries, claims	E	Link to claim line items	code + date
Allergy / Intolerance	substance, reaction, severity, criticality	ABDM, documents, user	E / M	Always shown with source; "no known allergies" stored distinct from "unknown"	substance code
Immunization	vaccine, dose number, date, batch, administering facility	ABDM ImmunizationRecord, certificates, cards	E / M	Validate against schedule spacing; flag implausible dates	vaccine code + dose

C. Medications

Entity	Key fields	Source systems	Update	Data-quality rules	Linkage keys
Medication (statement/request)	brand, molecule(s), strength, form, dose, route, frequency, duration, start/stop, prescriber, indication	ABDM Prescription, prescription images, discharge summaries	E	Brand→molecule mapping required; unknown brand → "needs confirmation"; duplicate molecule from different brands flagged	molecule code (SNOMED/ATC) + person
Medication Dispense	brand, qty, date, pharmacy, price, prescription link	Pharmacy invoices	E	Infer days-supply = qty / daily dose (only when dose known)	invoice ID; molecule
Adherence Event	scheduled time, taken/missed/snoozed	App reminders	C / M	Self-reported; label as such	medication ID

D. Diagnostics, vitals and devices

Entity	Key fields	Source systems	Update	Data-quality rules	Linkage keys
Lab Result (Observation)	test name (original), LOINC code, value, unit (original + UCUM), lab reference range, flag, specimen, collected/reported time, lab	ABDM DiagnosticReport, lab PDFs	E	**Use the lab's own reference range for flags.** Unit conversion only with a known factor. Values outside physiological plausibility → hold for review.	LOINC + collected date + lab
Diagnostic Report	panel, report date, performer, result refs, PDF ref, imaging impression (text)	Same	E	Report-level dedup by lab + accession no. + date	accession no.
Vital (clinical)	BP, pulse, weight, height, BMI, temperature, SpO2, glucose (with meal context)	ABDM WellnessRecord, documents, devices, manual	E / C / M	Context tags (fasting/post-prandial; seated); device class recorded	LOINC + timestamp
Wearable Metric	metric type, value, unit, interval, device/app, aggregation	Health Connect, HealthKit, vendor APIs	C / D	Daily aggregates stored by default (minimisation); raw high-frequency only if a feature needs it; dedupe overlapping sources by priority order	metric + interval + source
Activity	steps, active minutes, workouts (type, duration, distance, energy)	Same	D	Prefer the device the user marks as primary	interval
Sleep	start/end, duration, stages, interruptions	Same	D	Merge overlapping sessions; flag implausible (>16h)	session interval

E. Lifestyle and goals

Entity	Key fields	Source systems	Update	Data-quality rules	Linkage keys
Nutrition Log	meal time, dish (Indian dish DB ID),	In-app, Health Connect/HealthKit,	M / D	Portion conversion table; dietitian-	dish ID + time

Entity	Key fields	Source systems	Update	Data-quality rules	Linkage keys
	portion (katori/piece/grams), energy, macros, sodium, sugar, water, supplements	receipts (opt-in)		curated dish DB; receipts give "purchased", not "consumed"	
Wellness Goal	goal type (steps, weight, HbA1c target set by clinician, sleep), target, start, review date, set-by	User, clinician (via share)	M	Clinical targets only when entered by or confirmed with a clinician	goal ID
Risk Factor	tobacco, alcohol, activity level, family history, occupation exposure, travel	User questionnaire	M	Time-stamped; re-ask periodically	type
Mood Log (opt-in)	score, tags, note (encrypted), screener scores	User	M	Separate key; excluded from AI and sharing by default	—

F. Insurance and money

Entity	Key fields	Source systems	Update	Data-quality rules	Linkage keys
Insurance Policy	insurer, product name, UIN, policy no., type (retail/group/government), policy period, policyholder, insured members, TPA, sum insured, floater flag, renewal date, document refs	Policy schedule, CIS, e-card, (future) payer API / ABHA-policy link	E	Policy no. + insurer unique; group vs retail detection; renewal date sanity	insurer + policy no.; member ID
Coverage (benefit)	benefit type (IP, day-care, OPD, maternity, AYUSH, pre/post hospitalisation, ambulance, domiciliary), limit, sub-limit, co-pay %, deductible, room-rent cap, clause ref	Policy wording, CIS	E	Every coverage item must hold a `clause_ref` (doc + page + text span) or it is not shown as fact	policy ID + benefit code
Exclusion	type (permanent, specific, PED), description, code mapping (ICD/procedure where possible), clause ref	Wording, CIS	E	Same clause-ref rule	policy ID + exclusion ID
Waiting Period	type (initial, PED, specific disease/procedure, maternity), duration, start date (incl. portability credit), end date	Wording, CIS, user (continuity of cover)	E / M	Compute end dates from the inception date of continuous cover; ask the user to confirm portability history	policy ID + type
Premium	amount, due date, paid date, payer, mode, tax-deduction eligibility (information only)	Premium receipts, schedule	E	—	policy ID + period
Claim	claim no., type (cashless/reimbursement), member, encounter link, admission/discharge dates, diagnosis, hospital, amount claimed/approved/paid, deductions[], status history, denial reason (text + taxonomy code), TAT	Claim letters, TPA emails, user updates; (future) payer feed	E / M	Status transitions validated; deductions sum check; link to encounter and bills	insurer + claim no.

Entity	Key fields	Source systems	Update	Data-quality rules	Linkage keys
Expense	category (consult, diagnostics, pharmacy, hospitalisation, device, therapy), amount, date, payer (self/insurer/employer), receipt ref	Invoices, bills, claims	E	Avoid double counting: reimbursed amounts offset, not duplicated	receipt ID

G. Care management

Entity	Key fields	Source systems	Update	Data-quality rules	Linkage keys
Care Gap	rule ID, guideline source, due date, status (due/overdue/done/dismissed), evidence refs, coverage status	Insight engine (T5) + guidelines (T6)	D	Each gap cites rule + guideline + input facts; user can dismiss with reason	rule ID + person
Alert / Flag	type (trend, interaction, duplicate therapy, red-flag), severity, message, evidence, acknowledgement	Insight engine	E	Severity thresholds signed off by the clinical safety officer	—

6.4 Relationships (edge list)

```
Person -[HAS_IDENTITY]-> ABHAIdentity
Person -[RELATED_TO {type, guardian, scope}]-> Person (Dependent)
Person -[GRANTED]-> ConsentRecord -[COVERS]-> (any node)
Person -[HAD]-> Encounter -[AT]-> Facility ; Encounter -[WITH]-> Clinician
Encounter -[RECORDED]-> Condition | Procedure | Observation | MedicationRequest | Immunization
DiagnosticReport -[CONTAINS]-> Observation(LabResult)
MedicationRequest -[FULFILLED_BY]-> MedicationDispense -[EVIDENCED_BY]-> Expense
Person -[HAS_DEVICE_DATA]-> WearableMetric | Activity | Sleep | Vital
Person -[LOGGED]-> NutritionLog | MoodLog
Person -[INSURED_UNDER {member_id, role}]-> InsurancePolicy
InsurancePolicy -[PROVIDES]-> Coverage ; -[EXCLUDES]-> Exclusion ; -[IMPOSES]-> WaitingPeriod ; -[BILLED_AS]->
Premium
Claim -[UNDER]-> InsurancePolicy ; Claim -[FOR]-> Encounter ; Claim -[SETTLES]-> Expense
CareGap -[DERIVED_FROM]-> (Condition | Observation | RiskFactor | Person.age/sex)
CareGap -[COVERED_BY?]-> Coverage | Exclusion | WaitingPeriod   (Coverage-to-Care link)
Alert -[EVIDENCE]-> (any clinical node)
Any node -[SOURCED_FROM]-> SourceArtifact (FHIR bundle | Document page | Device | Manual)
```

6.5 Data-quality rules

Situation	Rule	User experience
Duplicate records (same report via ABDM and PDF)	Match on person + test/LOINC + collected time (±24h) + value (exact) + lab; keep T1, link T2 as `duplicate_of`	Single entry with "also in your uploaded report"
Duplicate encounters	Person + facility (HFR or fuzzy name) + class + date window	Merge suggestion; auto-merge only for T1 + T1 with same care context
Conflicting values (same test, same time, different values)	Preserve both; mark `conflicts_with`; exclude from trend computation until resolved	"Two different values found — which is correct?" with both source images
Unit mismatch	Convert using a UCUM-validated factor; keep original; if the unit is missing, infer only when the value range is unambiguous, else hold	Shows original and converted
Reference-range mismatch across labs	Store per-result range; trend charts show range bands per lab	Note: "Different labs use different normal ranges"
Missing data	Distinguish *unknown* vs *negative* vs *not applicable*; care gaps fire only when evidence is absent *and* the source coverage is adequate	"We don't have a record of this test — have you done it elsewhere?"
OCR/document uncertainty	Field confidence < threshold (e.g. 0.90 for numeric lab values, 0.98 for drug names/doses — **thresholds set by clinical safety review**) → requires user	Side-by-side crop of the source with an editable value

Situation	Rule	User experience
	confirmation; low-confidence data excluded from insights	
Handwritten prescriptions	Never auto-confirm; drug names checked against the brand dictionary; dose/frequency confirmation required	Guided confirmation; option to ask the pharmacist/doctor
Identity mismatch (document name ≠ person)	Hold the document; ask “Whose report is this?” (common in family phones)	Assign to the right family member
Partial ABDM bundles	Track per-care-context delivery status; retry within consent validity; reconcile	“3 of 4 records received from Hospital X”
Revoked/expired consent	Stop processing; remove from views; crypto-shred or delete per retention policy; recompute derived insights without the data	Confirmation with what was deleted
Stale data	Last-updated per domain; insights note data age	“Based on reports up to March 2026”

7. User Journeys and Experience Design

7.1 Design principles for India

Principle	Practical design
Vernacular-first	UI in English + Hindi at launch, then Tamil, Telugu, Marathi, Bengali, Kannada, Gujarati, Malayalam (prioritise by pilot geography). Medical terms are shown with a plain-language gloss ("HbA1c — 3-month average sugar"). Use speech input and read-aloud; consider **Bhashini** for ASR/TTS/translation [S58] ⚠️ **Validate API terms**.
WhatsApp-native ingestion	"Forward reports to our WhatsApp number" (WhatsApp Business Platform, user-initiated, opt-in recorded); unique email inbox per user (`ravi.k7@inbox.<brand>.in`); Android share sheet target.
Paper-to-digital	Camera capture with edge detection, multi-page stitching, glare warnings and offline queueing for poor connectivity.
Family-centred	Profile switcher on every screen; colour + photo per family member; "whose report is this?" prompt.
Low digital literacy	Large tap targets, icon + text, minimal typing, assisted mode, voice guidance; never more than one decision per screen in consent flows.
Low bandwidth / low-end Android	APK size budget; lazy-load charts; on-device caching (encrypted); SMS fallback for OTP and critical reminders.
Trust signals	Source badges on every item (Verified clinical / From your document / Device / You entered); "Why am I seeing this?" on every insight.
Clinical safety	Emergency banner and helplines available from every screen (§9.4); no diagnosis language.

7.2 Journey 1: Onboarding and ABHA linking

Step	User sees / does	System	Consent / safeguard	Failure handling
1	Chooses language; sees a 3-card value tour ("records, insurance, family")	Locale set	—	—
2	Mobile number + OTP	Account created	Short notice + link to full notice; consent P1 (vault)	OTP retry, SMS fallback, IVR fallback
3	"Do you have an ABHA?" → **Yes**: log in with ABHA address/number + OTP · **No**: create ABHA (Aadhaar or other supported method) · **Skip**	ABDM M1 / PHR APIs [S59] [S60]	Explain what ABHA is and is not ("ABHA links records; it does not store them centrally") [S1]	Aadhaar OTP failure → alternate method or skip; never block the app
4	"Find my records": pick hospitals/labs (search with HFR data; "near me"; recently visited)	Discovery requests to HIPs	Per-HIP opt-in; date range selector (default: last 3 years)	"No records found" → explain likely reasons (name mismatch, facility not ABDM-enabled) + upload option
5	Approve consent in-app (PHR)	Consent artifact issued; data request; encrypted push	P2 + ABDM artifact (`PATRQT`, `STORE`, explicit erase date)	Partial delivery tracking
6	"Add what you have": upload/forward reports, policy, prescriptions	Document pipeline	P1, P3, P4 shown as separate toggles	Offline queue
7	Add family members (optional)	Dependent profiles / invites	§7.8	—
8	First **Snapshot** appears (even if partial)	Insight engine	Labels on every item	"We're still receiving records from 2 hospitals"

Success metrics: onboarding completion; ABHA link rate; HIP discovery success rate; time-to-first-value (first parsed record).

7.3 Journey 2: Connecting wearables and health apps

1. **Settings → Connect devices.** The list shows "Phone health data (Health Connect / Apple Health)" first, then "Other apps (Oura, Withings, Fitbit…)" in later phases.
2. **Data-type picker.** Steps, sleep, heart rate, weight and BP are pre-selected **only if** the user's goals need them. Each type has a one-line "why we need this". Minimisation applies throughout.
3. The OS permission dialog is shown (Health Connect / HealthKit) [S24][S26]. If denied, the app explains how to re-enable it, with no nagging [S45].
4. Optional **history import** (Health Connect requires a separate permission for data older than 30 days before the grant) [S26] ⚠️ **Validate**.
5. **Background sync schedule.** Daily aggregates by default; battery-friendly.
6. **Source priority.** If both watch and phone count steps, the user picks a primary source. Dedup rules apply.
7. Device data is labelled **"Measured by your device — not a medical test"**.

7.4 Journey 3: Uploading an insurance policy and claims

Step	Detail
1. Add policy	Upload PDF / forward insurer email / photograph the e-card. Select "Personal" or "Employer (group)".
2. Parse	Policy parser extracts schedule fields + CIS + benefit table + exclusions + waiting periods, each with clause references.
3. Confirm	User confirms insured members (maps to family profiles), inception date of **continuous** cover (for waiting periods/portability) and TPA.
4. Coverage card	Sum insured · balance (if claims known) · room-rent cap · co-pay · key sub-limits · waiting periods with end dates · top exclusions · renewal date. Every line has "See clause" (opens the PDF at the highlighted span).
5. Add claim	Upload pre-auth letter, discharge bill, settlement or rejection letter; or forward TPA emails.
6. Claim tracker	Timeline: intimation → pre-auth → approval/query → discharge → final approval → settlement; deductions explained line by line ("Non-payable consumables ₹1,840 — Clause 4.2, List I"); denial reason mapped to a taxonomy with suggested next steps (e.g. "insurer's grievance cell → Insurance Ombudsman", information only) [S18] ⚠️ **Validate grievance path wording**.
7. Spend	Claims feed into the OOP spend view (claimed vs paid vs self-paid).

Guardrail: coverage answers are **informational interpretations of the policy document**, not a guarantee of claim admissibility. Show this label on every answer. Never recommend buying, switching or upgrading a policy unless the IRDAI licensing question is resolved (§9.6).

7.5 Journey 4: Uploading lab reports and prescriptions

1. User shares a PDF/photo (in-app, WhatsApp-forward, email-forward, share sheet).
2. **Classification.** Document type (lab report, prescription, discharge summary, bill, policy, other), person match (name/age/sex vs family profiles) and language.
3. **Extraction.**
   - *Lab report:* test rows → name, value, unit, range, flag → LOINC mapping.
   - *Prescription:* drug lines → brand → molecule, strength, dose, frequency, duration; doctor name/registration → HPR lookup.
4. **Confidence routing.**
   - High confidence: auto-accepted as T2 "unconfirmed".
   - Below threshold: "Please check these 3 values", with crops of the original.
   - Handwritten drug lines always need confirmation.
5. **Results.**
   - The timeline is updated.

- Trend charts are updated (only confirmed or high-confidence values).
- The medicine list is updated and **duplicate-molecule check** runs.
- A refill estimate is set if quantity is known.

6. **Explain.** Plain-language explanation of each test (reference knowledge, T6). Values outside the lab's range are marked "outside the lab's reference range" with "Discuss with your doctor". There is **no interpretation of what the abnormality means for the individual**.

7.6 Journey 5: Generating a "Health Financial + Clinical Snapshot"

A single shareable page (in-app, PDF export, and a time-bound doctor-share link) with these sections:

Section	Content	Tier labels
Header	Name, age, sex, blood group, ABHA address (masked), emergency contact, last updated	T4/T1
Active conditions	Each condition with first-recorded date and source	T1/T2/T4
Current medicines	Molecule + brand, dose, frequency, prescriber, last dispensed; duplicate-molecule flags	T1/T2/T4
Allergies	Substance + reaction + source; "unknown" vs "none"	T1/T2/T4
Recent key results	Last 3 values for condition-relevant tests (e.g. HbA1c, fasting glucose, lipids, creatinine/eGFR, TSH, Hb) with lab ranges and trend arrows	T1/T2
Vitals & lifestyle	30/90-day BP average (if home readings), weight trend, steps, sleep	T3/T4
Vaccinations & care gaps	Due/overdue items with guideline source	T5/T6
Hospitalisations & procedures	Dates, facility, discharge diagnosis	T1/T2
Insurance	Policies, sum insured, balance, waiting periods ending soon, key exclusions, renewal dates	T2
Spend (12 months)	Consultations, diagnostics, pharmacy, hospitalisation; reimbursed vs out-of-pocket	T2/T5
Data coverage	"Sources included: 2 hospitals (ABDM), 14 uploaded documents, Health Connect. Not included: …"	—
Disclaimer	"Summary of your records for information. Not a diagnosis. Verify with your clinician."	—

7.7 Journey 6: Asking questions (conversational assistant)

The assistant uses **retrieval over the user's consented graph only**. It answers with citations to source items, labels trust tiers, and refuses or redirects out-of-scope clinical questions. Templates for the five reference questions:

Q1. "What are my recurring health costs?"

> In the last 12 months you spent **₹38,420** on health. ₹24,100 went to medicines (mostly 3 monthly refills: metformin + glimepiride, atorvastatin, telmisartan) and ₹6,800 to diagnostics (4 lab visits). Your insurer reimbursed **₹0** of this, because your policy does not cover OPD expenses (Policy clause 3.1, *see clause*). Recurring monthly average: **≈ ₹2,000 for medicines**. *Sources: 11 pharmacy invoices, 4 lab bills, policy wording. Amounts from documents — please check any marked "unconfirmed".*

Q2. "Am I covered for this procedure?" (e.g. cataract surgery)

> Based on your policy document (Insurer X, "Plan Y", policy no. …1234): • Cataract surgery is listed under **day-care procedures** (Annexure II, *see clause*). • There is a **specific waiting period of 24 months** for cataract (Clause 4.2.b). Your continuous cover started **15 Mar 2025**, so this waiting period ends on **15 Mar 2027**

(computed). • A **sub-limit of ₹40,000 per eye** applies (Schedule, *see clause*). • Planned surgery usually needs **pre-authorisation** from your TPA (Medi Assist) at a network hospital for cashless treatment. **Expected out-of-pocket (estimate):** any cost above the sub-limit + non-payable items. *This is an interpretation of your policy document, not a claim decision. Confirm with your insurer/TPA before admission.*

Q3. "What preventive tests are due?"

For a 52-year-old woman with type 2 diabetes recorded: • **HbA1c** — last done 10 Sep 2026; commonly repeated every 3–6 months as advised by your doctor → *next due around Dec 2026–Mar 2027* (guideline, T6). • **Kidney function and urine albumin** — no record found in your data. • **Eye (retina) check** — no record found. • **Cervical and breast cancer screening** — population screening for women 30+ is offered under the national NCD programme (NP-NCD) [S37]; no record found. • **Blood pressure** — home readings in the last 30 days: average 136/86 (device). Coverage note: preventive health check up to ₹5,000 every 2 policy years under your policy (*see clause*). *These are reminders based on general guidelines and your records. Your doctor may advise differently. [Book with your doctor] [Mark as done elsewhere]*

Q4. "How is my diabetes trend changing?"

HbA1c: 6.4% (12 Jan 2026, Lab A, verified clinical) → 6.9% (20 May 2026, Lab B, from your document) → **7.1% (10 Sep 2026, Lab A, verified clinical)**. The values have **risen across your last three tests**. The lab's reference range is shown on the chart. **Fasting glucose (home meter):** 30-day average 138 mg/dL vs 124 mg/dL three months ago (device/self-entered). **Context you logged:** average steps fell from ~7,500 to ~4,200/day over the same period (device). *Discuss these trends with your doctor. This is not a diagnosis or a treatment recommendation.* **[Share summary with my doctor]**

Q5. "Which claims were rejected and why?"

1 of 3 claims in the last 2 years was **rejected**: Claim …778 (reimbursement, Oct 2025, ₹18,600). Reason stated in the TPA letter: *"Treatment for condition within the 2-year specific-disease waiting period"* → taxonomy: **Waiting period**. 1 claim was **partially approved**: ₹6,240 deducted (₹3,900 room-rent proportionate deduction; ₹2,340 non-payable consumables). **What you can do (information):** request the detailed reasoning from the insurer; use the insurer's grievance process; if unresolved, the Insurance Ombudsman route is available [S18] ⚠️ **Validate**. *Sources: 2 TPA letters, 1 settlement advice.*

Assistant refusal and redirect patterns

User asks	Response pattern
"Do I have diabetes?"	Shows recorded diagnoses and relevant results with sources; "Only a doctor can diagnose. Here's a summary you can share."
"Should I stop my BP tablet?"	"Please don't change medicines without your doctor's advice." Offers doctor-share; no dosing advice.
"I have chest pain now"	**Emergency interrupt** (§9.4): call 112 / nearest emergency; no further chat until acknowledged.
"Which policy should I buy?"	Information on own-policy gaps only; no product recommendation (licensing).

7.8 Journey 7: Family-member view with separate consent

Scenario	Flow	Consent rule
Child (<18)	Parent creates profile → verifiable parental consent captured [S11][S12] → child's records, vaccinations, growth	No behavioural tracking or targeted ads for children [S11]. At 18: notify and transfer control; the parent loses access unless the new adult re-grants.
Elderly parent with own phone	Caregiver sends invite → parent opens link, chooses language, consents with OTP → selects scope for the caregiver: *view*, *manage* (upload, reminders), *emergency-only*	Parent can revoke at any time; the activity log is visible to the parent.
Elderly parent without a smartphone	Assisted consent: caregiver initiates; parent's OTP on a basic phone or in-person confirmation; IVR read-out of notice in local language	`assisted_by` recorded. Periodic re-confirmation. ⚠️ **Validate legal sufficiency** with counsel.
Adult lacking capacity	Lawful guardian flow per DPDP Rules for	Guardian documentation verified ⚠️

Scenario	Flow	Consent rule
	persons with disability [S12]	**Validate**
Spouse	Each adult has their own account; mutual sharing only by explicit grant	No default spouse access.
Sensitive categories	Mental wellbeing, sexual/reproductive health, HIV, and others the user tags as private are **excluded from caregiver views by default**	The person can include them explicitly.

7.9 Journey 8: Consent withdrawal and data deletion

1. **Consent dashboard** → select a consent (e.g. "Hospital X records", "AI summaries", "Health Connect") → **Withdraw**.
2. **Show consequences in plain language:** what stops, and what will be deleted. Offer "Download my data first" (FHIR bundle + PDFs + CSV).
3. **Execute:**
   - *ABDM:* revoke via CM (or reflect revocation initiated in the ABHA app); stop pulls; erase data held under that artifact.
   - *Platform:* stop processing for that purpose.
   - *Devices:* revoke OS permission guidance + stop reads.
4. **Erasure:**
   - Delete or crypto-shred raw and normalised data from that source.
   - Recompute derived insights.
   - Purge from search indexes, caches and analytics stores.
   - Schedule backup expiry (backups age out within a defined window; restored backups re-apply the deletion ledger).
5. **Exceptions disclosed.** Data retained under legal obligation, e.g. transaction/billing records for tax law, and logs required by DPDP Rules / CERT-In for the prescribed period [S12][S20], is kept minimal and access-restricted.
6. **Receipt.** Confirmation of what was deleted, with a reference number. The grievance officer's contact is shown [S11].
7. **Account deletion.** The same flow covers all data. Dependent profiles must be transferred or deleted first.

8. Insight and Summary Engine

8.1 Architecture of insights

```
Graph (consent-filtered view)
    ├── Deterministic rules engine  (care gaps, waiting-period math, OOP, refill dates, duplicate molecule)
    ├── Statistical trend module     (direction, rate, variability; no prediction in MVP)
    ├── Knowledge services (T6)      (guidelines, drug knowledge, policy clauses, test explanations)
    └── LLM layer (constrained)      (summarise, explain, translate, answer Qs — ONLY over retrieved facts)
            └── Safety filter → Citation checker → Tier labeller → UI
```

- **Rules first, LLM last.** Any number, date, eligibility or flag comes from deterministic code with unit tests. The LLM only *phrases* and *translates* those outputs. Every sentence it produces must map to a retrieved fact or rule output (citation checker); sentences without support are dropped.
- **Clinical content governance.** A named clinical safety officer approves every rule, threshold and message template; content is version-controlled; changes go through a hazard log (§9.4).

8.2 Capability specifications

Capability	Inputs	Logic	Output example	Label & guardrail
Health timeline	Encounters, conditions, procedures, meds, labs, claims	Chronological merge; group by episode (admission ± related tests/claims)	"Mar 2026 — Admitted, City Hospital, 3 days: dengue fever (discharge summary). Claim approved ₹42,300."	Source badge on every event
Clinical summary	Active conditions, meds, allergies, immunizations, latest results	Active = clinical status active or recent med/test evidence; "unverified" section for T4-only	See Snapshot §7.6	No new diagnoses inferred; "possible" items listed as "mentioned in documents"
Abnormal value highlighting	Lab results + lab reference range	Outside lab range → mark; repeated outside range → "repeatedly outside range"	"LDL 168 mg/dL — above the lab's reference range"	No severity grading for the individual in MVP (clinician-reviewed critical-value list only triggers "contact your doctor promptly")
Trends	Time series (≥3 points)	Direction via simple regression; change vs prior; variability (BP SD)	"HbA1c has risen across your last 3 tests"	Never "your diabetes is worsening"; wording approved by the clinical safety officer
Fitness & lifestyle summary	Steps, active minutes, sleep, weight, nutrition logs, goals	Weekly/monthly aggregates vs user goals; streaks	"You averaged 6,100 steps (goal 8,000) and 6h 10m sleep this month"	Device-measured label; goals user- or clinician-set
Preventive-care plan	Age, sex, conditions, risk factors, last test dates; guideline rules (T6)	Rule library sourced from Indian programmes (NP-NCD screening for 30+, UIP for children) [S37][S38] and clinician-approved chronic-care monitoring intervals ⚠️ **Validate guideline citations**	"Cervical cancer screening: no record found"	"General guideline — your doctor may advise differently"; user can dismiss
Medication intelligence	Med list, dispenses, adherence logs	**MVP:** duplicate-molecule detection, refill-due estimate, adherence summary. **Phase 2:** licensed DDI checks filtered to clinically significant severity	"Two of your medicines contain the same ingredient (paracetamol)"	"Check with your doctor or pharmacist" — never "stop"
Insurance summary	Policy, coverage, exclusions, waiting periods, claims	Clause-cited extraction; waiting-period end dates; sum-insured consumption; renewal reminders	"PED waiting period ends 15 Mar 2027"	"Interpretation of your policy document, not a claim decision"
Coverage-to-Care gap	Care gaps × coverage/exclusions/waiting periods × network	Join a recommended service to benefit clauses	"Retina check due · OPD not covered · est. ₹800–1,500 out-of-pocket (estimate)"	Estimates shown as ranges with basis
Health spend analytics	Expenses, claims, premiums	Category totals; reimbursed vs OOP;	"Net OOP in FY 2025-26: ₹52,300 (excluding	Amounts from documents; information only, no tax

Capability	Inputs	Logic	Output example	Label & guardrail
		recurring detection; annual premium vs claims	premiums)"	advice
Claim analytics	Claims, letters	Status history, TAT, deduction categories, denial taxonomy	"Room-rent proportionate deduction caused 63% of your deductions"	Information only
Risk flags	Rule triggers (critical values, red-flag symptoms, dangerous combinations)	Clinician-approved rules with severity levels	"Your report shows a value the lab marked critical. Contact your doctor today."	Informational; escalation path; logged

8.3 Care-gap rule library: structure

```yaml
rule_id: CG-DM-UACR-01
title: "Urine albumin (kidney check) for people with diabetes"
applies_if:
  condition_any: [SNOMED:44054006]          # Type 2 diabetes mellitus
evidence_of_completion:
  loinc_any: ["14959-1", "9318-7"]         # microalbumin / albumin-creatinine ratio (validate codes)
interval_months: 12                          # set by clinical governance
guideline_ref: "Clinician-approved, aligned to national/Indian society guidance (cite)"
message_key: cg.dm.uacr.due
coverage_lookup: [benefit:OPD, benefit:annual_health_check]
severity: reminder
owner: clinical_safety_officer
version: 1.2
```

> The LOINC and SNOMED codes above are illustrative. They must be validated by the clinical informatics lead against current LOINC/SNOMED CT releases and NRCES value sets [S6][S50].

8.4 Explainability standard (every insight)

Each insight card must show:

1. **What**: the statement.
2. **Based on**: linked source items, with tier badges.
3. **How**: the rule or method in plain words.
4. **Confidence / limitations**: missing sources, unconfirmed values.
5. **What you can do**: a non-directive action (discuss with doctor, book test, check policy clause).
6. **Feedback**: "Is this wrong?", which feeds the correction workflow.

Example (corrected from v1.0):

> **HbA1c trend.** Your HbA1c was 6.4% on 12 Jan 2026 and 7.1% on 10 Sep 2026 (both from Lab A, verified clinical). Both values are above the lab's reference range (4.0–5.6%), and the later value is higher. *Method:* comparison of your two most recent lab results. *Limitation:* results from other labs may not be included. **Please discuss this trend with your doctor; this is not a diagnosis.**

9. Trust, Safety, Privacy, and Compliance

Legal-advice flag. This section maps obligations for product design. It is **not legal advice**. Engage Indian counsel with DPDP, health-regulatory and insurance expertise before launch, and obtain written opinions on the items marked ⚖️ **Opinion required**.

9.1 Regulatory map

Regime	Applies to this product because…	Key obligations / risks	Status / validation
DPDP Act, 2023 [S11]	The company processes digital personal data (including health data) of Data Principals in India	Notice; consent or legitimate use; purpose limitation; accuracy; reasonable security safeguards; breach intimation; erasure; children's data; grievance redressal; Data Principal rights (access, correction, erasure, nomination); penalties up to **₹250 crore** for failure to take reasonable security safeguards [S11]	Act in force in phases via the Rules
DPDP Rules, 2025 [S12]	Operational detail for the Act	Notice content; Consent Manager registration; breach intimation to each affected person and to the Board (detailed report within **72 hours**, as understood); reasonable security safeguards (encryption/masking/tokenisation, access control, logging and monitoring, backups); log retention of at least one year; verifiable parental consent; exemptions for healthcare professionals/clinical establishments in specified cases; Significant Data Fiduciary duties	Notified **November 2025**; phased commencement, with most fiduciary obligations ~18 months after notification ⚠️ **Validate exact dates and rule numbers**
ABDM Health Data Management Policy [S16] and ABDM participation terms	The product participates as PHR/HIU (and HIP)	Consent per ABDM artifact; purpose limitation; erasure at `dataEraseAt`; security standards; audit; no use beyond consent ⚠️ **Validate latest HDM Policy version and HIU storage rules**	Condition of ABDM integration
CERT-In Directions (28 April 2022) [S20]	The company is a body corporate / service provider operating IT systems in India	Report specified cyber incidents to CERT-In within **6 hours**; maintain ICT logs for **180 days** within India; synchronise clocks to NTP sources designated by NIC/NPL	In force ⚠️ **Validate any amendments**
IT Act 2000 s.43A / SPDI Rules 2011	Health data is "sensitive personal data" under the SPDI Rules	Reasonable security practices (e.g. ISO 27001-type), consent, disclosure limits	Continue until DPDP provisions replace them (the DPDP Act omits s.43A on commencement) ⚠️ **Validate commencement**
Telemedicine Practice Guidelines 2020 [S21]	If the product connects users to doctors or enables tele-consults	Only registered medical practitioners may consult; platforms must verify RMPs; **AI/ML platforms may not counsel patients or prescribe**	Applies to any tele-consult feature; shapes the AI assistant's scope
Medical Devices Rules 2017 /	Software intended for	Risk classification, licensing,	⚖️ **Opinion required** on

Regime	Applies to this product because...	Key obligations / risks	Status / validation
CDSCO [S22]	diagnosis, monitoring or treatment may fall within the medical-device definition	quality management (ISO 13485), clinical evaluation	whether risk flags, interaction alerts or trend scoring are SaMD; design MVP to stay "informational"
Mental Healthcare Act 2017 [S23]	Optional mental-wellbeing features	Right to confidentiality of mental-health information	Design: separate consent, exclusion from sharing by default
IRDAI regulations [S18][S19] [S47]	Insurance explainers, claim assistance, any renewal/recommendation	Product and policyholder-protection norms (CIS, claim timelines); **intermediary registration** if soliciting/recommending/sellin g insurance	⚖️ **Opinion required** before any "renew/compare/buy" feature
Consumer Protection Act 2019, E-Commerce Rules 2020, CCPA Dark Patterns Guidelines 2023 [S45]	Consumer-facing subscription app	Fair pricing disclosure; easy cancellation; no dark patterns (false urgency, basket sneaking, confirm-shaming, forced action, subscription traps, nagging, etc.)	Applies to consent and subscription UX
Drugs and Cosmetics Act/Rules; Drugs and Magic Remedies (Objectionable Advertisements) Act	Pharmacy referrals; health claims in marketing	No facilitation of unlawful sale of prescription drugs; no prohibited health advertising claims	Relevant to marketplace features
Clinical Establishments Act 2010	Only if the company itself provides clinical services	Registration under state adoption	Likely not applicable to a data platform ⚠️ **Validate per state**
ICMR Ethical Guidelines for AI in Biomedical Research and Healthcare (2023) [S44]	AI features; any research use	Autonomy, safety, data privacy, accountability, transparency, ethics-committee oversight for research	Adopt as governance baseline

9.2 DPDP obligations translated into product controls

DPDP principle	Product control	Owner	Evidence artefact
Notice (s.5)	Layered, multilingual notice per purpose; versioned	Legal + Design	Notice registry with hashes
Consent (s.6)	Purpose catalogue (§5.4), granular toggles, consent ledger, withdrawal as easy as grant	Product + Eng	Consent ledger; UX test records
Legitimate uses (s.7)	Narrow use, e.g. a **medical emergency** basis for showing emergency info; do not stretch it to cover analytics	Legal	Basis register per processing activity
Accuracy (s.8(3))	Correction workflow; conflict surfacing; source display	Product	Correction logs
Security safeguards (s.8(5))	Controls in §9.3	Security	ISMS, pen-test reports
Breach intimation (s.8(6))	Incident runbook (§9.5)	Security + Legal	Incident register
Erasure (s.8(7))	Retention schedule + crypto-shredding	Eng	Deletion ledger
Grievance (s.8(10), s.13)	In-app grievance with SLA tracking; published grievance officer	Support	Ticket metrics
Children (s.9)	Verifiable parental consent; no tracking/behavioural monitoring/targeted ads for children	Product + Legal	VPC records
Rights (s.11–14)	Self-serve access/export (FHIR + PDF), correction, erasure,	Product	Rights-request logs

DPDP principle	Product control	Owner	Evidence artefact
	nomination of a person to exercise rights on death/incapacity		
Significant Data Fiduciary (s.10)	Prepare for possible notification as SDF (large volumes of sensitive health data): DPO in India, periodic DPIA, independent audit	Legal	DPIA, audit reports ⚖️ **Opinion required**
Cross-border transfer (s.16)	Host in India; restrict vendors (LLM/OCR) to India regions or contractually controlled processing; monitor any government restriction list	Eng + Legal	Data-flow map; vendor register

9.3 Security architecture controls

Control area	Implementation
Data classification	C4: raw clinical documents, FHIR bundles, mental-health data, identifiers (ABHA number, policy numbers). C3: normalised clinical/insurance graph. C2: derived insights. C1: de-identified aggregates.
Encryption	TLS 1.2+ (1.3 preferred) in transit; AES-256 at rest; **envelope encryption with per-person, per-source data keys** in a cloud KMS/HSM (India region); ABDM transfers via per-request ECDH Curve25519 key pairs [S60]; mental-health data under a separate key hierarchy.
Crypto-shredding	Erasure of a source = destroy its data key; backups become unreadable for that scope.
Identity & access	Customer: OTP + device binding + optional biometric app lock. Workforce: SSO + MFA + just-in-time privileged access; **no standing human access to C4 data**; break-glass with dual approval and logging.
Authorisation	Attribute-based access control: `subject × purpose × consent × data category`; enforced in a central policy engine (e.g. OPA-style) on every API, export and analytics job.
Tokenisation / masking	ABHA number, Aadhaar-linked fields (never store the Aadhaar number), policy numbers, mobile numbers tokenised; masked in logs, support tools and analytics.
Audit	Immutable, append-only audit log (WORM storage) of consent, access, disclosure, export, correction, revocation and deletion events; user-visible access log.
Logging & monitoring	SIEM; anomaly detection on bulk access; log retention ≥ 180 days in India (CERT-In) and ≥ 1 year where DPDP Rules require [S12][S20]; time sync to designated NTP.
Application security	Secure SDLC; SAST/DAST; dependency scanning; mobile app hardening (root/jailbreak detection, certificate pinning, encrypted local storage); OWASP MASVS alignment; annual third-party pen test + ABDM WASA [S59].
Vendor governance	DPDP-aligned processing agreements; sub-processor register; security assessment; data-residency clauses; **no-training clauses** for LLM/OCR vendors; deletion SLAs.
Resilience	Multi-AZ in an India region; encrypted backups with tested restore; RPO/RTO targets; DR in a second India region.
Certifications (target)	ISO/IEC 27001 and 27701; SOC 2 Type II for B2B buyers (optional).

9.4 Clinical safety framework

Element	Requirement
Clinical safety officer	Named, registered medical practitioner accountable for clinical content, rules and thresholds

Element	Requirement
Hazard log	Identify hazards (e.g. misread drug dose, missed critical value, false reassurance, outdated guideline, wrong-person record), assess severity × likelihood, define mitigations, track residual risk
Intended-use statement	"Information and organisation of personal health records; general wellness and preventive reminders; not for diagnosis or treatment decisions." Supports the SaMD position ⚖️ **Opinion required**
Language rules	Approved verbs: *shows*, *recorded*, *outside the lab's range*, *has risen*, *is due*, *discuss*. Prohibited: *you have*, *diagnosis*, *you should take/stop*, *safe*, *normal for you*, *cured*
Critical values	Clinician-approved list of lab-flagged critical values → prominent "contact your doctor today / seek care" message; no attempt at interpretation
Red-flag symptoms	When a user types symptoms such as chest pain, breathlessness, stroke signs, severe bleeding, suicidal thoughts or loss of consciousness: **emergency interrupt** with 112 (national emergency), 108 (ambulance, in most states), and Tele-MANAS **14416** for mental-health support [S39] ⚠️ **Validate all numbers per state before release**
No delayed care by design	The app never says "no need to see a doctor"; absence of data is never presented as absence of disease
Human review	High-risk outputs (critical values, interaction alerts at "major" severity) can be routed to a clinician-review queue in premium tiers
Post-market surveillance	Track user-reported errors, near-misses and complaints; monthly safety review; incident reporting process

9.5 Breach response runbook (summary)

Phase	Actions	Clock
Detect & triage	SIEM alert / report → incident commander; severity classification	T0
Contain	Revoke credentials/keys; isolate systems; preserve evidence	ASAP
Report to CERT-In	Reportable incident types	**Within 6 hours** of noticing [S20]
Intimate Data Protection Board	Initial intimation without delay; detailed report (facts, cause, mitigation, affected persons)	**Within 72 hours** (or as extended by the Board) per DPDP Rules [S12] ⚠️ **Validate**
Notify affected Data Principals	Plain-language notice: nature, extent, likely consequences, mitigation, steps to protect themselves, contact	Without delay [S12]
Notify ABDM / partners	Per ABDM and partner agreements	As contracted ⚠️ **Validate ABDM reporting requirement**
Remediate & review	Root cause; fixes; lessons learned; update hazard log/DPIA	Post-incident

9.6 Insurance-related compliance boundaries

Feature	Risk level	Position
Show the user's own policy terms, waiting periods, exclusions (from their document)	Low	Information service; label as interpretation; cite clauses
Claim tracker and deduction explainer	Low–Medium	Information; no representation before insurer on user's behalf in MVP
Claim assistance (filing on the user's behalf, follow-up with TPA)	Medium	Check whether this constitutes an intermediary activity or claims consultancy requiring authorisation ⚖️ **Opinion required**
"Your cover may be inadequate" (coverage adequacy)	Medium	Information about own policy only; no product suggestion
Compare/recommend/sell/renew	**High**	Requires IRDAI registration (e.g. corporate

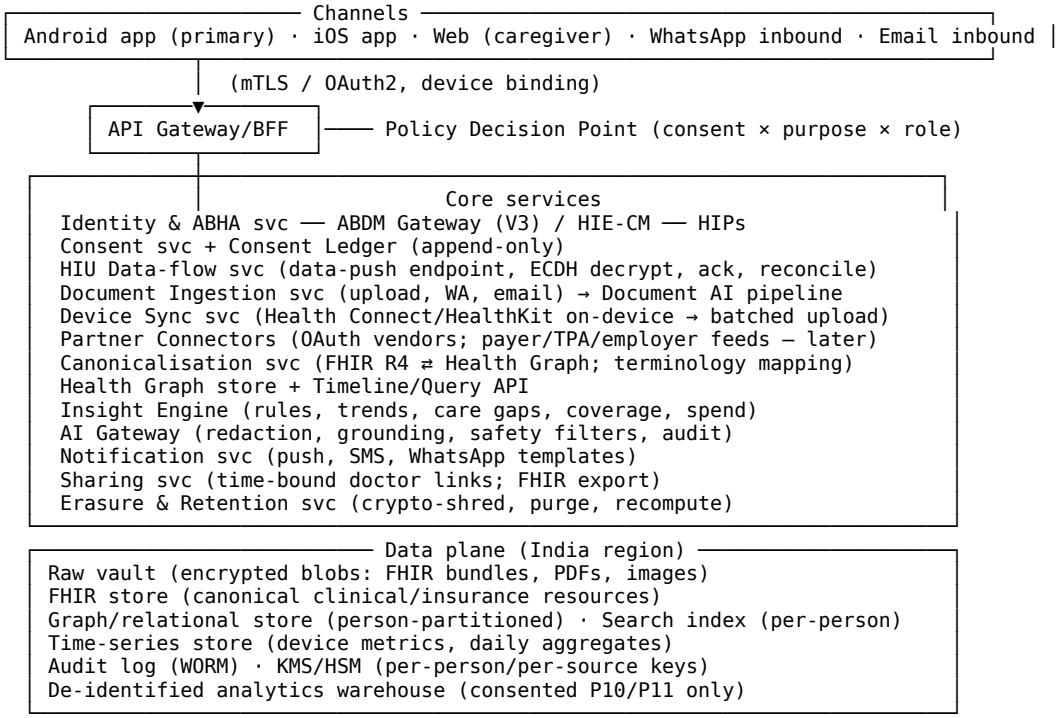
Feature	Risk level	Position
policies; earn commission		agent, web aggregator, broker) or partnership with a registered intermediary with clear disclosures [S47] ⚖️ **Opinion required**
Share user data with insurers for underwriting	**High**	Not in roadmap. If ever considered: separate explicit consent, no penalty for refusal, legal review, and no use of data obtained for care purposes

9.7 Responsible AI controls

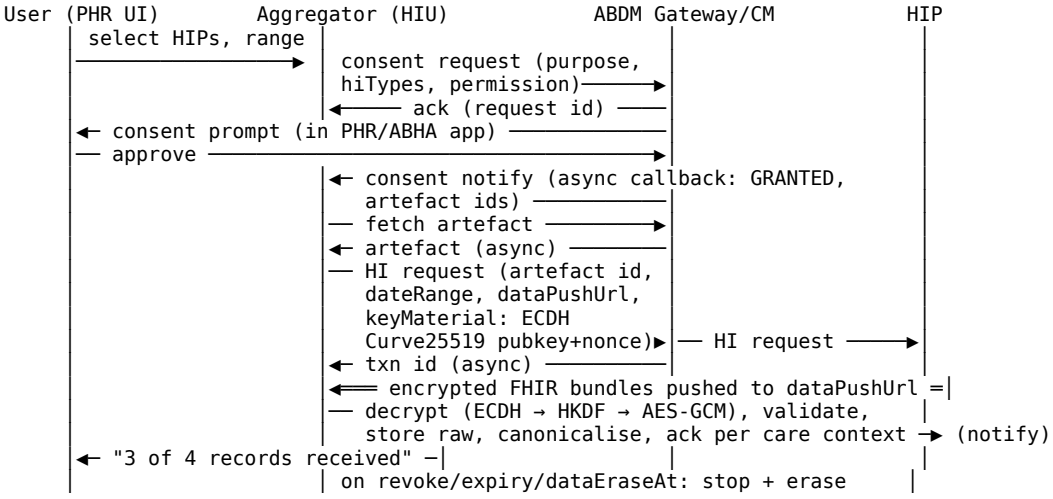
Control	Implementation
Consent-aware retrieval	The LLM context only receives facts from consents covering the `clinical_summary` / `insurance_analysis` purposes
Minimisation & redaction	Direct identifiers (name, ABHA, phone, policy number, addresses) removed or pseudonymised before model calls; full histories never sent by default
Model hosting	Prefer models hosted in India regions or self-hosted; contractual **no-retention / no-training**; logs within India ⚠️ **Validate vendor region availability**
Grounding & citation	Every generated sentence linked to a fact ID or rule output; unsupported sentences dropped; numbers copied from structured fields, never generated
Safety filters	Red-flag detection before generation; prohibited-language filter after generation
Evaluation	Golden test sets in English and Indian languages (lab explanations, policy Q&A, refusals); hallucination rate, citation accuracy and refusal correctness tracked per release; clinician review of samples
Auditability	Store prompt template version, retrieved fact IDs, model version, output, and safety-filter results per response (retained per audit policy, access-restricted)
Transparency	“AI-generated summary” label; “How this was made” link; easy error reporting
Low-confidence data	Excluded from AI context unless user-confirmed

10. Technical Architecture

10.1 Logical architecture



10.2 ABDM HIU / PHR data flow (corrected sequence)



Notes:

- Every ABDM interaction is asynchronous (request → `on-` callback). Implement idempotency keys (`REQUEST-ID`), timestamps and retries [S60].
- Use V3 gateway endpoints with `X-CM-ID` = `sbx` (sandbox) or `abdm` (production) [S60].
- Generate a **new key pair per HI request**. Store private keys only in memory/KMS for the life of the transaction.

10.3 HIU integration pseudocode (corrected for async consent)

```
# 1. Create consent request (purpose codes per ABDM; validate against current spec)
req_id = abdm.consent_requests.init(
    patient_abha_address=person.abha_address,
    purpose_code="PATRQT",                  # self-requested (validate); CAREMGT for doctor-share
    hi_types=["DiagnosticReport", "Prescription", "DischargeSummary", "OPConsultation"],
    hips=selected_hip_ids,
    permission={
        "accessMode": "STORE",
        "dateRange": {"from": "2023-01-01T00:00:00Z", "to": "2026-10-21T00:00:00Z"},
        "dataEraseAt": "2027-10-21T00:00:00Z",
```

```
        "frequency": {"unit": "HOUR", "value": 1, "repeats": 0},
    },
)
ledger.record_pending(person.id, req_id, purpose="P2_abdm_self_access")

# 2. Asynchronous callback when the user approves or denies in the PHR/ABHA app
@callback("/v3/hiu/consent/request/notify")
def on_consent_notify(evt):
    verify_gateway_signature(evt)
    ledger.update_status(evt.consent_request_id, evt.status)          # GRANTED / DENIED / REVOKED / EXPIRED
    if evt.status == "GRANTED":
        for artefact_id in evt.consent_artefact_ids:
            abdm.consents.fetch(artefact_id)                          # result arrives via on-fetch callback
    elif evt.status in ("REVOKED", "EXPIRED"):
        erasure.schedule(scope=evt.consent_artefact_ids)

@callback("/v3/hiu/consents/on-fetch")
def on_artefact(evt):
    artefact = evt.consent
    ledger.attach_artefact(artefact)
    keys = crypto.new_x25519_keypair()                                # per request; never reused
    kms.hold_ephemeral(artefact.id, keys.private)
    abdm.health_information.request(
        consent_id=artefact.id,
        date_range=artefact.permission.dateRange,
        data_push_url=settings.DATA_PUSH_URL,
        key_material=keys.public_material(nonce=crypto.nonce32()),
    )

# 3. HIP pushes encrypted bundles to the data-push endpoint
@endpoint("/data/push", idempotent_on="transactionId+careContextReference")
def on_data_push(payload):
    priv = kms.get_ephemeral(payload.consent_id)
    for entry in payload.entries:
        bundle = crypto.decrypt_abdm(entry.content, priv, payload.keyMaterial)   # ECDH -> HKDF -> AES-GCM
        raw_ref = vault.put_encrypted(bundle, person_key(payload))
        result = fhir.validate(bundle, profiles="NRCES")
        nodes = canonicalise(bundle, provenance={
            "consent_id": payload.consent_id, "txn_id": payload.transactionId,
            "source": payload.hip_id, "raw_ref": raw_ref, "trust_tier": "T1"})
        graph.upsert(nodes, dedupe=True)
    abdm.health_information.notify(payload.transactionId, status="TRANSFERRED")
    insights.recompute(person=payload.person_id)
```

10.4 Document AI pipeline

Stage	Function	Build / buy note
Intake	Virus scan, file type check, page split, de-duplication by hash	Build
Pre-processing	De-skew, de-noise, glare detection, orientation	Buy/OSS
OCR	Printed English + major Indian scripts; handwriting (low confidence)	**Buy/partner** (evaluate India-region availability and accuracy on Indian lab/pharmacy layouts)
Classification	Lab / prescription / discharge / bill / policy / CIS / claim letter / e-card / other	Build (fine-tuned on own labelled data, with consent P10 or synthetic data)
Layout & table extraction	Lab tables, bill line items, benefit tables	Build + OSS
Clinical NER & normalisation	Tests → LOINC, drugs → molecule/SNOMED, diagnoses → SNOMED/ICD-10, units → UCUM	Build on licensed terminology + Indian drug dictionary
Policy clause extraction	Benefits, limits, exclusions, waiting periods with spans	**Build** (core IP)
Confidence scoring	Field-level calibrated confidence	Build
Human-in-the-loop	User confirmation UI; internal review queue for premium/critical items (with consent and strict access controls)	Build
Output	Canonical nodes with provenance + page/bbox references	Build

Accuracy targets (to validate in pilot): ≥ 98% field accuracy on confirmed lab values; ≥ 95% on printed prescriptions after confirmation; clause-citation precision ≥ 95% on policy Q&A. Track per lab chain and insurer template.

10.5 Technology choices (indicative)

Layer	Options	Notes
Cloud	Hyperscaler India regions (Mumbai/Hyderabad/Delhi NCR/Pune)	Keep all personal data in India; DR in a second India region
FHIR server	HAPI FHIR (OSS) or a managed FHIR service available in an India region	NRCES profile validation [S6]
ABDM integration	Own implementation on V3, referencing NHA's open-source ABDM-wrapper [S60]	The wrapper is Spring Boot + MongoDB; evaluate for reuse vs reference
Graph/relational	PostgreSQL (person-partitioned, row-level security) + edge tables; or a graph DB if query patterns justify it	Simplicity favours Postgres for MVP
Time series	Timescale/ClickHouse-class store for device data	Daily aggregates by default
Search	Per-person encrypted index	Avoid cross-person indexes on C3/C4 data
Policy engine	OPA-style ABAC	Single enforcement point
Mobile	Kotlin (Android) + Swift (iOS), or cross-platform with native Health Connect/HealthKit modules	Health Connect and HealthKit need native code
Terminology	SNOMED CT (India NRC), LOINC, ICD-10, UCUM, ATC [S50]	Licence registrations
LLM	India-hosted model endpoints with no-retention terms, or self-hosted open models	Behind the AI Gateway
Messaging	WhatsApp Business Platform via a BSP; SMS via DLT-registered templates (TRAI)	Opt-in records; template approval

10.6 Non-functional requirements

NFR	Target (MVP)
Availability	99.5% app/API; data-push endpoint 99.9% (ABDM pushes must not be lost)
Latency	Timeline load < 2 s on 4G for 500 items; Snapshot < 5 s
Document turnaround	Parsed result < 60 s for a typical 2-page lab report
Scalability	Person-partitioned design; horizontal scaling of ingestion workers
Privacy	100% of reads pass the policy engine; zero C4 data in logs
Erasure	Source-level erasure executed within a defined SLA; backups age out within the defined backup-retention window
Accessibility	WCAG 2.1 AA-aligned; font scaling; screen-reader labels; read-aloud
Localisation	All user-facing strings externalised; medical glossary per language reviewed by clinicians

11. MVP Scope and Roadmap

11.1 Source prioritisation (value × feasibility)

Source	User value	Feasibility	MVP decision
Lab report PDFs/photos	Very high (most common artefact; trends)	High	**Include (core)**
Prescriptions (printed + handwritten with confirmation)	High (medicine list)	Medium	**Include**
Discharge summaries	High (hospitalisation history)	Medium	**Include**
Insurance policy schedule + CIS + e-card	Very high (paid wedge)	High	**Include (core)**
Claim letters / settlement advices	High	High	**Include**
Pharmacy invoices	High (medicines + spend)	High	**Include**
ABDM records (PHR + HIU)	High where available; trust anchor	Medium (certification on critical path)	**Include**: launch with document flows if ABDM production access is still pending
Health Connect / HealthKit	Medium (chronic-care context)	High	**Include** (steps, sleep, weight, BP, glucose, heart rate)
Manual entry (allergies, history, family history, vitals)	Medium	High	**Include**
Vendor wearable clouds (Oura, Withings, Fitbit, Garmin)	Low–Medium in India	Medium	Phase 2
Nutrition logging	Medium (diabetes users)	Medium (Indian dish DB needed)	Phase 2
Mental-wellbeing check-ins	Medium	High technically / high governance need	Phase 2 (after clinical safety sign-off)
Payer/TPA/employer feeds	Very high	Low (partnerships)	Phase 2 (pilot partners)
NHCX (via provider SaaS / partner)	High	Low	Phase 3
AA insurance data	Medium	Low–Medium	Phase 2 discovery
Email-inbox scanning (Gmail API)	Medium	Low (restricted-scope assessment) [S33]	Not planned; use forwarding instead

11.2 90-day MVP definition

Target users for the pilot: urban/semi-urban Android users aged 30–60 who manage a chronic condition, or who care for a parent with one, and hold at least one health insurance policy (retail or group). Pilot in 1–2 cities and 2 languages (English + Hindi; add one regional language if the pilot city requires).

Must-have features

#	Feature	Acceptance criteria
F1	Account, language choice, consent onboarding with purpose catalogue	All purposes separately toggleable; consent ledger records every event; notice in 2 languages
F2	ABHA create/login + record discovery/linking + self-requested fetch (PHR + HIU)	Sandbox-certified flows; production when credentials are granted; partial-delivery tracking
F3	Document ingestion: upload, camera, share-sheet, **WhatsApp-forward**, **email-forward**	Classification + person-assignment prompt; offline queue
F4	Lab report, prescription, discharge summary, pharmacy invoice parsing with confirmation UI	Confidence routing; source crop view; corrections logged

#	Feature	Acceptance criteria
F5	Policy + CIS + e-card parsing; coverage card; waiting-period calculator; clause citations	Every coverage statement cites a clause span
F6	Claim tracker (document-driven) + deduction/denial explainer	Status timeline; denial taxonomy; deductions sum check
F7	Unified timeline + clinical summary + Snapshot (PDF + time-bound doctor-share link)	Tier badges; data-coverage statement; share link expiry + access log
F8	Trends for key labs and vitals; duplicate-molecule check; refill estimates; medicine reminders	Rules unit-tested; clinical safety officer sign-off on wording
F9	Care-gap reminders (limited, clinician-approved rule set: diabetes, hypertension, NP-NCD 30+ screening, child UIP)	Each reminder cites rule + guideline; dismissible
F10	Spend dashboard (OOP vs reimbursed; recurring costs)	Reimbursements offset correctly
F11	Family profiles: minors (verifiable parental consent) + adult invite with scoped caregiver grants	Sensitive categories excluded by default
F12	Health Connect / HealthKit sync (selected types)	Per-type permission; daily aggregates
F13	Consent dashboard, data export (FHIR + PDF), withdrawal + erasure, account deletion	Erasure executes end-to-end, including derived insights
F14	Grounded Q&A assistant for the five reference question types (§7.7), with refusal patterns	Golden-set pass thresholds; citations on every answer
F15	Emergency interrupt and helpline access	Red-flag terms tested in both languages

Explicitly out of MVP: provider cohort dashboards; insurer/TPA integrations; policy recommendations or sales; drug-interaction alerts beyond duplicate molecules; mental-health screeners; nutrition logging; vendor wearable clouds; UHI booking; marketplace referrals.

MVP data model: the Section 6 entities **Person, Relationship, ABHA Identity, Consent Record, Caregiver Grant, Facility, Clinician, Encounter, Condition, Allergy, Immunization, Medication, Medication Dispense, Lab Result, Diagnostic Report, Vital, Wearable Metric (daily), Activity, Sleep, Insurance Policy, Coverage, Exclusion, Waiting Period, Premium, Claim, Expense, Care Gap, Alert**, all with the common provenance envelope.

MVP consent flows: onboarding purposes (P1, P3, P4, P5, P6 opt-in); ABDM self-access (P2, `PATRQT/STORE`); doctor-share (P7, `VIEW`, time-bound); caregiver grants (P8); P10/P11/P12 **off** and not prompted in MVP.

MVP workstreams and exit criteria (scheduling is left to the team)

Workstream	Key deliverables	Exit criterion
Compliance & legal	DPIA; notices; consent catalogue; processor agreements; legal opinions (IRDAI, SaMD, HDM retention)	Opinions received; DPIA signed by DPO
ABDM integration	Sandbox registration (V3); M1 + PHR flows + M3; functional tests; WASA audit; sandbox-exit application	Sandbox test cases passed; audit findings closed; production request filed
Document AI	Classifiers; lab/prescription/invoice/policy/claim extractors; confirmation UI	Accuracy targets met on pilot corpus
Graph & insights	Canonical model; dedup/conflict rules; rule library v1; trends; spend	Clinical safety officer sign-off; unit-test coverage on rules
App & UX	Android-first app (iOS if resourced), 2 languages, accessibility	Usability tests with low-literacy and elderly participants
Security	KMS envelope encryption; ABAC; audit log; pen test	Pen test with no open critical/high findings

Workstream	Key deliverables	Exit criterion
Pilot ops	Recruitment, support desk, grievance workflow	Pilot cohort onboarded

11.3 MVP success metrics

Metric	Definition	Pilot target (hypothesis to validate)
Activation	% of sign-ups adding ≥1 record within 24h	≥ 60%
ABHA link rate	% of users who link/create ABHA	≥ 40%
HIP fetch yield	Average consented HIP connections per ABHA-linked user; % yielding ≥1 record	Measure (baseline)
Structured share	% ABDM records with coded Observations vs PDF-only	Measure (baseline)
Parse accuracy	Field accuracy after confirmation (labs / prescriptions / policies)	≥ 98% / ≥ 95% / ≥ 95%
Time to Snapshot	From first upload to Snapshot	< 10 minutes
Insurance engagement	% users with a parsed policy who open a coverage answer	≥ 50%
Care gaps	Gaps surfaced per user; % marked done within the pilot	Measure
Doctor-share	% of users sharing a Snapshot with a clinician	≥ 15%
Retention	D30 retention (caregiver and chronic segments)	≥ 35%
Trust	% of users reporting they understand who can see their data (survey)	≥ 80%
Safety	Clinically significant errors reaching users	0 tolerated; all near-misses reviewed
Conversion (if paywall tested)	Premium/family plan conversion	Measure by price-point A/B

11.4 Phase 2 (after MVP validation)

Theme	Capabilities
Insurance depth	Payer/TPA/employer pilot integrations (claim-status events, e-cards, network lists); AA insurance-data discovery; cashless pre-admission checklist; renewal-risk alerts (information only)
Clinical depth	Licensed drug-interaction checks with clinician-approved severity filtering; expanded care-gap library (cardiac, thyroid, CKD, maternal, adult vaccination); clinician-review queue (premium)
Lifestyle	Indian-dish nutrition logging (IFCT-based, dietitian-curated); vendor wearable clouds (Oura, Withings, Fitbit, Garmin with approval); CGM CSV import
Mental wellbeing	Opt-in mood check-ins and validated screeners with crisis routing (after safety sign-off)
ABDM	Act as HIP to re-share user documents and wellness records; Scan & Share support
B2B2C	Employer benefits-navigation offering (aggregated reporting only)
Languages	6–8 Indian languages with clinician-reviewed glossaries; voice-first navigation

11.5 Phase 3

Theme	Capabilities
Provider SaaS	Clinician dashboard for patient-shared summaries; consented care-gap lists; NHCX participation as provider technology partner (eligibility/pre-auth/claim) [S59]
Care navigation	UHI-based booking for diagnostics/consults to close gaps [S13]; neutral ranking with conflict disclosures
Insurance (regulated)	If licensing obtained or via a registered partner: compliant

Theme	Capabilities
	comparison/renewal journeys
Research & population health	Opt-in, ethics-approved, de-identified research programme [S44]; aggregated benchmarks for employers/payers
Advanced analytics	Validated risk models only with regulatory clearance where required (CDSCO)
Environment	AQI-aware respiratory insights (opt-in, coarse location)

12. Build vs Partner Decisions

Capability	Decision	Rationale	Candidate partner types	Licence / regulatory note
ABDM integration (M1, PHR, M3, M2)	**Build** (reference NHA's open-source wrapper [S60])	Core competency; certification owned by the company	NHA integration support	ABDM certification + WASA audit
Consent ledger & policy engine	**Build**	Core trust IP	—	DPDP
Health Graph & canonicalisation	**Build**	Core IP; quality differentiator	—	Terminology licences
FHIR server	**Adopt OSS / managed**	Commodity	HAPI FHIR; managed FHIR in India region	Data residency
OCR engine	**Partner/buy**	Commodity; multilingual handwriting is hard	Cloud OCR vendors (India region), Indian OCR specialists	Processor agreement; no-training clause; residency
Document understanding (lab/prescription/policy/claim)	**Build on top of OCR**	Indian templates and clause extraction are differentiators	Annotation vendors (under strict DPAs, synthetic/de-identified data)	Consent P10 or synthetic data only
Indian brand→molecule dictionary	**License + curate**	Coverage and update burden	Indian drug-information publishers	Commercial licence
Drug-interaction knowledge base	**License**	Clinical liability; maintenance	Global DDI knowledge-base vendors	Commercial licence; clinical governance
Terminology (SNOMED CT, LOINC, ICD-10)	**License (free/affiliate)**	Standards	NRCES (SNOMED CT India NRC) [S50]; Regenstrief (LOINC)	Affiliate registrations
Nutrition database	**License + curate**	Indian dish coverage	ICMR-NIN (IFCT) [S34]; academic datasets; dietitians	Licence for commercial use ⚠️ **Validate**
Wearable connectivity	**Build** on Health Connect/HealthKit; **partner** with vendors later	OS aggregators give broad coverage cheaply	Garmin/Samsung partner programmes	Platform policies [S25] [S26]
Multilingual (ASR/TTS/translation)	**Partner**	Speed to multi-language	Bhashini [S58]; commercial Indian-language AI vendors	Clinician review of medical translations
LLM	**Partner/self-host** behind own AI Gateway	Rapid evolution; keep control layer in-house	India-region model hosting; open-weight models	No-retention, residency
WhatsApp / SMS	**Partner**	Regulated channels	WhatsApp BSPs; DLT-registered SMS aggregators	Opt-in; template approval; TRAI DLT
Payer/TPA/employer data	**Partner**	No public APIs	Insurers, TPAs, employee-benefit platforms	Data-sharing agreements; IRDAI considerations
Insurance distribution	**Partner** (if pursued)	Licensing	IRDAI-registered intermediary	⚖️ **Opinion required**
Tele-consult / clinician review	**Partner**	Regulated practice	RMP networks/telemedicine providers compliant with TPG 2020 [S21]	Telemedicine guidelines
Diagnostics/pharmacy fulfilment	**Partner**	Not core; conflict-of-interest risk	Lab chains, licensed pharmacies	Disclosures; drug-law compliance
Security operations	**Hybrid**	24×7 coverage	MSSP for SOC; CERT-In empanelled auditors	CERT-In directions

13. Key Risks and Mitigations

#	Risk	Category	Likelihood	Impact	Mitigation	Owner
R1	Breach of health data	Security	Medium	Severe	Envelope encryption + crypto-shredding; no standing access; SIEM; pen tests; runbook (6h CERT-In, 72h Board) [S12] [S20]; cyber insurance	CISO
R2	Invalid or bundled consent (DPDP non-compliance)	Privacy	Medium	High	Purpose catalogue; unbundled toggles; versioned multilingual notices; consent receipts; UX audits against dark-pattern guidelines [S45]	DPO
R3	Purpose creep (using care data for marketing, model training, underwriting)	Privacy	Medium	High	Policy engine enforces purpose; P10–P12 off by default; data-use review board	DPO
R4	Over-retention of ABDM data beyond `dataEraseAt`	Compliance	Medium	High	Automated erasure scheduler tied to artifacts; audits; erasure tests in CI [S60]	Eng lead
R5	Cross-border transfer via LLM/OCR vendors	Compliance	Medium	High	India-region processing; redaction; contractual controls; vendor register	DPO
R6	Misread lab value or drug dose from OCR	Clinical safety	High	High	Confidence thresholds; mandatory confirmation for drug lines; plausibility checks; source crops; low-confidence data excluded from insights	Clinical safety officer
R7	Misinterpretation of lab values / false reassurance	Clinical safety	Medium	High	Lab-specific ranges; approved language; no “normal for you”; “absence of data ≠ absence of disease”	CSO
R8	LLM hallucination	AI safety	Medium	High	Rules-first; grounding + citation checker; numbers from structured fields; golden-set evaluation per release	AI lead
R9	Delayed care / missed emergency	Clinical safety	Low–Medium	Severe	Red-flag interrupts; helplines; no triage claims; critical-value prompts	CSO
R10	Product classified as a medical device (SaMD)	Regulatory	Medium	High	Intended-use statement; informational design; early CDSCO-focused legal opinion; QMS readiness if needed [S22]	Regulatory lead
R11	Insurance features deemed unlicensed intermediation	Regulatory	Medium	High	No recommendations/sales; legal opinion; partner with registered intermediary if needed [S47]	Legal
R12	Low ABDM record yield (few HIPs, PDF-only bundles)	Data access	High	Medium	Document-first strategy; measure yield; HIP	Product

#	Risk	Category	Likelihood	Impact	Mitigation	Owner
					onboarding partnerships; re-request flows	
R13	ABDM certification delays / API version changes	Delivery	Medium	Medium	Start sandbox early; build on V3; abstraction layer; track NHA advisories [S59][S60]	Eng lead
R14	Insurer/TPA refuse data partnerships	Commercial	High	Medium	Value proposition for payers (complete documents, fewer queries); start with employer channel; document intelligence remains self-sufficient	BD
R15	Wearable API changes (Google Fit shutdown, Fitbit migration)	Technical	High	Low–Medium	Health Connect/HealthKit as primary; vendor APIs optional [S26][S27][S28]	Mobile lead
R16	Wrong-person records on shared family phones	Data quality / privacy	High	High	Person-match checks; “whose report is this?”; separate profiles; ABHA demographic checks	Product
R17	Elderly/low-literacy users can’t give meaningful consent	Trust / legal	Medium	High	Vernacular audio notices; assisted consent with own-device confirmation; legal review of sufficiency	Design + Legal
R18	Commercial bias in recommendations (marketplace)	Trust	Medium	High	Neutral ranking; disclosures; marketplace out of MVP; ethics review	CEO
R19	Becoming an attractive central data honeypot	Security / trust	Medium	Severe	Minimise retention; user-controlled deletion; per-person keys; optional on-device-only mode for sensitive categories	CISO
R20	DPDP Rules interpretation changes / SDF designation	Regulatory	Medium	Medium	Regulatory watch; design to strictest reading; DPIA cadence	DPO
R21	Incompatible formats / terminology gaps (local test names, Indian brands)	Data quality	High	Medium	Terminology team; mapping tables with review; feedback loops from corrections	Clinical informatics
R22	Trust erosion from opaque insights	Trust	Medium	High	Explainability standard (§8.4); source badges; easy corrections; transparency reports	Product

14. Open Questions and Validation Plan

#	Question	Why it matters	Validation experiment	Decision informed
Q1	Will consumers link ABHA and approve ABDM consents?	Determines the weight of ABDM vs documents	Pilot with 100–500 users: measure ABHA link rate, consent approval, drop-off per step	ABDM prominence in onboarding
Q2	What is the actual ABDM record yield and structure?	Determines parsing and insight design	Instrument HIP discovery/fetch: % with records, records/user, % coded vs PDF; break down by facility type	Investment in FHIR vs PDF pipelines
Q3	Which sources create the most perceived value?	Prioritisation	In-pilot ranking + usage analytics across lab PDFs, policies, claims, pharmacy invoices, wearables	Phase 2 priorities
Q4	Is insurance clarity the paid wedge?	Business model	Fake-door + price A/B tests (individual vs family plan); willingness-to-pay interviews	Pricing and packaging
Q5	Can policy parsing be accurate across insurers?	Core feature feasibility	Build a corpus of retail + group policy documents from top insurers (user-contributed with consent, or public sample wordings); measure clause-citation precision	Insurer coverage roadmap
Q6	Do clinicians use patient-shared Snapshots?	Provider value	Pilot with 5–20 clinicians: time-to-history, completeness, satisfaction; qualitative interviews	Phase 3 provider SaaS
Q7	Will insurers/TPAs/employers partner?	Data access	Structured interviews with insurers, TPAs, benefits platforms; propose a document-completeness pilot	Phase 2 partnerships
Q8	Is NHCX ABHA ↔ policy linking going to be exposed to consumer apps?	Future insurance data rail	Written query to NHA integration support; monitor NHCX documentation [S59]	Insurance architecture
Q9	Are risk flags/interaction alerts SaMD under CDSCO?	Scope and cost	Legal/regulatory opinion; review CDSCO software guidance ⚠️ **Validate**	Phase 2 clinical features
Q10	Do claim-assistance features require IRDAI authorisation?	Scope	Insurance counsel opinion	Claim assistance roadmap
Q11	Do users understand trust tiers and consent screens?	Trust, legal validity	Comprehension tests (teach-back) in 2–3 languages with elderly and low-literacy participants	Consent UX
Q12	Which analytics are trusted and acted upon?	Insight design	A/B explainability variants; measure care-gap closure and doctor-share	Insight engine roadmap
Q13	What retention is permitted for ABDM-sourced data in a personal vault?	Data architecture	Review the current HDM Policy + ABDM terms; written clarification from NHA ⚠️ **Validate**	Erasure defaults
Q14	Does the company risk SDF designation?	Compliance cost	Legal assessment against DPDP criteria; scenario planning	DPO/audit budget
Q15	Can WhatsApp-based document intake meet privacy expectations?	Ingestion channel	Security review of BSP data handling; user trust survey	Channel strategy

15. Appendix: Source Links, Standards, and Glossary

Appendix A — Source register

Status: **V** = verified in-session from an official NHA repository · **A** = author-supplied in Playbook v1.0, not re-opened · **K** = official source known to the research team; URL/document to be confirmed.

ID	Source	URL / locator	Status
S1	ABDM HIP/HIU Guidelines	https://abdm.gov.in/strapicms/uploads/HIP_HIU_Guidelines_f85df336ec.pdf	A
S2	ABDM Building Blocks (v8.3 external)	https://abdm.gov.in/strapicms/uploads/ABDM_Building_Blocks_v8_3_External_Version_eabbc5c0f3_4_a96f40c649_57c96f3_4de80a9b9c.pdf	A
S3	ABDM Guidance Document for ABDM-compliant HMIS/LMIS (FHIR)	https://abdm.gov.in/strapicms/uploads/Guidance_Document_for_ABDM_Compliant_HMIS_LMIS_d066e52a6d.pdf	A
S4	Building HIU System — API Flow (M3)	https://sandboxcms.abdm.gov.in/uploads/Building_HIU_System_API_Flow_M3_Documentation_5327c6f3_4de80a9b9c.pdf	A
S5	ABDM consent manager & gateway documentation (community)	https://docs.coronasafe.network/abdm-documentation/building-blocks/consent-manager-and-gateway	A (secondary)
S6	NRCES FHIR R4 profiles for ABDM	https://www.nrces.in/ndhm/fhir/r4/profiles.html	A
S7	NHCX package (GitHub)	https://github.com/nha-in/nhcx-package	A
S8	PIB release on NHCX workflows	https://www.pib.gov.in/PressReleseDetail.aspx?PRID=2236366	A
S9	Account Aggregator Framework (DFS)	https://financialservices.gov.in/account-aggregator-framework	A
S10	RBI Master Direction — NBFC-Account Aggregator	https://www.rbi.org.in/Scripts/NotificationUser.aspx?Id=10598	A
S11	Digital Personal Data Protection Act, 2023	https://www.meity.gov.in/static/uploads/2024/06/2bf1f0e9f04e6fb4f8fef35e82c42aa5.pdf	A
S12	Digital Personal Data Protection Rules, 2025	https://static.pib.gov.in/WriteReadData/specificdocs/documents/2025/nov/doc20251117695301.pdf	A
S13	Unified Health Interface (UHI)	https://abdm.gov.in/uhi	A
S14	ABDM portal and public dashboard	https://abdm.gov.in	K

ID	Source	URL / locator	Status
S15	ABDM Sandbox (V3)	https://sandbox.abdm.gov.in/sandbox/v3/ (URL as cited in NHA's NHCX guide [S59])	V (URL)
S16	ABDM Health Data Management Policy (latest version)	abdm.gov.in → Resources/Policies	K
S17	NRCES FHIR Implementation Guide (ABDM)	https://www.nrces.in/ndhm/fhir/r4/index.html	K
S18	IRDAI Master Circular on Health Insurance Business (2024) and policyholder-protection circulars	https://irdai.gov.in (Circulars)	K
S19	IRDAI (Insurance Products) Regulations, 2024	https://irdai.gov.in (Regulations)	K
S20	CERT-In Directions under s.70B(6) IT Act, 28 April 2022	https://www.cert-in.org.in	K
S21	Telemedicine Practice Guidelines, March 2020	https://www.mohfw.gov.in/pdf/Telemedicine.pdf	K
S22	Medical Devices Rules, 2017 and CDSCO notifications on software	https://cdsco.gov.in	K
S23	Mental Healthcare Act, 2017	https://www.indiacode.nic.in	K
S24	Apple HealthKit documentation	https://developer.apple.com/documentation/healthkit	K
S25	Apple App Review Guidelines (5.1.3 Health and Health Research)	https://developer.apple.com/app-store/review/guidelines/	K
S26	Android Health Connect developer guide	https://developer.android.com/health-and-fitness/guides/health-connect	K
S27	Google Fit APIs (deprecation / migration)	https://developers.google.com/fit	K
S28	Fitbit Web API reference	https://dev.fitbit.com/build/reference/web-api/	K
S29	Garmin Connect Developer Program	https://developer.garmin.com/gc-developer-program/	K
S30	Samsung Health developer (Data SDK)	https://developer.samsung.com/health	K
S31	Oura Cloud API v2	https://cloud.ouraring.com/v2/docs	K
S32	Withings developer API	https://developer.withings.com	K
S33	Google OAuth restricted-scope verification (CASA)	https://developers.google.com/identity/protocols/oauth2/production-readiness/restricted-scope-verification	K
S34	ICMR-National Institute of Nutrition (IFCT 2017; Dietary Guidelines for Indians 2024; Nutrient Requirements 2020)	https://www.nin.res.in	K
S35	National List of Essential Medicines 2022	https://cdsco.gov.in / https://main.mohfw.gov.in	K
S36	Pradhan Mantri Bhartiya Janaushadhi Pariyojana	https://janaushadhi.gov.in	K

ID	Source	URL / locator	Status
	product list		
S37	National Programme for Prevention and Control of NCDs (NP-NCD) operational guidelines	https://main.mohfw.gov.in	K
S38	Universal Immunization Programme schedule	https://main.mohfw.gov.in	K
S39	Tele-MANAS (National Tele Mental Health Programme)	https://telemanas.mohfw.gov.in	K
S40	Anjana RM et al. Metabolic NCDs in India (ICMR-INDIAB), *Lancet Diabetes & Endocrinology*, 2023	doi:10.1016/S2213-8587(23)00119-5	K
S41	National Health Accounts Estimates for India (latest, NHSRC/MoHFW)	https://nhsrc.in	K
S42	National Family Health Survey (NFHS-5)	https://rchiips.org/nfhs/	K
S43	PM-JAY (NHA) and Ayushman Vay Vandana releases	https://nha.gov.in/PM-JAY; https://pib.gov.in	K
S44	ICMR Ethical Guidelines for Application of AI in Biomedical Research and Healthcare (2023)	https://main.icmr.nic.in	K
S45	CCPA Guidelines for Prevention and Regulation of Dark Patterns, 2023	https://consumeraffairs.nic.in	K
S46	Sahamati (AA industry alliance) and ReBIT AA technical standards	https://sahamati.org.in; https://api.rebit.org.in	K
S47	IRDAI regulations on insurance intermediaries (web aggregators, corporate agents, brokers)	https://irdai.gov.in (Regulations)	K
S49	Health Claims Exchange (HCX) protocol specification	Swasth/HCX protocol documentation (locate)	K
S50	SNOMED CT National Release Centre, India (NRCES)	https://www.nrces.in	K
S52	Draft Drugs and Cosmetics (Amendment) Rules on sale of drugs by e-pharmacy, 2018	https://cdsco.gov.in / e-Gazette	K
S58	Bhashini (National Language Translation Mission, MeitY)	https://bhashini.gov.in	K
S59	**NHA-ABDM/NHCX repository**: NHCX Postman collections (sandbox/production onboarding, participant and use-case APIs) and *"NHCX – Guide for Providers"* integrator deck; last commit 27 Sep 2024	https://github.com/NHA-ABDM/nhcx	**V**
S60	**NHA-ABDM/ABDM-wrapper repository**: ABDM reference HIP/HIU implementation (V1→V3), consent `Permission` model, HI-type enum, ECDH/AES-GCM crypto, V3 gateway usage; last commit 21 Feb 2025	https://github.com/NHA-ABDM/ABDM-wrapper	**V**

IDs S48, S51 and S53–S57 are reserved and unused in this edition.

Appendix B — Verification checklist (clear before external use)

#	Item	Where used	Check against
B1	DPDP Rules 2025: notification date, commencement phases, breach-report timing (72h), log retention, notice content, Consent Manager conditions, children/healthcare exemptions	§1, §9	S12 (official gazette text)
B2	DPDP Act section numbers and penalty amounts	§9.2	S11
B3	ABDM purpose codes (esp. PATRQT), frequency units, current V3 consent and PHR-app APIs	§5, §10	ABDM sandbox V3 docs (S15), S4
B4	Current HI-type list (incl. Invoice) and NRCES profile versions	§4.1, §5	S6, S17
B5	HDM Policy version; HIU storage/retention rules; ABDM breach-reporting obligations	§5, §9	S16
B6	Sandbox exit steps; WASA/CERT-In auditor requirement	§5.6	S15, S59, NHA integration support
B7	ABHA/linked-record/HFR/HPR scale figures	§2.1	S14 dashboard; PIB
B8	Third-party consent managers in ABDM; DPDP Consent Manager interplay	§3.2	S2, S16, S12
B9	NHCX: current onboarding counts; IRDAI direction; ABHA ↔ policy linking access for consumer/PHR apps	§3.4	S8, S59, NHA
B10	IRDAI 2024 health insurance norms (cashless timelines, PED/moratorium limits, CIS format, grievance/Ombudsman wording)	§2, §7	S18, S19
B11	AA insurance FIP availability	§4.2	S9, S46
B12	IRDAI intermediary triggers for recommendations/claim assistance	§9.6	S47 + counsel
B13	CDSCO position on clinical decision support software	§9.1	S22 + counsel
B14	Health Connect permission rules (history >30 days, background read), Play health-apps policy	§4.3, §7.3	S26
B15	Google Fit shutdown date; Fitbit API migration; Oura token policy; Samsung SDK partner terms	§4.3	S27, S28, S31, S30
B16	Apple Guideline 5.1.3 wording; Health Records availability in India	§4.3	S24, S25
B17	IFCT/Indian food DB licensing	§4.4	S34
B18	E-pharmacy rules status	§4.5	S52
B19	SNOMED CT India licence terms and drug extension	§4.5	S50

#	Item	Where used	Check against
B20	NP-NCD screening protocol, UIP schedule	§8	S37, S38
B21	Helpline numbers (112, 108, Tele-MANAS 14416) per state	§4.7, §9.4	S39, state sources
B22	OOP share, NCD prevalence, PM-JAY figures, NFHS-5 insurance coverage	§1, §2	S40–S43
B23	Competitor ABDM integration status and features	§2.3	ABDM integrator list; company sources
B24	Bhashini API terms	§7.1	S58
B25	LOINC/SNOMED codes in examples and rule library	§8.3, App. D	LOINC, SNOMED CT browsers

Appendix C — Standards reference

Standard	Use in product
HL7 FHIR R4 + NRCES ABDM profiles	Exchange, canonical clinical/insurance resources, export
NHCX FHIR profiles (Claim, ClaimResponse, CoverageEligibility, InsurancePlan…)	Normalisation target for policy/claim documents; future NHCX participation
SNOMED CT (India NRC)	Conditions, procedures, findings, drugs (India extension)
LOINC	Lab tests and vital-sign observations
ICD-10	Diagnoses on claims and discharge summaries
UCUM	Units of measure
ATC	Drug classification (molecule level)
ECDH (Curve25519) + HKDF + AES-GCM	ABDM health-information transfer encryption [S60]
JWE (RFC 7516)	NHCX payload encryption [S59]
UHI / Beckn	Discovery and booking (later phases)
ReBIT AA specifications	If integrating Account Aggregator data (insurance FIPs)
ISO/IEC 27001 / 27701	Information security and privacy management
OWASP ASVS / MASVS	Application and mobile security verification

Appendix D — FHIR R4 examples (corrected)

Illustrative only. Validate against current NRCES profiles; ABDM bundles wrap clinical content in `Composition`-based document bundles (e.g. DiagnosticReportRecord, PrescriptionRecord, DischargeSummaryRecord) [S6].

D.1 Patient (ABHA identifier)

```
{
  "resourceType": "Patient",
  "id": "patient-001",
  "identifier": [{
    "type": {"text": "ABHA address"},
    "system": "https://healthid.abdm.gov.in",
    "value": "ravi.kumar@abdm"
  }],
  "name": [{"text": "Ravi Kumar"}],
  "gender": "male",
  "birthDate": "1985-06-12"
}
```

The identifier `system` URI is illustrative. Use the URI prescribed by the current NRCES Patient profile.

D.2 Observation: HbA1c (unchanged from v1.0 except reference-range structure)

```
{
  "resourceType": "Observation",
  "id": "observation-hba1c-001",
  "status": "final",
  "category": [{"coding": [{"system": "http://terminology.hl7.org/CodeSystem/observation-category", "code":
"laboratory"}]}],
  "code": {"coding": [{"system": "http://loinc.org", "code": "4548-4",
            "display": "Hemoglobin A1c/Hemoglobin.total in Blood"}], "text": "HbA1c"},
  "subject": {"reference": "urn:uuid:patient-001"},
```

```
  "effectiveDateTime": "2026-09-10",
  "valueQuantity": {"value": 7.1, "unit": "%", "system": "http://unitsofmeasure.org", "code": "%"},
  "referenceRange": [{"low": {"value": 4.0, "unit": "%"}, "high": {"value": 5.6, "unit": "%"},
                      "text": "4.0 - 5.6% (laboratory-specific)"}]
}
```

D.3 DiagnosticReport: laboratory (corrected: report code matches its content)

```
{
  "resourceType": "DiagnosticReport",
  "id": "diagnostic-report-lab-001",
  "status": "final",
  "category": [{"coding": [{"system": "http://terminology.hl7.org/CodeSystem/v2-0074", "code": "LAB",
"display": "Laboratory"}]}],
  "code": {"coding": [{"system": "http://loinc.org", "code": "4548-4",
            "display": "Hemoglobin A1c/Hemoglobin.total in Blood"}], "text": "HbA1c report"},
  "subject": {"reference": "urn:uuid:patient-001"},
  "effectiveDateTime": "2026-09-10",
  "issued": "2026-09-10T18:00:00+05:30",
  "performer": [{"reference": "urn:uuid:organization-lab"}],
  "result": [{"reference": "urn:uuid:observation-hba1c-001"}],
  "presentedForm": [{"contentType": "application/pdf", "title": "Laboratory Report",
                     "url": "urn:uuid:binary-lab-report-001"}]
}
```

> v1.0 used LOINC 24323-8 (comprehensive metabolic panel) as the report code while the only result was HbA1c. Use a panel code only when the report contains that panel's results.

D.4 DocumentReference: discharge summary (corrected LOINC code)

```
{
  "resourceType": "DocumentReference",
  "id": "document-discharge-summary-001",
  "status": "current",
  "type": {"coding": [{"system": "http://loinc.org", "code": "18842-5", "display": "Discharge summary"}],
           "text": "Discharge Summary"},
  "subject": {"reference": "urn:uuid:patient-001"},
  "context": {"encounter": [{"reference": "urn:uuid:encounter-ip-001"}]},
  "content": [{"attachment": {"contentType": "application/pdf", "title": "Discharge Summary",
                              "url": "urn:uuid:binary-discharge-001"}}]
}
```

> v1.0 used 34117-2 ("History and physical note"). The NRCES DischargeSummaryRecord is a `Composition`-based document. A SNOMED CT type such as 373942005 (*Discharge summary*) may be used there; validate against the profile.

D.5 MedicationRequest. The v1.0 structure is retained. Recommendations: code medications with **SNOMED CT** (as used in NRCES profiles) plus ATC where useful; keep the brand name in `medicationCodeableConcept.text`; never store dose inferred from OCR without user confirmation.

D.6 Claim (FHIR). The v1.0 example is retained as an internal normalisation target. Note that NHCX claim bundles follow NRCES/NHCX-specific profiles and are exchanged only between participants (PAYER/PROVIDER/TPA) using JWE encryption [S59].

D.7 Internal Coverage-clause object (non-FHIR helper)

```
{
  "policy_id": "pol-001",
  "benefit": "day_care_procedure",
  "item": "Cataract surgery",
  "limit": {"amount": 40000, "currency": "INR", "per": "eye"},
  "waiting_period": {"type": "specific_disease", "months": 24,
                     "continuous_cover_start": "2025-03-15", "ends_on": "2027-03-15"},
  "clause_ref": {"document_id": "doc-policy-wording-001", "page": 14, "span": [1203, 1388],
                 "text_hash": "sha256:…"},
  "extraction": {"confidence": 0.96, "verification": "user_confirmed"},
  "trust_tier": "T2"
}
```

Appendix E — Glossary

Term	Meaning
AA	Account Aggregator (RBI-regulated NBFC-AA; data-blind consent conduit for financial data)
ABDM	Ayushman Bharat Digital Mission (National Health Authority)
ABHA	Ayushman Bharat Health Account (14-digit number; ABHA

Term	Meaning
	address as a handle)
Care context	Provider-side grouping of health records (e.g. a visit) linked to an ABHA address
CIS	Customer Information Sheet: IRDAI-mandated summary of a health policy's key terms
CM / HIE-CM	Health Information Exchange–Consent Manager
Consent artifact	Machine-readable, signed record of a patient's consent in ABDM
Data Fiduciary / Data Principal	DPDP terms for the entity determining purpose and means of processing / the individual
DPB	Data Protection Board of India
DPDP	Digital Personal Data Protection Act, 2023 (and Rules, 2025)
FHIR	HL7 Fast Healthcare Interoperability Resources
FIP / FIU	Financial Information Provider / User (AA framework)
HFR / HPR	Health Facility Registry / Healthcare Professionals Registry
HIP / HIU	Health Information Provider / User
HI type	ABDM health-information type (OPConsultation, Prescription, DischargeSummary, DiagnosticReport, ImmunizationRecord, HealthDocumentRecord, WellnessRecord)
M1 / M2 / M3	ABDM integration milestones: ABHA; HIP linking and sharing; HIU consent and import
NHCX	National Health Claims Exchange (provider ↔ payer/TPA claims rail)
NRCES	National Resource Centre for EHR Standards (FHIR IG; SNOMED CT NRC for India)
OOP	Out-of-pocket expenditure
PED	Pre-existing disease (insurance)
PHR	Personal Health Record (app)
RMP	Registered Medical Practitioner
SaMD	Software as a Medical Device
SDF	Significant Data Fiduciary (DPDP)
TPA	Third-Party Administrator (health insurance claims)
Trust tier	This report's labelling of data provenance (T1 verified clinical … T6 reference knowledge)
UHI	Unified Health Interface (open protocol for discovery, booking, fulfilment)
WASA	Web Application Security Assessment (ABDM security testing)