National-Scale Healthcare Management System (HMS)

## **1. Executive Summary**

The National-Scale Healthcare Management System (HMS) will unify patient care, provider operations, insurance processing, billing, inventory, and public health reporting across public and private healthcare facilities nationwide. This BRD defines the **business goals, scope, processes, and detailed business requirements** to guide solution design, procurement, implementation, and user acceptance. It deliberately avoids technical implementation details.

**Business Outcomes (12–24 months):**

* Single longitudinal health record for ≥ 80% of the population.
* 30% reduction in average outpatient waiting time and 20% improvement in bed turnover.
* ≥ 95% on-time public health reporting for notifiable conditions.
* ≥ 15% reduction in claim rejection rates and ≥ 20% faster revenue cycle closure.
* Full auditability of clinical, financial, and administrative actions.

## **2. Business Context**

### **2.1 Current Challenges**

* Fragmented patient identities and duplicate records.
* Manual handoffs across registration → clinical → pharmacy → billing → insurance.
* Delayed or incomplete lab/radiology results and critical value escalations.
* Inconsistent claim adjudication documentation and payer rules.
* Poor stock visibility (drug expiries, shortages), leading to care delays.
* Inconsistent reporting to national disease registries.

### **2.2 Target Future State**

* One patient view across facilities with consent-driven access.
* Standardized, guided workflows from appointment to discharge and follow-up.
* Time-bound notifications for critical events (e.g., critical lab results).
* Transparent, rules-driven billing and claims; payer collaboration.
* Inventory visibility from national to facility level with proactive replenishment.
* Timely, privacy-preserving public health surveillance and analytics.

## **3. Goals & Objectives (SMART)**

* **G1 Access & Continuity:** Establish a lifelong patient profile with consent preferences; **≥ 98%** successful patient retrieval at point of care.
* **G2 Service Efficiency:** Reduce outpatient visit cycle time by **30%** within 12 months of go-live at a facility.
* **G3 Safety & Quality:** Ensure **100%** acknowledgment of critical lab/imaging results within **30 minutes** of verification.
* **G4 Financial Integrity:** Achieve **≤ 5%** claim rejection rate nationally by month 18.
* **G5 Public Health:** Report notifiable diseases **within 60 minutes** of confirmation in **≥ 95%** of cases.
* **G6 Governance:** Maintain complete, tamper-evident audit histories for **100%** sensitive actions.

## **4. Scope**

### **4.1 In Scope**

Patient administration, appointments & encounters, clinical documentation, medications (e-prescription & dispensing), diagnostics (lab & imaging), insurance eligibility & claims, billing & payments, inventory & procurement, public health registries, analytics & dashboards, patient portal, provider registry, and national data exchanges (identity, drugs, diseases).

### **4.2 Out of Scope (Phase 1)**

Advanced genomics, tele-surgery, third-party wellness marketplaces, cross-border medical tourism billing, and research data warehouses (non-operational analytics).

## **5. Stakeholders & Personas**

* **Patients & Caregivers:** Appointment, records, consent, bills, payments.
* **Front-Desk Staff:** Registration, check-in, scheduling, queueing.
* **Clinicians (Doctors, Nurses, Therapists):** Notes, orders, care plans, discharge.
* **Pharmacists & Storekeepers:** Prescriptions, dispensing, stock management.
* **Lab & Imaging Personnel:** Orders, specimen/study, verification, result release.
* **Insurance & Payers:** Eligibility, pre-authorization, claims adjudication.
* **Finance & Billing:** Tariffs, invoices, settlements, refunds.
* **Supply Chain & Procurement:** Requisitions, purchase orders, vendor performance.
* **Public Health Officials:** Notifiable disease intake, investigations, dashboards.
* **Hospital Leadership:** Operational KPIs, compliance, audit reviews.

(See Appendix A for detailed persona needs and access boundaries.)

## **6. Value Proposition**

* **For Patients:** Faster, safer care; transparent costs; control over consent.
* **For Providers:** Less rework; fewer errors; predictable schedules; actionable alerts.
* **For Payers:** Cleaner claims; lower fraud; faster adjudication.
* **For Government:** Reliable surveillance; equitable access insights; policy-making data.

## **7. High-Level Business Processes**

1. **Patient Onboarding & Identity Resolution** → Consent capture → Record merge when duplicates are found.
2. **Appointment → Check-In → Encounter Management** → Queueing → Discharge.
3. **Clinical Documentation** → Orders (medications, lab, imaging) → Results → Care plan updates.
4. **Medication Fulfillment** → Dispensing → Refill management → Adherence follow-up.
5. **Diagnostics** → Order validation → Specimen/study → Result verification → Critical notifications.
6. **Billing & Payments** → Estimates → Invoicing → Discounts/waivers → Payment plans.
7. **Insurance** → Eligibility → Pre-authorization → Claims → Adjudication → Appeals.
8. **Inventory & Procurement** → Requisitions → Purchase orders → Receipt → Put-away → Consumption → Reorder.
9. **Public Health Reporting** → Case creation → Investigation workflow → Alerts → Outcomes.
10. **Analytics & Management Reporting** → KPIs → Benchmarking → Action logs.

(Non-technical flows; see Appendix B for swimlane narratives.)

## **8. Detailed Business Requirements**

**Notation:** Requirements are grouped by domain with IDs like **BR-PA-###**. Each includes: **Objective, Triggers, Actors, Standard Flow, Exceptions, Business Rules, Notifications, Timelines/SLAs, Reports, Acceptance Criteria.**

### **8.1 Patient Administration (PA)**

**Objective:** Establish accurate, consent-aware patient records and resolve duplicates.

* **BR-PA-001 (Create/Update Patient):** **Trigger:** New patient arrival or demographic change.  
   **Actors:** Patient/Caregiver, Front-Desk.  
   **Rules:**
  + Mandatory fields: full name, date of birth, sex at birth, government ID (if available), primary contact, address, next of kin.
  + Capture multiple identifiers (national, facility, insurer).
  + Consent categories (care, research, communication) selectable individually; default is **care only** if not specified.  
     **Exceptions:** No ID → issue temporary registration with reconciliation within **2 business days**.  
     **Notifications:** Confirmation SMS/email to patient on new registration/changes.  
     **Acceptance:** Record saved with time-stamped audit entry; confirmation provided; consent status visible on patient header.
* **BR-PA-002 (Duplicate Detection & Merge):** **Trigger:** Potential duplicate detected during registration/search.  
   **Rules:** Merge requires **two-person review** (Front-Desk + Supervisor) with documented rationale; original records remain referenced in a merge log.  
   **Acceptance:** Post-merge: single active profile; historical references preserved; all linked encounters visible under the surviving profile.
* **BR-PA-003 (Consent Management):** **Rules:** Consent can be granted, limited, or withdrawn by the patient; emergency override requires senior clinician justification and is time-boxed to the encounter.  
   **Acceptance:** Access decisions honor consent; override events are flagged in privacy audits.

### **8.2 Encounter & Scheduling (EM)**

**Objective:** Ensure timely access to care and clear lifecycle management of visits.

* **BR-EM-010 (Scheduling):** **Rules:** Slot allocation respects provider availability, specialty, room/equipment needs, and max daily load; enforce overbooking limits per department policy.  
   **Exceptions:** Double-book only with Department Head approval; auto-notify impacted patients.  
   **KPIs:** Appointment no-show rate tracked by clinic; reschedule lead time.
* **BR-EM-011 (Check-In & Queueing):** **Rules:** Priority for urgent cases, elderly, pregnant, and special needs per policy; queue display anonymized.  
   **Acceptance:** Average waiting time reported at day/clinic level; patient receives current position estimate.
* **BR-EM-012 (Admission/Transfer/Discharge):** **Rules:** Admission requires bed and consultant assignment; transfer requires destination acceptance; discharge requires summary and medication reconciliation.  
   **Timelines:** Discharge summary available within **2 hours** post discharge.  
   **Acceptance:** Each state change is visible in encounter history and appears in operational dashboards.

### **8.3 Clinical Documentation (CD)**

**Objective:** Accurate, timely, and auditable clinical records.

* **BR-CD-020 (Structured Notes):** **Rules:** Standard templates (SOAP, operative, discharge) per specialty; mandatory sections cannot be bypassed.  
   **Acceptance:** Finalized notes are locked; addendums permitted with reason; version history retained.
* **BR-CD-021 (Coding):** **Rules:** Diagnoses and procedures coded using nationally adopted classifications; system validates incompatible code pairs; provisional vs confirmed diagnoses distinguished.  
   **Acceptance:** Coding completeness **≥ 95%** for discharges within **24 hours**.
* **BR-CD-022 (Clinical Alerts):** **Rules:** Alert policies for vitals trends, fall-risk, sepsis bundles; alerts must be acknowledged.  
   **Acceptance:** Acknowledgment timestamps visible; unacknowledged alerts escalate to charge nurse after **15 minutes**.

### **8.4 Medication Management (MM)**

**Objective:** Safe prescribing, dispensing, and adherence.

* **BR-MM-030 (E-Prescription):** **Rules:** Must specify dose, route, frequency, duration, and indication; check for allergies and interactions; pediatric dosing requires weight-based calculation entry.  
   **Exceptions:** Override requires clinician justification and creates a safety flag.  
   **Acceptance:** Patient receives medication instructions; pharmacy queue updated.
* **BR-MM-031 (Dispensing & Refill):** **Rules:** Dispense against active prescriptions only; substitutions per formulary policy; controlled substances require dual verification.  
   **KPIs:** Dispensing turnaround times; stockout incidents.  
   **Acceptance:** Label includes patient name, directions, and warnings; inventory decremented; lot/expiry captured.
* **BR-MM-032 (Medication Reconciliation):** **Rules:** At admission and discharge, reconcile home meds vs in-hospital meds; discrepancies recorded.  
   **Acceptance:** Discharge summary includes reconciled list and patient education.

### **8.5 Diagnostics — Laboratory & Imaging (DG)**

**Objective:** Complete, timely, and traceable diagnostics.

* **BR-DG-040 (Order Validation):** **Rules:** Verify test prerequisites (e.g., fasting), specimen type, priority; prevent duplicates within defined windows.  
   **Acceptance:** Orders carry clear collection instructions; conflicting orders flagged.
* **BR-DG-041 (Specimen/Study Workflow):** **Rules:** Barcoded chain-of-custody checkpoints (collected, received, in-process, verified); imaging studies include preparation and post-procedure notes.  
   **Timelines:** Routine labs **within 6 hours**, stat **within 60 minutes**; imaging report for urgent cases **within 2 hours** of study.  
   **Acceptance:** Complete trace history visible; lost/damaged specimen procedure documented.
* **BR-DG-042 (Result Verification & Critical Escalation):** **Rules:** Technologist verification followed by pathologist/radiologist sign-off; critical results escalate to responsible clinician and charge nurse until acknowledged.  
   **Acceptance:** 100% critical results acknowledged **≤ 30 minutes**.

### **8.6 Insurance & Claims (IC)**

**Objective:** Reduce rejections and accelerate payment.

* **BR-IC-050 (Eligibility & Coverage):** **Rules:** Verify coverage and co-pay before high-cost services; capture pre-authorization approvals and reference numbers.  
   **Acceptance:** Estimate of patient responsibility provided prior to service.
* **BR-IC-051 (Claim Creation & Submission):** **Rules:** Compile clinical, financial, and authorization data; apply payer-specific rules and documentation; support multi-payer splits.  
   **Exceptions:** Missing documentation triggers a checklist and blocks submission.  
   **Acceptance:** Submission confirmation with tracking; first-pass acceptance ≥ **90%** by month 12.
* **BR-IC-052 (Appeals & Denials):** **Rules:** Standardized denial reasons; appeal deadlines tracked; attachments managed.  
   **Acceptance:** Appeal success rate and cycle time reported per payer.

### **8.7 Billing & Payments (BP)**

**Objective:** Transparent, accurate patient and payer billing.

* **BR-BP-060 (Tariffs & Estimates):** **Rules:** Charges derived from service catalog, packages, and discounts; one price list active per facility at a time; compassionate waivers require review board approval.  
   **Acceptance:** Patients receive itemized estimates and final bills; discrepancies explained.
* **BR-BP-061 (Invoicing & Receipts):** **Rules:** Invoices reflect services rendered; deposits and advances adjusted; refunds processed with approval trail.  
   **Acceptance:** Receipt issued instantly upon payment; patient billing history accessible.
* **BR-BP-062 (Payment Plans):** **Rules:** Installments with defined schedule, interest/penalties as per policy; missed payments trigger reminders and alternate arrangement offers.  
   **Acceptance:** Plan status viewable by Finance and patient; delinquency escalations logged.

### **8.8 Inventory & Procurement (IV)**

**Objective:** Ensure drug and consumable availability with minimal waste.

* **BR-IV-070 (Stock Accuracy & Traceability):** **Rules:** Record lot/expiry and manufacturer for all receipts; FEFO (first-expiry-first-out) dispensing; quarantine expired or recalled items.  
   **Acceptance:** Monthly stock variance ≤ **1%** by value.
* **BR-IV-071 (Replenishment & Forecasting):** **Rules:** Reorder points derived from consumption and seasonality; emergency procurement path defined.  
   **Acceptance:** Stockout days per critical drug ≤ **2%** annually.
* **BR-IV-072 (Vendor Management):** **Rules:** Approved vendor lists; performance scorecards (on-time delivery, quality, price adherence).  
   **Acceptance:** Quarterly vendor performance reviews.

### **8.9 Public Health Surveillance (PH)**

**Objective:** Timely, accurate national reporting and outbreak response.

* **BR-PH-080 (Notifiable Disease Cases):** **Rules:** Mandatory case creation when qualifying lab/imaging/clinical criteria met; local validation; automatic routing to national registry.  
   **Timelines:** Report within **60 minutes** of confirmation.  
   **Acceptance:** Case ID returned; investigation assignment recorded.
* **BR-PH-081 (Contact Tracing & Alerts):** **Rules:** Close-contact identification rules per disease; exposure notifications via approved channels.  
   **Acceptance:** Exposure lists maintained; alert delivery status tracked.
* **BR-PH-082 (Immunization Registry):** **Rules:** Record vaccine type, lot, site, and adverse events; schedule reminders for follow-up doses.  
   **Acceptance:** Coverage dashboards by district.

### **8.10 Analytics, Management Reporting & Dashboards (AN)**

**Objective:** Operational transparency and strategic insight.

* **BR-AN-090 (Operational KPIs):** **Examples:** Waiting time, bed occupancy, theater utilization, claim status, stockouts, critical alert acknowledgments.  
   **Acceptance:** Standard dashboards per role; drill-downs to clinic/ward.
* **BR-AN-091 (Ad-Hoc Queries & Cohorts):** **Rules:** Authorized users can define cohorts for quality improvement and policy evaluation using de-identified data.  
   **Acceptance:** Query results exportable per data governance rules.

## **9. Roles, Access & Oversight (Business View)**

* **Role Families:** Patient, Caregiver, Front-Desk, Clinician, Nurse, Pharmacist, Lab Tech, Radiologist, Billing, Finance, Insurance Assessor, Storekeeper, Procurement Officer, Public Health Officer, Facility Admin, National Admin, Auditor.
* **Principles:** Minimum necessary access, consent-aware access, emergency override with justification and audit, segregation of duties (e.g., billing vs waiver approval).

## **10. Policy, Compliance & Ethics (Business)**

* Adhere to national health data protection and patient rights legislation.
* Explicit patient consent for non-care uses (e.g., research communications).
* Sensitive events (mental health, reproductive health, communicable diseases) require enhanced oversight.
* Retention schedules: clinical and financial records per statutory timelines; legal hold procedures defined.
* Audit trails for all sensitive actions; periodic audit reviews with findings and remediation.

## **11. Service Levels & KPIs (Business)**

* **Availability of front-line services:** Clinic hours; planned downtime notifications **≥ 72 hours** in advance.
* **Turnaround Times:** Admissions **≤ 15 min** after bed availability; routine labs **≤ 6 h**, stat **≤ 60 min**; discharge summary **≤ 2 h**.
* **Financial:** First-pass claim acceptance **≥ 90%**; average days in AR **≤ 45**.
* **Inventory:** Stockout days of critical drugs **≤ 2%**; expired items quarantined same day.
* **Public Health:** Notifiable reporting on time **≥ 95%**.

## **12. User Experience & Accessibility (Business)**

* Clear, plain-language interfaces; local language support; large-font options.
* Queue status visibility without exposing identities.
* Patient bills and instructions written at an accessible reading level; pictograms for dosing.

## **13. Reporting Catalogue (Examples)**

* **Clinical:** Sepsis bundle compliance, readmission within 30 days, surgical site infections.
* **Operational:** Appointment no-show, average wait, bed occupancy, OT utilization.
* **Financial:** Revenue by service line, payer mix, write-offs, refund turnaround.
* **Inventory:** ABC analysis, stock aging, vendor performance.
* **Public Health:** Case counts by district, R(t) proxy, immunization coverage.  
   (Complete catalogue in Appendix C with owners, frequency, and distribution lists.)

## **14. Implementation Phasing (Business View)**

* **Phase 1 (Months 0–6):** Patient administration, scheduling, outpatient clinical documentation, basic billing, pharmacy, routine labs, foundational reporting.
* **Phase 2 (Months 6–12):** Inpatient flows, imaging, advanced billing, insurance claims, inventory & procurement.
* **Phase 3 (Months 12–18):** Public health registries, patient portal at scale, advanced analytics, appeals & denials, capacity planning.  
   Each phase includes change management, training, and UAT cycles with business sign-off.

## **15. Training, Communication & Change Management**

* **Training:** Role-based curricula; scenario practices (e.g., emergency admission); super-user program per facility.
* **Communication:** Go-live readiness scorecards; patient-facing FAQs; helpline staffing.
* **Adoption Metrics:** Login rates, documentation completeness, alert acknowledgments, billing accuracy.

## **16. Risks & Mitigations**

* **Data Quality (duplicates, miscoding):** Data stewardship roles; merge governance; coding audits.
* **Operational Disruption at Go-Live:** Parallel runs; on-site floor support; contingency paper flows.
* **Stakeholder Resistance:** Early involvement; clinical champions; feedback loops.
* **Policy Variance Across Facilities:** Standard operating procedures with controlled local variations.
* **Timely Public Health Reporting:** Clear responsibility matrix; escalation rules.

## **17. Assumptions & Dependencies**

* National identity, provider, drug, and disease registries are maintained by respective authorities.
* Facilities designate data stewards and super-users.
* Payers provide current coverage and authorization rules and SLA commitments.
* Legal and privacy frameworks enable the specified uses with consent.

## **18. Business Acceptance Criteria (UAT-Level)**

* **BAC-01 Patient Lifecycle:** Create, update, merge, and consent flows validated with 25 real-world scenarios, including emergency override and reconciliation.
* **BAC-02 Encounter Flows:** 30 end-to-end journeys from appointment to discharge across specialties with time checks.
* **BAC-03 Diagnostics:** 20 lab and 10 imaging scenarios including critical value escalations and lost specimen handling.
* **BAC-04 Pharmacy:** 25 prescriptions including pediatric dosing, substitution, controlled substances.
* **BAC-05 Billing & Claims:** 30 scenarios covering estimates, waivers, multi-payer claims, appeals.
* **BAC-06 Inventory:** 20 stock scenarios including FEFO, quarantines, recalls, emergency procurement.
* **BAC-07 Public Health:** 15 notifiable case scenarios including contact tracing and alerting.
* **BAC-08 Reporting:** Validate 30 priority reports and 10 dashboards for correctness and timeliness.

## **19. Traceability (Goals → Requirements → Measures)**

| **Goal** | **Representative Requirements** | **Measures** |
| --- | --- | --- |
| G1 | BR-PA-001/2/3 | % successful patient retrieval; merge backlog days |
| G2 | BR-EM-010/11/12 | Avg wait time; discharge summary timeliness |
| G3 | BR-DG-042; BR-CD-022 | Critical acknowledgment time; alert escalation counts |
| G4 | BR-IC-051/52; BR-BP-060/61 | First-pass acceptance; days in AR |
| G5 | BR-PH-080/81 | On-time reporting rate; investigation start times |
| G6 | All “audit-sensitive” BRs | Completed audit review cycles; exceptions closed |