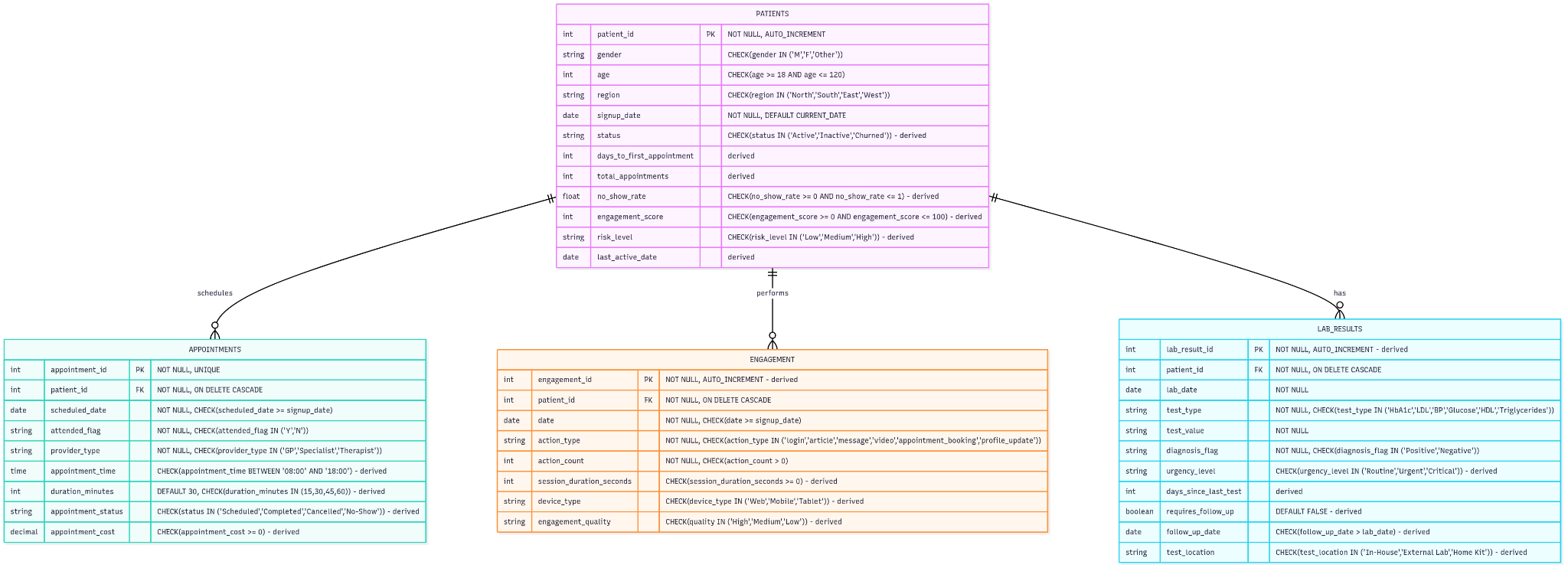
**ER Diagram - PART 1**



Data Model Documentation :

PRIMARY KEYS AND FOREIGN KEYS

Primary Keys (PK):

- PATIENTS: patient\_id (AUTO\_INCREMENT, NOT NULL)

- APPOINTMENTS: appointment\_id (UNIQUE, NOT NULL)

- ENGAGEMENT: engagement\_id (AUTO\_INCREMENT, derived composite key)

- LAB\_RESULTS: lab\_result\_id (AUTO\_INCREMENT, derived composite key)

Foreign Keys (FK):

- APPOINTMENTS: patient\_id → PATIENTS.patient\_id (ON DELETE CASCADE)

- ENGAGEMENT: patient\_id → PATIENTS.patient\_id (ON DELETE CASCADE)

- LAB\_RESULTS: patient\_id → PATIENTS.patient\_id (ON DELETE CASCADE)

RELATIONSHIPS & CARDINALITY

- PATIENTS to APPOINTMENTS: One-to-Many (1:N) - Mandatory participation on APPOINTMENTS side

- PATIENTS to ENGAGEMENT: One-to-Many (1:N) - Optional participation

- PATIENTS to LAB\_RESULTS: One-to-Many (1:N) - Optional participation

DATABASE CONSTRAINTS

PATIENTS Table Constraints:

- patient\_id: PRIMARY KEY, AUTO\_INCREMENT, NOT NULL

- gender: CHECK constraint - Must be 'M', 'F', or 'Other'

- age: CHECK constraint - Must be between 18 and 120 (legal adults only)

- region: CHECK constraint - Limited to 'North', 'South', 'East', 'West'

- signup\_date: NOT NULL, DEFAULT CURRENT\_DATE

- status: CHECK constraint - 'Active', 'Inactive', or 'Churned' (derived)

- no\_show\_rate: CHECK constraint - Must be between 0 and 1 (percentage as decimal)

- engagement\_score: CHECK constraint - Must be between 0 and 100

- risk\_level: CHECK constraint - 'Low', 'Medium', or 'High' (derived from engagement patterns)

APPOINTMENTS Table Constraints:

- appointment\_id: PRIMARY KEY, UNIQUE, NOT NULL

- patient\_id: FOREIGN KEY, NOT NULL, CASCADE DELETE

- scheduled\_date: NOT NULL, Must be >= patient's signup\_date

- attended\_flag: NOT NULL, CHECK constraint - Only 'Y' or 'N'

- provider\_type: NOT NULL, CHECK constraint - 'GP', 'Specialist', or 'Therapist'

- appointment\_time: CHECK constraint - Between 08:00 and 18:00 (business hours)

- duration\_minutes: DEFAULT 30, CHECK constraint - Must be 15, 30, 45, or 60

- appointment\_cost: CHECK constraint - Must be >= 0

ENGAGEMENT Table Constraints:

- engagement\_id: PRIMARY KEY, AUTO\_INCREMENT

- patient\_id: FOREIGN KEY, NOT NULL, CASCADE DELETE

- date: NOT NULL, Must be >= patient's signup\_date

- action\_type: NOT NULL, CHECK constraint - Limited to defined action types

- action\_count: NOT NULL, Must be > 0

- session\_duration\_seconds: CHECK constraint - Must be >= 0

- device\_type: CHECK constraint - 'Web', 'Mobile', or 'Tablet'

- engagement\_quality: CHECK constraint - 'High', 'Medium', or 'Low'

LAB\_RESULTS Table Constraints:

- lab\_result\_id: PRIMARY KEY, AUTO\_INCREMENT

- patient\_id: FOREIGN KEY, NOT NULL, CASCADE DELETE

- lab\_date: NOT NULL

- test\_type: NOT NULL, CHECK constraint - Limited to defined test types

- test\_value: NOT NULL

- diagnosis\_flag: NOT NULL, CHECK constraint - 'Positive' or 'Negative'

- urgency\_level: CHECK constraint - 'Routine', 'Urgent', or 'Critical'

- requires\_follow\_up: DEFAULT FALSE

- follow\_up\_date: Must be > lab\_date when populated

- test\_location: CHECK constraint - 'In-House', 'External Lab', or 'Home Kit'

**DERIVED ATTRIBUTES**

PATIENTS Table:

- status: Status is calculated from the last activity date (Active: >30 days; Inactive: 30-90 days; Churned: > 90 days)

- days\_to\_first\_appointment: DATEDIFF(fsignup\_date, first appointment\_date)

- total\_appointments: total\_appointments COUNT(appointments) each patient

- no\_show\_rate: COUNT(attended\_flag='N') / COUNT(appointments)

- engagement\_score: Engagement is not calculated as a total score but is distributed weights on the frequency, recency, and variety of actions

- risk\_level: Determined as a factor of no\_show\_rate and engagement\_score

- last\_active\_date: last\_active\_date MAX(engagement.date, appointments.scheduled date)

APPOINTMENTS Table:

- appointment\_time: Calculated from scheduled\_date and/or business logic

- duration\_minutes: Provider\_type based (GP=30, Specialist=45, Therapist=60)

- appointment\_status: Determined from attended\_flag and scheduled\_date

- appointment\_cost: Provider type and duration based

ENGAGEMENT Table:

- engagement\_id: AUTO\_INCREMENT for uniqueness

- session\_duration\_seconds: Computed from session timestamps

- device\_type: Extracted from user agent or session metadata

- engagement\_quality: Derived from action\_count and session\_duration

LAB RESULTS Table:

- lab\_result\_id: AUTO\_INCREMENT for uniqueness

- urgency\_level: Assigned from value ranges and diagnosis\_flag

- days\_since\_last\_test: Computed from previous test of same type

- requires\_follow\_up: Diagnostic\_flag='positive' or abnormal values

- follow\_up\_date: Determined by the ranking

- test\_location: Scheduling system or test\_type based