Entity (Table) Descriptions

Patients(PatientID PK, Name, DOB, Phone)

- Tracks each person receiving care. One row = one patient.

Staff(StaffID PK, Position, StaffName, Phone, DOB)

- Tracks all personnel employed by the clinic (e.g., admin, aides, therapists). One row = one staff member.

Therapist(Specialty, StaffID PK/FK → Staff)

- Subtype of Staff for clinical providers who deliver therapy. Inherits Staff attributes (StaffID, StaffName, Position, Phone, DOB) and adds **Specialty**.

Referrals(ReferralID PK, PatientID FK → Patients, DxCode, ReferringProvider, ReferralDate)

- Captures inbound referrals for a patient, including diagnosis code, who referred, and the referral date. One row = one referral event.

Sessions(SessionID PK, PatientID FK → Patients, Therapist [ideally FK → Therapist/Staff], SessionDate, Status, PainPre, PainPost, Notes)

- Each therapy visit/encounter for a patient. Records supervising therapist, date, status, pain ratings, and notes.

Exercises(ExerciseID PK, Name, BodyRegion, Difficulty)

- Library of exercises that can be prescribed/performed during sessions.

SessionExercises(SessionExerciseID PK, SessionID FK → Sessions, ExerciseID FK → Exercises, Sets, Reps, Resistance)

- Associative table that logs which exercises were performed in a given session and with what dosage (sets/reps/resistance).

OutcomeMeasures(OutcomeID PK, PatientID FK → Patients, MeasureName, Score, TakenOn)

- Standardized assessments/scores recorded for patients over time.

Relationship Descriptions

- **Has (Patients — Referrals)**

Meaning: A patient can **have** multiple referrals across time.

Cardinality: **Patients 1 — N Referrals** (each referral belongs to exactly one patient).

- **Creates (Therapist — Referrals)**

Meaning: A therapist (or external provider recorded in ReferringProvider) **creates** a referral for a patient.

Cardinality: **Therapist 0..N — 0..N Referrals** (in practice: a referral is typically associated with one referrer; if referrers are external, this may be stored as text rather than a FK).

- **Attends (Patients — Sessions)**

Meaning: A patient **attends** therapy sessions.

Cardinality: **Patients 1 — N Sessions** (each session is for exactly one patient).

- **Supervises (Therapist — Sessions)**

Meaning: A therapist **supervises** (conducts) a session.

Cardinality: **Therapist 1 — N Sessions** (each session has one supervising therapist; stored as Therapist in the table, ideally a FK to Therapist/Staff).

- **Contains / ConsistsOf (Sessions — SessionExercises — Exercises)**

Meaning: A session **contains** many performed exercises; details (sets/reps/resistance) are captured in SessionExercises.

Cardinality: Sessions and Exercises are **many-to-many**, resolved via **SessionExercises** into:

    - **Sessions 1 — N SessionExercises**
    - **Exercises 1 — N SessionExercises**
- **Measures (Patients — OutcomeMeasures)**

Meaning: Outcome measures **are recorded for** a patient over time.

Cardinality: **Patients 1 — N OutcomeMeasures**.

- **Specialization / ISA (Therapist ⊂ Staff)**

Meaning: **Therapist** is a specialization of **Staff**. Every therapist **is a** staff member and inherits Staff attributes; **Therapist** adds a **Specialty**.

Attribute Descriptions

IDs (no ambiguity)

- **PatientID (PK)**: System-generated unique identifier for each patient (surrogate key; immutable).
- **StaffID (PK)**: Unique identifier for any staff member; reused in **Therapist** to denote therapist subtype.
- **ReferralID (PK)**: Unique identifier per referral event.
- **SessionID (PK)**: Unique identifier per therapy visit.
- **ExerciseID (PK)**: Unique identifier per cataloged exercise.
- **SessionExerciseID (PK)**: Unique identifier per exercise instance within a session (not reused).
- **OutcomeID (PK)**: Unique identifier per recorded outcome measure.

Foreign keys

Referrals.PatientID → Patients.PatientID; **Sessions.PatientID → Patients.PatientID**;

Sessions.Therapist → Therapist.StaffID (recommended FK);

SessionExercises.SessionID → Sessions.SessionID; **SessionExercises.ExerciseID → Exercises.ExerciseID**;

OutcomeMeasures.PatientID → Patients.PatientID.

Non-obvious attributes (by table)

Staff

- **Position**: Role label (e.g., Admin, PT, PTA); controlled vocabulary recommended.
- **Phone**: E.164 format recommended; may include extensions.
- **DOB**: Used for HR/verification; consider access controls.

Therapist (subtype of Staff)

- **Specialty**: Primary domain of practice (e.g., Orthopedic, Neuro).
    - *Potentially multi-valued.* Current schema allows **one** specialty; if therapists can have multiple specialties, model with a junction table (TherapistSpecialty).

Referrals

- **DxCode**: Diagnosis code at referral (ICD-10 string).
- **ReferringProvider**: Free-text name or NPI of external provider
- **ReferralDate**: Calendar date referral was created/received (no time component).

Sessions

- **Therapist**: Identifier of supervising therapist. **Use StaffID (FK to Therapist)** rather than free text to ensure integrity.
- **SessionDate**: Date (and optionally time) of encounter; store timezone if time used.
- **Status**: Encounter state; recommended enum: {Scheduled, Completed, Canceled, No-Show}.
- **PainPre / PainPost**: Patient-reported pain scores immediately before and after the session.
    - Scale should be fixed and documented (e.g., integer 0–10). Consider constraints (0–10).
- **Notes**: Unstructured clinical note; consider length limits and privacy tagging.

Exercises

- **Name**: Short exercise label (e.g., “SLR”).
- **BodyRegion**: Controlled vocabulary (e.g., Cervical, Lumbar, Shoulder, Hip, Knee, Ankle).
- **Difficulty**: Ordinal scale; define explicitly (e.g., 1–5 or {Easy, Moderate, Hard}); enforce via CHECK.

SessionExercises (bridge)

- **Sets / Reps / Resistance**: Dosage parameters for the performed exercise.

    - **Resistance**: Free text or numeric with unit (e.g., “5 lb”, “Blue band”). If numeric, store unit separately to avoid ambiguity.

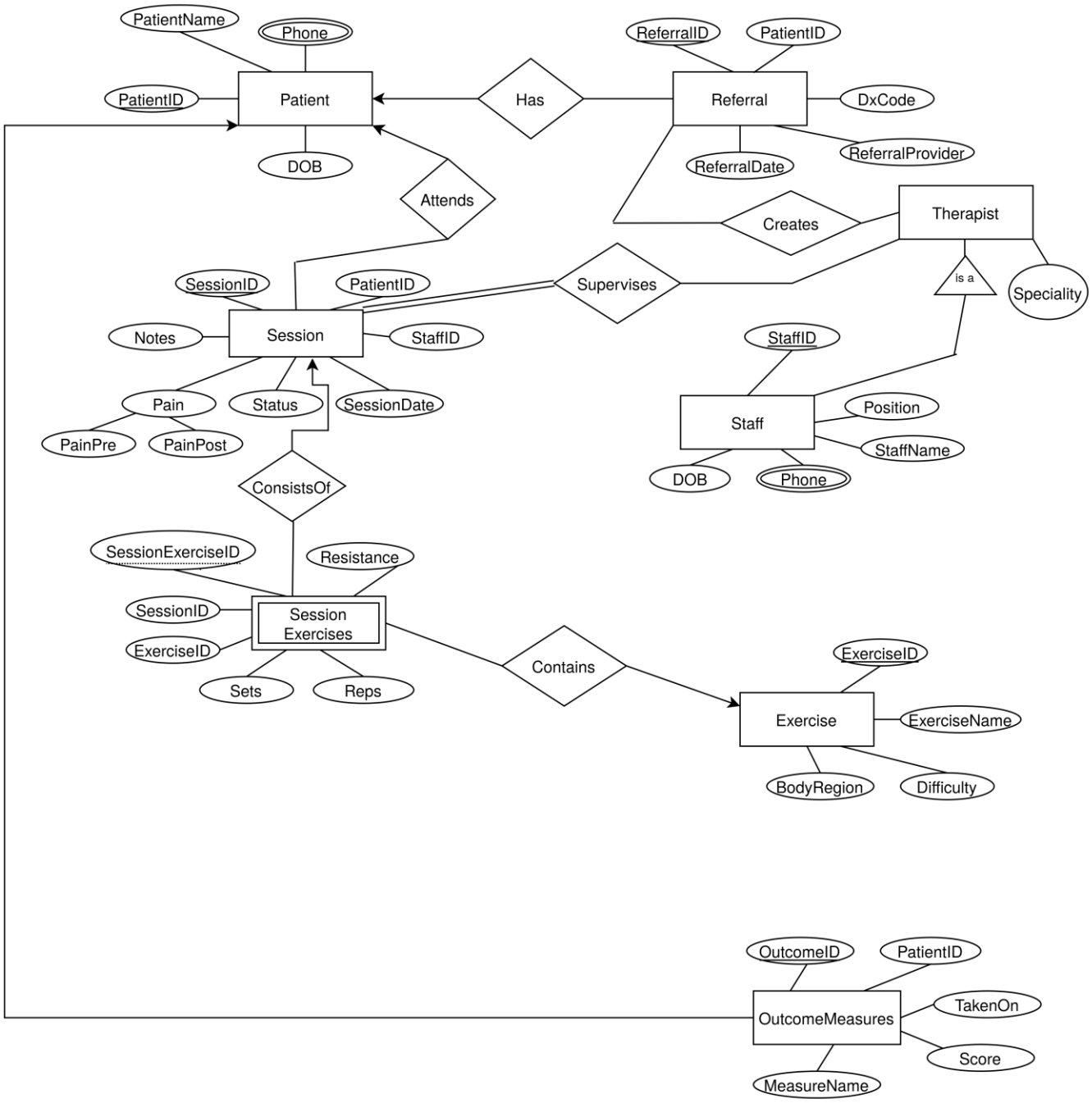
OutcomeMeasures

- **MeasureName**: Assessment instrument label (e.g., “ODI”, “LEFS”, “TUG”). Use controlled list if possible.
- **Score**: Numeric or structured string depending on instrument; document allowable ranges per measure.
- **TakenOn**: Date assessment was administered (no time unless needed for same-day repeats).

Multi-valued / composite notes

- **Specialty (Therapist)**: *Potentially multi-valued* in real life; current model treats as single. If multiple specialties are required, add TherapistSpecialty(TherapistID FK, Specialty) with unique (TherapistID, Specialty).
- No composite attributes are modeled; addresses are not present.
- No other multi-valued attributes appear in the ERD; repeated per-session exercises are handled via **SessionExercises** (1-to-many from Session).

Corrected ERD



Relational Schema

Staff(StaffID PK, StaffName, Position, Phone, DOB)

Therapist(StaffID PK,
StaffID FK → Staff(StaffID), Specialty)
(Subtype: every Therapist is a Staff row; only Specialty lives here.)

Patients(PatientID PK, Name, DOB, Phone)

Referrals(ReferralID PK,
PatientID FK → Patients(PatientID),
DxCode, ReferralDate,
ReferringProvider NULL) -- external name/NPI (optional)

Sessions(SessionID PK,
PatientID FK → Patients(PatientID),
TherapistID FK → Therapist(StaffID),
SessionDate, Status, PainPre, PainPost, Notes)

Exercises(ExerciseID PK, Name, BodyRegion, Difficulty)

SessionExercises(SessionExerciseID PK,
SessionID FK → Sessions(SessionID),
ExerciseID FK → Exercises(ExerciseID),
Sets, Reps, Resistance)

OutcomeMeasures(OutcomeID PK,
PatientID FK → Patients(PatientID),
MeasureName, Score, TakenOn)

Justifications

Therapist repeats Staff attributes (Position, StaffName, Phone, DOB) → transitive redundancy.

Sessions.Therapist is a text field, not an FK → hidden dependency.

Referential Integrity Constraints

- **Therapist(StaffID)** → **Staff(StaffID)**: ON DELETE RESTRICT, ON UPDATE CASCADE.

- **Referrals.PatientID** → **Patients.PatientID**: ON DELETE RESTRICT (health records), ON UPDATE CASCADE.
- **Sessions.PatientID** → **Patients.PatientID**: ON DELETE RESTRICT.
- **Sessions.TherapistID** → **Therapist.StaffID**: ON DELETE RESTRICT (or SET NULL if reassignment allowed).
- **SessionExercises.SessionID** → **Sessions.SessionID**: ON DELETE CASCADE (delete lines when a session is removed).
- **SessionExercises.ExerciseID** → **Exercises.ExerciseID**: ON DELETE RESTRICT (can't remove cataloged exercise if referenced).
- **OutcomeMeasures.PatientID** → **Patients.PatientID**: ON DELETE RESTRICT.

Integrity rule for referrals' referrer fields: enforce one-and-only-one source:

- CHECK ((ReferrerStaffID IS NOT NULL) <> (ReferringProvider IS NOT NULL)).

Domain/Range checks (data integrity):

- Sessions.Status in {Scheduled, Completed, Canceled, NoShow}.
- Sessions.PainPre, Sessions.PainPost integers 0–10 (or your defined scale).
- Exercises.Difficulty within defined ordinal set.
- Nonnegative Sets, Reps; Resistance typed (consider unit column if numeric).

Functional Dependencies

Patients(PatientID PK, Name, DOB, Phone)

- **PatientID → Name, DOB, Phone**

Staff(StaffID PK, StaffName, Position, Phone, DOB)

- **StaffID → StaffName, Position, Phone, DOB**

Therapist(StaffID PK/FK → Staff, Specialty)

- **StaffID → Specialty**
  (ISA subtype: the same StaffID also determines Staff attributes via join, but that's cross-table.)

Referrals(ReferralID PK, PatientID FK, DxCode, ReferralDate, ReferringProvider)

- **ReferralID → PatientID, DxCode, ReferralDate, ReferringProvider**

Sessions(SessionID PK, PatientID FK, TherapistID FK, SessionDate, Status, PainPre, PainPost, Notes)

- **SessionID → PatientID, TherapistID, SessionDate, Status, PainPre, PainPost, Notes**

Exercises(ExerciseID PK, Name, BodyRegion, Difficulty)

- **ExerciseID → Name, BodyRegion, Difficulty**

SessionExercises(SessionExerciseID PK, SessionID FK, ExerciseID FK, Sets, Reps, Resistance)

- **SessionExerciseID → SessionID, ExerciseID, Sets, Reps, Resistance**

OutcomeMeasures(OutcomeID PK, PatientID FK, MeasureName, Score, TakenOn)

- **OutcomeID → PatientID, MeasureName, Score, TakenOn**

Cross Table Implications

From **Therapist.StaffID** and the ISA:

> **StaffID → StaffName, Position, Phone, DOB** (in Staff) and **StaffID → Specialty** (in Therapist).

Thus, after joining Therapist ▷◁ Staff, **StaffID** determines all those attributes.

From **Sessions.TherapistID** (FK to Therapist), after join you get:

> **TherapistID → Specialty** (and via Staff join: StaffName, Position, Phone, DOB).
> From **Referrals.ReferrerStaffID** (if used), after join:
> **ReferrerStaffID → Specialty** (and Staff attributes

Data Dictionary

Data Item	Definition	Data Type	Notes
Position	Role label (Admin, PT, PTA)	VARCHAR(50)	Possible values: 'Admin', 'PT', 'PTA'. Attribute of Staff.
Specialty	Specialized focus of physical therapist	VARCHAR(50)	Attribute of Therapist (Subclass of Staff).
DxCode	Diagnosis Code at referral	VARCHAR(20)	Follows ICD- 10 standard (e.g., 'M54.5' for lower back pain).
ReferringProvider	Name of provider who referred patient	VARCHAR(50)	Attribute of Referral.
Status	State of a session	VARCHAR(20)	Domain: 'Scheduled', 'Completed', 'Cancelled', 'No-Show'.
PainPre	Patient reported pain score prior to a session	TINYINT	Range 0-10. Attribute of Session.
PainPost	Patient reported pain score after a session	TINYINT	Range 0-10. Attribute of Session.
BodyRegion	Area of the body targeted by an exercise	VARCHAR(30)	Examples: 'shoulder', 'knee', 'back'. Attribute of exercise.
Difficulty	Measure of exercise difficulty	TINYINT	Range 1-5 (1 = Easy, 5 = Hard).
Sets	Number of grouped consecutive repetitions of an exercise	TINYINT	Must be > 0. Attribute of exercise.
Reps	Number of times you complete a single repetition in a set	TINYINT	Must be > 0. Attribute of exercise.
Resistance	Resistance in an exercise	VARCHAR(20)	Examples: 'bodyweight', '10 lb.', 'green band'.
MeasureName	Name of Performance or functional measure taken	VARCHAR(50)	Examples: 'ODI', 'LEFS', 'TUG'.
Score	Numeric value of the performance measurement	DECIMAL(5, 2)	Measurement Result. Scored out of 100.

Database Authorizations

User Role	Patients	Staff	Therapist	Referrals	Sessions	Exercises	Session Exercises	Outcome Mreasure
Patient	SELECT	-	-	SELECT	SELECT	-	-	SELECT
Therapist	SELECT	SELECT	SELECT	SELECT, INSERT	SELECT, INSERT	SELECT	SELECT, INSERT	SELECT, INSERT
Admin	SELECT, INSERT,	SELECT, INSERT,	SELECT, INSERT,	SELECT, INSERT,	SELECT, INSERT,	SELECT, INSERT,	SELECT, INSERT,	SELECT, INSERT,

	UPDATE, DELETE	UPDATE, DELETE	UPDATE, DELETE	UPDATE, DELETE	UPDATE, DELETE	UPDATE, DELETE	UPDATE, DELETE	UPDATE, DELETE