Claims:

What is claimed is:

1. **A closed-loop dosing engine** for automated drug or fluid administration to a patient, the engine comprising:
   1.1. a *sensor interface* configured to receive continuous-stream or discrete laboratory data indicative of patient physiology;
   1.2. a *baseline risk core* that assigns a first numerical risk value **Rcore(L)** to each control loop **L** according to harm-severity, time-to-harm and reversibility parameters;
   1.3. an *ICD-10 attribute overlay module* that, for every active International Classification of Diseases (ICD-10) diagnosis code **d** in the patient's record, retrieves a stored tuple of control modifiers $\langle w_{d,L}, \delta_{d,L}, \alpha_{d,L}, \Gamma_{d,L}, \beta_{d,L}, \sigma_{d,L}, \omega'_{d,L}, \mu'_{d,L} \rangle$ and (i) multiplies **Rcore(L)** by **$w_{d,L}$**, (ii) applies $\delta_{d,L}$ and $\alpha_{d,L}$ to adjust dose ceilings and rate limits, and (iii) injects gating, mutual-exclusion and synergy edges Γ, β, σ into a conflict graph;
   1.4. a *medication-and-demographic overlay module* that (i) computes a medication-recency coefficient ρ_m for each prescription **m** by an exponential decay of a last-fill timestamp, (ii) scales loop risk and dose parameters by ρ_m, and (iii) adjusts control gains with demographic scalars derived from age, weight, height and sex;
   1.5. a *priority arbitration engine* that, on every control cycle:
      a) constructs, from the conflict graph, a queue of enabled loops per shared actuator;
      b) orders the queue by composite risk **$R(L)=Rcore(L)\cdot\prod w_{d,L}\cdot\prod\rho_m$** and by topological precedence;
      c) enforces gating, mutual-exclusion and synergy constraints;
      d) selects at most one winning loop (plus any synergistic partner) per actuator and emits an actuation command limited by $\delta_{d,L}$ and $\alpha_{d,L}$;
   1.6. an *audit-ledger module* that records, for every actuation, a tamper-evident entry comprising timestamp, loop identifier, composite-risk value, overlaid modifiers applied, actuator command and clinician overrides, thereby enabling traceability;
   1.7. at least one *actuator driver* that executes the actuation command on an infusion pump, ventilator or other therapy device;
   whereby the dosing engine delivers patient-specific therapy that is simultaneously risk-weighted, diagnosis-aware, medication-aware and demographically scaled, while ensuring deterministic conflict resolution and full auditability.

2. **The engine of claim 1,** wherein the ICD-10 attribute overlay module stores the control-modifier tuples in a relational table keyed by ICD-10 code and loop identifier, and merges multiple active diagnoses by (a) multiplicatively combining scalar fields and (b) performing set-union on list fields.

3. **The engine of claim 1** wherein the medication-recency coefficient $\rho_m=\exp[-\lambda\cdot\Delta t]$ with λ selectable between 0.01 day^{-1} and 0.1 day^{-1}, and Δt is the elapsed time since last

pharmacy fill.

4. **The engine of claim 1** wherein demographic scalars reduce dose-rate aggressiveness by at least 20 % for patients over 75 years of age.

5. **The engine of claim 1,** further comprising a μ-band adaptive-learning subsystem that suppresses actuator changes inside an inner tolerance band and passively estimates patient-specific dose–response Jacobian entries, subject to the dose ceiling modifiers $\delta_{d,L}$.

6. **The engine of claim 1,** wherein the audit-ledger module cryptographically hashes each log entry and chains the hashes to create a tamper-evident ledger.

7. **The engine of claim 1** wherein mutually exclusive edges $\beta_{d,L}$ disable concurrent infusion of drugs that are chemically incompatible or physiologically antagonistic.

8. **The engine of claim 1** wherein gating edges $\Gamma_{d,L}$ enforce a minimum serum potassium threshold before insulin infusion is allowed in patients coded with E87.5 hyperkalemia.

9. **The engine of claim 1** wherein synergy edges $\sigma_{d,L}$ co-schedule loop pairs for simultaneous initiation when the patient carries R65.21 septic-shock diagnosis.

10. **The engine of claim 1** wherein clinician overrides can temporarily force or block a loop, and such overrides are logged with user identity in the audit ledger.

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11. **A method of automated therapeutic dosing,** comprising:
    11.1. ingesting sensor streams and laboratory results for a patient;
    11.2. computing baseline risk values for a plurality of control loops;
    11.3. retrieving active ICD-10 diagnosis codes and applying for each code a stored set of risk-weights, dose-limit modifiers, and graph-edge modifiers to the corresponding control loops;
    11.4. retrieving a list of current medications and their last-fill dates, calculating medication-recency coefficients, and modulating loop risk and dose parameters accordingly;
    11.5. scaling control gains using demographic data including age, weight, height and sex;
    11.6. constructing a conflict-resolution graph that includes precedence, gating, mutual-exclusion and synergy relationships;
    11.7. ranking enabled loops per actuator by composite risk and graph precedence, selecting a highest-priority loop that is not gated or excluded, and generating a dose command constrained by the applied dose-limit modifiers;
    11.8. executing the dose command on an actuator;
    11.9. writing an immutable audit record containing the decision rationale;
    11.10. repeating steps 11.1 through 11.9 on each control cycle.

12. **The method of claim 11,** wherein dose commands are generated at a frequency of at least 10 Hz when continuous sensors are available and at the arrival of each laboratory result when operating in a lab-driven mode.

13. **The method of claim 11** wherein any two diagnosis overlays that attempt to increase the same dose ceiling are resolved by selecting the more restrictive ceiling.

14. **The method of claim 11** further comprising passively observing μ-band deviations to update patient-specific Jacobian coefficients for cross-loop interactions.

15. **The method of claim 11** wherein audit records are hash-chained and stored in a write-once medium to satisfy regulatory traceability requirements.

16. **The method of claim 11,** wherein a loop governing sodium correction is automatically capped at ≤ 8 mmol L^{-1} per 24 h when the patient carries ICD-10 code E87.1 for hyponatremia.

17. **The method of claim 11** wherein insulin infusion is automatically gated unless serum potassium exceeds 3.5 mmol L^{-1} in any patient carrying ICD-10 code E87.5 for hyperkalemia.

18. **The method of claim 11** wherein vasopressor dose targets are reduced when ICD-10 code I61.9 intracerebral hemorrhage is active.

19. **The method of claim 11** wherein inhaled oxygen and PEEP titration loops are co-scheduled when ICD-10 code J80 acute respiratory distress syndrome is present.

20. **The method of claim 11** wherein risk values, dose limits and graph edges are recomputed whenever a new diagnosis code, medication or demographic update is received, thereby maintaining real-time personalization.