1. Automated radiological pre-screening - Design a system that analyzes chest X-rays to flag potential abnormalities (nodules, infiltrates, pneumothorax) before radiologist review, prioritizing urgent cases and generating preliminary findings reports that highlight areas of concern with specific coordinates and preliminary severity assessments.
2. Medication reconciliation during hospital admission - Develop a workflow that compares patients' home medication lists against hospital formulary options, identifies therapeutic equivalents, flags potential interactions or contraindications based on current lab values and diagnoses, and generates a recommended inpatient medication plan for physician approval.
3. Post-discharge follow-up management - Create a system that monitors patient-reported symptoms after hospital discharge via text or voice interactions, escalates concerning patterns to care teams, provides personalized recovery guidance, and adjusts follow-up frequency based on individual risk profiles.
4. Clinical documentation assistance - Implement a workflow that listens to patient-provider conversations, generates structured clinical notes in the SOAP format, extracts billable diagnoses and procedures for coding, and prompts providers about missing documentation elements required for quality measures.
5. Chronic pain treatment optimization - Design a system that tracks patient-reported pain levels, functional capacity, medication use, and side effects between appointments, suggesting evidence-based adjustments to non-opioid therapies and identifying candidates who might benefit from complementary approaches like physical therapy.
6. Preventive care gap closure - Develop a workflow that analyzes patient records against age and condition-appropriate screening recommendations, identifies overdue preventive services, generates personalized outreach communications, and facilitates direct scheduling for patients who respond positively.
7. Clinical trial screening and referral - Create a system that continuously evaluates patient populations against active trial enrollment criteria, alerts providers to potentially eligible patients during encounters, generates pre-populated referral documents, and tracks outcomes of referrals to optimize future matching algorithms.
8. Laboratory result interpretation and follow-up - Implement a workflow that evaluates incoming lab results against patient-specific normal ranges, suggests appropriate follow-up timeframes for abnormalities, generates patient-friendly explanations, and creates provider task reminders for results requiring action.
9. Mental health symptom monitoring - Design a system that conducts periodic validated screenings (PHQ-9, GAD-7) between therapy sessions, identifies concerning trends or acute risk factors, provides personalized coping strategies based on previous effective interventions, and alerts providers to patients who may need appointment adjustments.
10. Perioperative risk optimization - Develop a workflow that identifies modifiable risk factors before scheduled surgeries, creates personalized pre-operative optimization plans (smoking cessation, glucose control, nutritional support), tracks progress through automated check-ins, and adjusts recommendations based on patient responses and timeline to surgery.
11. Multi-modal EHR data integration for phenotyping - Design a system that harmonizes structured and unstructured clinical data (notes, lab values, imaging reports, genomic data) to automatically identify complex phenotypes for research cohorts, using natural language processing to extract relevant information from clinical narratives and integrating it with structured data to create comprehensive, validated phenotype definitions.
12. Real-time clinical decision support for antimicrobial stewardship - Develop a workflow that continuously analyzes microbiology results, antibiograms, patient-specific factors (renal function, drug interactions), and institutional resistance patterns to generate tailored antibiotic recommendations, flagging opportunities for de-escalation and providing evidence summaries linked to relevant literature.
13. Automated systematic review generation and maintenance - Create a system that continuously scans published literature across multiple databases, extracts structured data from relevant studies using NLP, synthesizes findings using meta-analytic techniques, generates living systematic reviews with forest plots and certainty of evidence assessments, and updates conclusions as new evidence emerges.
14. Precision dosing through multi-parameter pharmacokinetic modeling - Implement a workflow that integrates patient-specific variables (genomics, organ function, concomitant medications, comorbidities) to create individualized pharmacokinetic models, predicts optimal dosing regimens, simulates concentration-time profiles, and recommends therapeutic drug monitoring schedules with Bayesian adaptive refinement.
15. Multivariate temporal pattern recognition for early sepsis detection - Design a system that analyzes temporal relationships between vital signs, laboratory values, medication administration, and clinical documentation to identify subtle patterns preceding septic deterioration, generating interpretable explanations for its predictions and calibrating alert thresholds to institutional workflow constraints.
16. Automated curation of genomic variant significance - Develop a workflow that continuously evaluates newly identified genetic variants against multiple evidence sources (population databases, functional studies, segregation data), applies ACMG/AMP classification criteria, generates evidence summaries with confidence metrics, and proposes reclassifications as new information becomes available.
17. Natural language query interface for clinical data warehouses - Create a system that translates natural language research questions into optimized database queries across federated data sources, identifies appropriate cohort definitions and confounding variables, suggests analytical approaches, and generates reproducible analysis notebooks with appropriate statistical methods.
18. Computational pathology workflow for digital slide analysis - Implement a workflow that processes whole slide images to quantify histopathological features, integrates with clinical and molecular data, identifies regions of interest for pathologist review, and generates composite biomarkers that correlate with treatment response and outcomes.
19. Automated adverse drug event detection and causality assessment - Design a system that monitors clinical documentation, laboratory trends, and medication administration records to identify potential adverse drug events, applies established causality algorithms (Naranjo, WHO-UMC), generates standardized case reports, and identifies patterns across patient populations.
20. Synthetic data generation with privacy preservation - Develop a workflow that creates realistic but non-identifiable patient datasets for algorithm development and validation, preserving complex relationships between variables while ensuring statistical anonymity, generating evaluation metrics for data utility and re-identification risk, and maintaining clinical plausibility of synthetic cases.