# Prescription Evaluation with GPT4 and **openFDA**

# Situation

# Statistics - Thanks Brian!

**2023**
**1:4 Patients Harmed in Hospitals**

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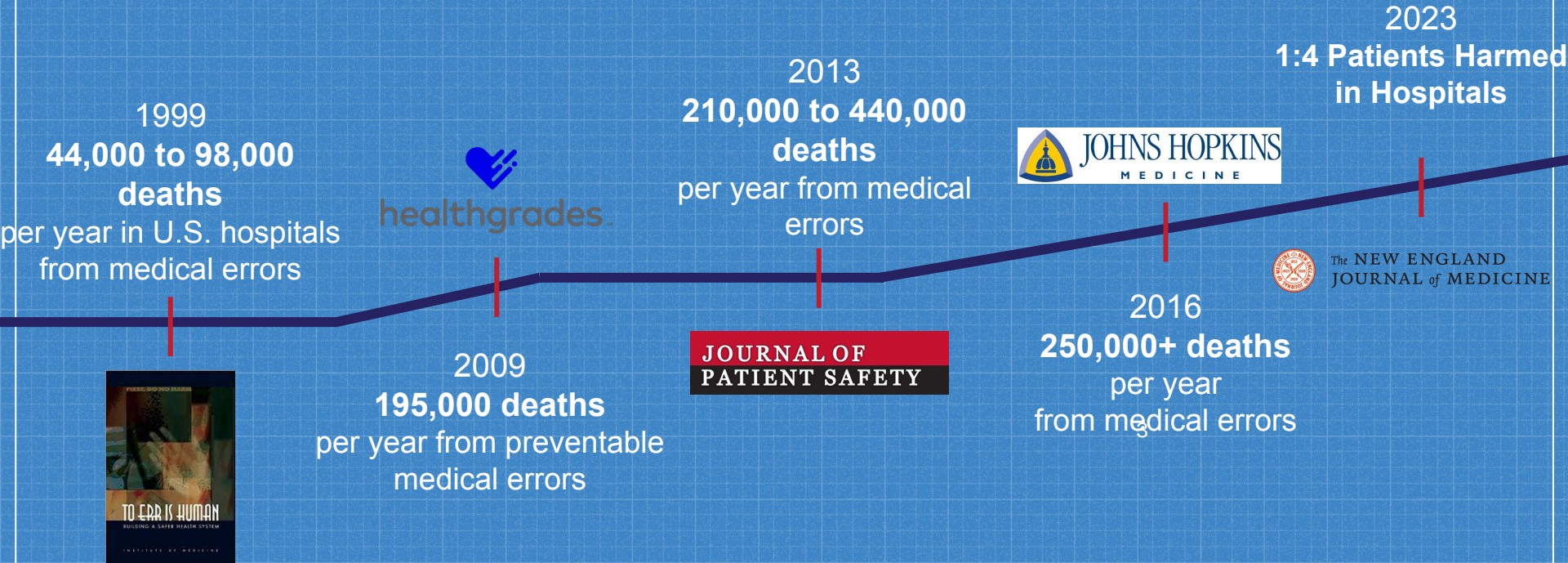
# Our Idea

- Stats
  - 1:4 Patients Harmed in Hospitals, 44% medication-related
- Common Errors
  - dispensing an incorrect medication
  - miscalculating a dose
  - failing to identify drug interactions or contraindications

- **Scope: Prescription checker for healthcare providers, reducing human oversight, complacency and improving effectiveness**

# Workflow
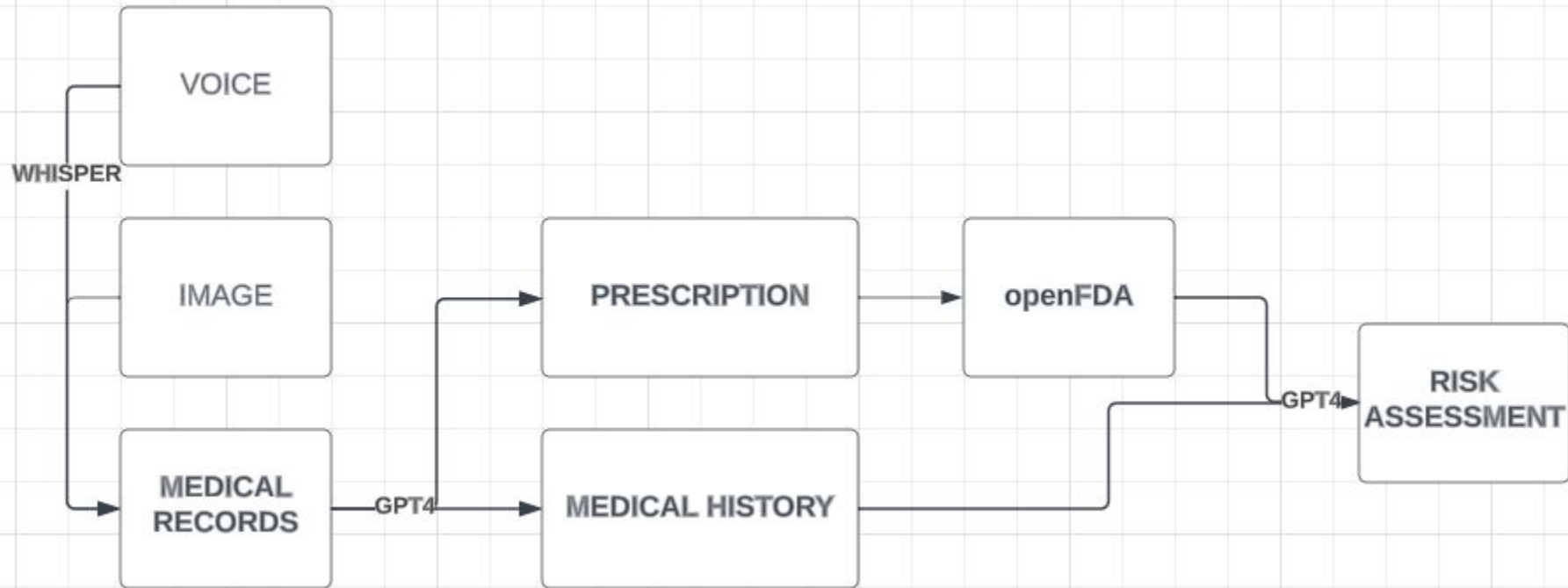
# Under the Hood

➔ Text Input: patient record and prescription

➔ Info Extraction

◆ Patient's medical history

◆ Patient's symptoms and diagnosis

◆ Doctor's prescription

➔ Fetch drug information from OpenFDA API

➔ Query LLM with combined information (with prompt engineering)

➔ Output: Warnings and evaluation of the treatment's level of dangerousness

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# Demo

admission date discharge date date birth sex service medicine allergy known allergy adverse drug reaction ... st name un chief complaint shortness breath major surgical invasive procedure esophagogastroduodenoscopy endoscopic clipping intubation extubation history present illness yo male history recent admission av block presumed lyme disease htn dm prior imi w systolic chf ef h gib unclear etiology presented acute onset dyspnea lying bed home lasting two hour patient discharged cardiology service following admission dyspnea found new heart block elevated troponin st change ekg concern new onset av block secondary lyme disease patient discharged home ceftriaxone also restarted aspirin admission tonight patient started dyspnea home rest pt denies chest pain complains nausea episode non bloody emesis looked dark brown got go bathroom felt lightheaded fell hit head lose consciousness pt endorses dark stool noticed since starting iron pt denies fever cough abdominal pain ed initial v ra exam significant pale conjunctiva guaiac positive dark stool lab notable hct previous hct day ago wbc potassium bicarb creatinine lactate inr ekg significant sinus rhythm street address elevation ii iii avf twi avl felt consistent prior two gauge iv placed patient transfused unit prbcs additional unit crossmatched ng lavage marroon return clear patient given protonix bolus gtt potassium patient received calcium chloride insulin albuterol amp sodium bicarb emergency department patient noted worsening dyspnea telemetry became bradycardiac three four epidoses lasting approximately one minute patient heart rate improved spontaneously require atropine transfer patient sinus tach sbp arrival micu patient feel comfortable endorses intermittent dyspnea chest pain ng tube place draining dark brown red fluid denies abdominal pain nausea vomiting diarrhea past medical history schf ef reported dm complicated neuropathy ckd ac htn hl ckd baseline cr chronic anemia uncertain etiology baseline high chronic leukocytosis chronic gi bleed uncertain etiology barretts esophagus prior sbo adhesion p loa social history life hospital wife bedbound m name stitle full time caretaker one son life home retired former pack year smoker quit year ago former beer drinker denies illicits family history mother died name ni father died cancer grandfather died mi dm physical exam admission general appearance acute distress eye conjunctiva perrl lymphatic cervical wnl cardiovascular normal normal peripheral vascular bilateral dp pulse respiratory chest crackle base bilaterally abdominal soft non tender bowel sound present skin warm pertinent result lab admission wbc rbc hgb hct mcv mch mchc rdw glucose urea n creat sodium potassium chloride total co anion gap lactate k pt ptt inrpt hematocrit blood hct blood hct blood hct pm blood hct blood hct pm blood hct lactate blood lactate k blood lactate blood lactate microbiology blood culture x ngtd urine culture growth lyme serology antibody b burgdorferi detected eia imaging tte left atrium mildly dilated left ventricular wall thickness normal posterior wall thin fibrotic akinetic left ventricular cavity size normal overall left ventricular systolic function moderately depressed lvef secondary akinesis inferior posterior wall tissue doppler imaging suggests increased left ventricular filling pressure pcwp mmhg right ventricular free wall thickness normal right ventricular chamber size normal depressed free wall contractility aortic valve leaflet mildly thickened minimally increased gradient consistent minimal aortic valve stenosis mitral valve leaflet mildly thickened mitral valve prolapse moderate mitral regurgitation seen tricuspid valve leaflet mildly thickened moderate pulmonary artery systolic hypertension trivial physiologic pericardial effusion echocardiographic sign tamponade compared finding prior study image reviewed left ventricular ejection fraction reduced secondary extensive inferior posterior wall dysfunction cxr chin elevated tip endotracheal tube upper margin clavicle le cm carina probably acceptable position tube could advanced mm secure seating pulmonary edema mild atelectasis left base new mild cardiomegaly stable pleural effusion pneumothorax brief hospital course mr known lastname year old male history av nodal blockade htn dm prior imi systolic chf ef h gib unclear etiology presenting dyspnea hematemesis secondary upper gib well myocardial ischemia setting gib gi bleed upper gi bleed demonstrated hematemesis ng lavage bloody fluid initially given unit prbcs l ivf improvement hemodynamics patient evidence active end organ ischemia given troponin elevation st change ekg elevated lactate patient received total unit prbc well one ffp platelet transfusion gi saw patient performed endoscopy twice first provide adequate visualization due significant bleeding second endoscopy visualized vascular lesion consistent dieulafoy lesion clipped post procedure patient remained hemodynamically stable stable hct require transfusion hematocrit remained stable floor ppi transitioned iv po repeat endoscopy day discharge showed barretts biopsy taken repeat egd week myocardial ischemia patient likely demand ischemia setting gib without chest pain patient troponin elevation prior hospitalization setting renal failure repeat tte performed compared finding prior study image reviewed left ventricular ejection fraction reduced secondary extensive inferior posterior wall dysfunction atrius cardiology evaluated patient beta blocker initially held acute gi bleed restarted stable heart rhythm stable occasional nd degree block similar previous hospitalization asa restarted need restarted discretion pcp cardiologist restarted home dos lisinopril hctz restarted mg metoprolol succinate follow atrius cardiology lyme carditis av block patient presented osh new onset high grade av block narrow complex junctional escape rhythm patient currently undergoing empiric treatment lyme disease given history tick exposure initial lyme serology negative repeated still negative continued ceftriaxone project day course end cardiology feel pacer indicated time given improvement treatment hyperkalemia unclear etiology improved ed following administration calcium bicarb insulin likely secondary ckd potassium normalized wnl time transfer floor remained stable chf tte ef hospitalization history ef prior tte repeat tte ckd creatinine increased baseline possibly setting poor perfusion setting hemorrhage patient cr remained elevated time transfer slowly trended back toward baseline leukocytosis baseline elevated wbc additional elevation felt secondary inflammatory state created gi bleed myocardial ischemia dm continued home dose lantus insulin sliding scale transitional issue need asa restarted need lab checked pcp follow visit need uptitration bb tolerated code status full communication son name ni telephone fax wife name ni telephone fax follow appts gi cardiology id pcp medication admission ceftriaxone g iv qh course complete simvastatin mg daily insulin glargine unit qhs omeprazole mg hospital ferrous sulfate mg hospital aspirin mg daily discharge medication atorvastatin mg tablet sig one tablet po daily daily disp tablet refill insulin glargine unit ml solution sig eighteen unit subcutaneous bedtime omeprazole mg capsule delayed releasee c sig one capsule delayed releasee c po twice day ceftriaxone dextroseiso o gram ml piggyback sig two g intravenous qh every hour day last day completed disp q vial refill sodium chloride syringe sig see ml injection qh every hour needed line flush sodium chloride flush ml iv qh prn line flush peripheral line flush ml normal saline every hour prn heparin porcine pf unit ml syringe sig see ml intravenous prn needed needed line flush heparin flush unit ml ml iv prn line flush picc heparin dependent flush ml normal saline followed heparin daily prn per lumen order filled pharmacy dosage form syringe strength unit ml metoprolol succinate mg tablet extended release hr sig one tablet extended release hr po day disp tablet extended release hr refill lisinopril mg tablet sig one tablet po daily daily hydrochlorothiazide mg capsule sig one capsule po daily daily discharge disposition home service facility year digit discharge diagnosis primary diagnosis upper gastrointestinal bleed dieulafoys lesion non st elevation myocardial infarction secondary demand ischemia secondary diagnosis chronic systolic congestive heart failure pulmonary hypertension chronic kidney disease barretts esophagus hypertension hyperlipidemia discharge condition mental status clear coherent level consciousness alert interactive activity status ambulatory requires assistance aid walker cane discharge instruction dear mr known lastname pleasure caring hospital admitted serious gastrointestinal bleed required endoscopic procedure intensive care unit procedure bleeding controlled blood test following intervention stable heart trouble previous hospitalization kept close eye well made following change medication continue ceftriaxone g iv daily stopped simvastatin start atorvastatin mg instead changed metoprolol mg daily continue take med prescribed weigh every morning name md md weight go lb followup instruction department infectious disease monday first name namepattern name md md telephone fax building lm hospital unit name hospital campus west best parking hospital ward name garage name last name lf first name lf location location un university college primary care address hospital university college numeric identifier phone telephone fax appt thursday also need seen cardiologist one month follow please call make appointment also need repeat endoscopy week called gi department schedule hearsd e week need call telephone fax schedule
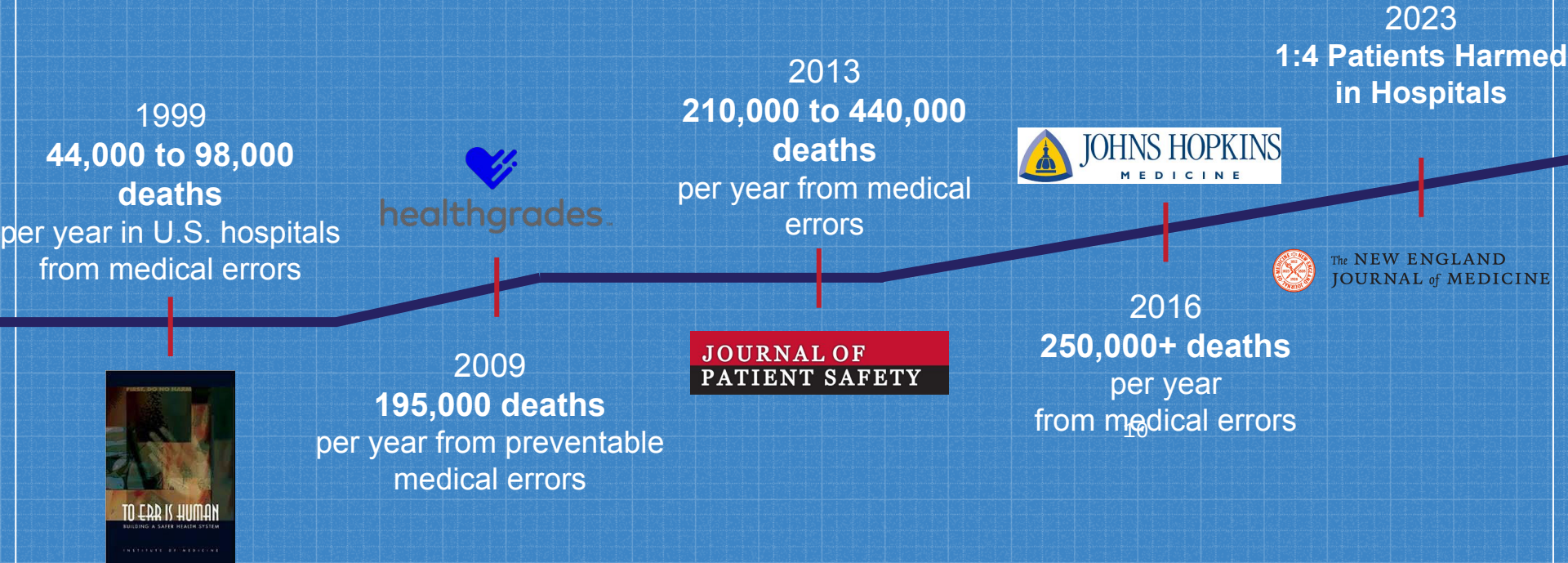
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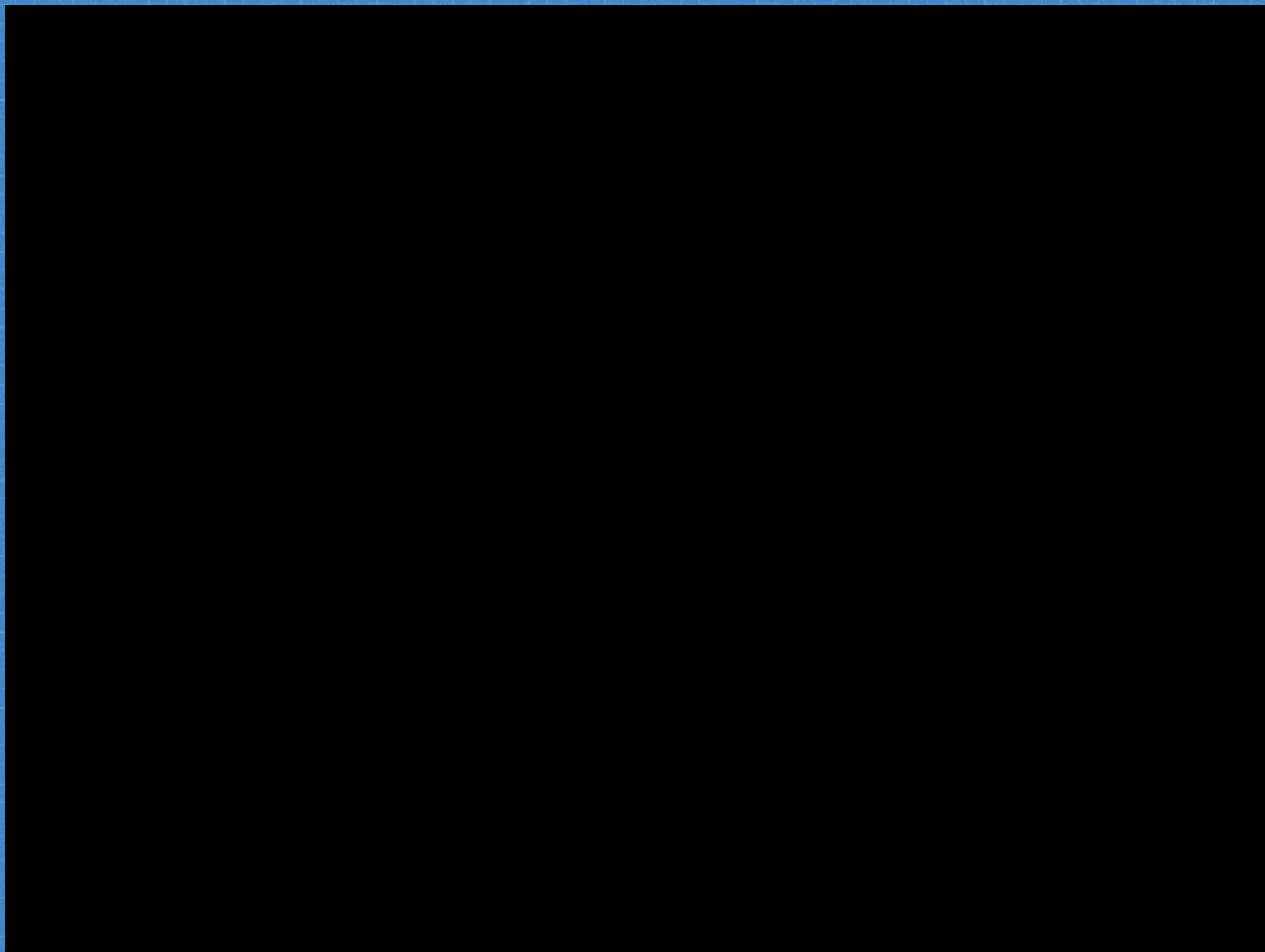
# Building the Future

- Hook 1:
- Hook 2: MIMIC-III Public Set
- Multimodal inputs
  - Voice and Image
- Better LLMs
  - GPT4 instead of GPT3.5
  - Med-PaLM2
- Reinforcement learning (RLHF)
  - Like ChatGPT, doctors' feedback can be used to improve the model

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# References

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