Multicenter Prospective Comparative-Effectiveness Trial: UFH vs LMWH in Emergency General Surgery (EGS)

Aims and Outcomes

Overall objective: Determine the comparative effectiveness and safety of LMWH vs UFH for VTE prophylaxis in Emergency General Surgery (EGS) inpatients across diverse centers and identify modifiable care processes and high-risk subgroups.

Primary Outcome

Symptomatic VTE within 30 days of admission (composite of objectively confirmed DVT by ultrasound and/or PE by CT.

Secondary Outcomes

1. In-hospital major bleeding (ISTH definition)
2. Any allogeneic transfusion ≥1 unit PRBC after first prophylactic dose
3. Return to OR for invasive procedure for bleeding
4. 30-day all-cause mortality
5. Total VTE (symptomatic and asymptomatic)

Tertiary Outcomes

- • ICU-free days to day 28 and hospital length of stay
  • Process metrics: time-to-first chemoprophylaxis dose; % on-time doses (±2h); missed-dose rate with reasons; peri-op holds/resume timing; renal (CrCl-based) and BMI-based dosing compliance; mechanical prophylaxis (IPC) adherence. For medication adherence there will be a review of the medication administration record to ensure the medication was administered and adherence metrics were met.

• Suspected/confirmed HIT

Specific Aims

Aim 1 (Effectiveness): Determine whether LMWH reduces 30-day symptomatic VTE vs UFH.
Hypothesis: LMWH lowers VTE risk vs UFH.
Strategy: Prospective review of EGS patients. VTE as confirmed by Imaging.

Aim 2 (Safety): Compare major bleeding and transfusion between LMWH and UFH.
Hypothesis: LMWH does not increase major bleeding/transfusion vs UFH.
Strategy: ISTH criteria; blood bank linkage; return-to-OR capture.

Study Design

- Design: Prospective, observational
- Study Type: Multicenter
- Duration: 18 months

Inclusion Criteria (complete list of ICD-10 codes listed at end of proposal)

- Adults ≥18 years admitted under EGS/ACS service
- Undergoing surgical intervention for the following ICD-10 codes relating to acute intrabdominal processes:
    - K35.* (Acute appendicitis)
    - K81.* (Acute cholecystitis)
    - K56.5 (Intestinal adhesions with obstruction)
    - K57.2*,K57.3* (Complicated diverticulitis with perforation or Abscess)
    - K85.* (Acute pancreatitis)
    - K46.0 (Strangulated abdominal hernia)
    - K25.5 (Acute gastric ulcer perforation)
    - K65.0 (Acute peritonitis)
    - K65.1 (Intra-abdominal Abscess)

- Admitted for >24 hours
- Eligible for pharmacologic VTE prophylaxis
- We will specifically plan to look at the below operations, but will include others as they are encountered:

Acute Appendicitis (K35.*)

- **44950** – Appendectomy
- **44960** – Appendectomy for ruptured appendix with abscess or generalized peritonitis
- **44970** – Laparoscopic appendectomy

Acute Cholecystitis (K81.*)

- **47562** – Laparoscopic cholecystectomy
- **47563** – Laparoscopic cholecystectomy with cholangiography
- **47564** – Laparoscopic cholecystectomy with exploration of common bile duct
- **47600** – Open cholecystectomy
- **47605** – Open cholecystectomy with cholangiography

Intestinal Adhesions with Obstruction (K56.5)

- **44005** – Enterolysis, open

- **44200** – Laparoscopic enterolysis
- **44120** – Small bowel resection
- **44121** – Small bowel resection with anastomosis
- **44202** – Laparoscopic small bowel resection

Complicated Diverticulitis with Perforation/Abscess (K57.2*, K57.3*)

- **44140** – Partial colectomy with anastomosis
- **44141** – Partial colectomy with skin-level colostomy
- **44143** – Partial colectomy with end colostomy and rectal closure
- **44204** – Laparoscopic partial colectomy with anastomosis
- **44206** – Laparoscopic partial colectomy with colostomy
- **49020** – Drainage of intra-abdominal abscess, open
- **49405 / 49406** – Percutaneous drainage of abdominal abscess

Acute Pancreatitis (K85.*)

- **48001** – Incision and drainage of pancreas / pancreatic abscess
- **49020** – Open drainage of intra-abdominal abscess
- **49405 / 49406** – Percutaneous drainage of pancreatic or peripancreatic collections

Strangulated Abdominal Hernia (K46.0)

- **49507** – Repair of strangulated inguinal hernia
- **49561** – Repair of strangulated incisional hernia
- **49587** – Repair of strangulated ventral hernia
- **44120 / 44121** – Small bowel resection
- **44202** – Laparoscopic small bowel resection

Acute Gastric Ulcer with Perforation (K25.5)

- **43840** – Gastrorrhaphy for perforated gastric ulcer
- **43843** – Gastrorrhaphy with vagotomy
- **43605** – Partial gastrectomy
- **43631** – Laparoscopic repair of gastric perforation

Acute Peritonitis (K65.0)

- **49000** – Exploratory laparotomy
- **49020** – Drainage of peritoneal abscess
- **44120 / 44121** – Small bowel resection
- **44140 / 44143** – Partial colectomy w/ or w/o ostomy

Intra-Abdominal Abscess (K65.1)

- **49020** – Open drainage of intra-abdominal abscess
- **49405** – Image-guided percutaneous drainage
- **49406** – Image-guided drainage with catheter placement
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Exclusion Criteria

- Therapeutic anticoagulation at baseline
- Active bleeding
- Severe renal impairment with a GFR < 30 ml/min/1.73m2
- History of HIT
- Comfort care on admission
- Absolute contraindication to chemoprophylaxis (e.g., certain spine/neuro interventions)
- Pregnancy

Statistical Analysis Plan

Tests and Models

• Continuous data: weighted linear regression; Wilcoxon for descriptive
• Categorical data: weighted log-binomial or Poisson with robust variance
• Survival data: Cox proportional hazards
• Multiple comparisons: Primary endpoint α=0.05; secondary FDR (Benjamini–Hochberg q=0.10); tertiary exploratory

Sample Size & Power

The presumed event rate in the high risk UFH group = 7.5%, while it is 5.2% in the high risk LMWH group. For an Alpha error = 0.05 and a Beta error = 0.20 a total sample size of 3700 patients is required (patients per arm = 1850).

Confounding & Bias Control

i. • Stratification: center-level and key clinical strata. Center level variation will be determined by a yes/no answer on VTE screening vs. symptomatic imaging. This covariate will be included in the center-level hierarchical models. We will also track surveillance intensity at each center by examining the US rate / 100 EGS admission, whether routine duplex screening exists at the center, and the # CTPA/CTA Chest / 100 EGS admissions.
   • Regression: hierarchical models with PS weights

ii. Missing data: Data will be captured exclusively in REDCap, we will minimize missingness through required fields for a prespecified Minimal Required Dataset(MRD) (exposure, primary outcome, key safety outcomes, and core confounders), and explicit 'unknown/not documented' options. Data completeness will be monitored monthly, with site-level dashboards and predefined thresholds (MRD ≥95% complete; primary outcome ascertainment ≥90%) triggering queries, retraining, and targeted audits. Thirty-day outcomes will be actively obtained using a standardized follow-up protocol. Analytically, missing covariates will be handled using Multiple Imputation (MICE) including site, exposure, and outcomes, while missing primary outcomes will be addressed using censoring/IPCW methods and prespecified best-/worst-case sensitivity analyses."

Subgroups & Sensitivity

• Subgroups: ICU vs ward, operative vs non-operative, diagnosis family, center type, high risk as defined by:

i. BMI> 30
ii. Smokers
iii. Age > 75
iv. Cancer
v. Prior VTE
vi. Immobility/ Bed Rest
vii. CHF
viii. MI <1m
ix. sepsis

Sensitivity: We will prospectively inventory and timestamp each site's VTE prophylaxis policy (agent preference, dosing, renal/BMI adjustments, neuraxial and perioperative hold rules, and surveillance practices) at onboarding. In the primary analysis, we will use propensity score methods incorporating center and patient-level covariates and fit hierarchical models with center random effects to account for clustering and policy-driven practice patterns; a center fixed-effects model will be a prespecified sensitivity analysis. Centers with limited treatment overlap will be handled via overlap weighting and prespecified restrictions to the overlap population, and any mid-study policy changes will be analyzed as natural experiments using difference-in-differences approaches

x.
xi. Sepsis

• Sensitivity: As-treated, per-protocol

Software

R, SAS. Primary analysis in R.

Variables to be Collected

Patient-Level Baseline Variables

Variable	Type	Timing	Definition / Source
Age	Continuous	Baseline	Age at admission
Sex	Categorical	Baseline	Male / Female / Other
Race/Ethnicity	Categorical	Baseline	Self-reported
BMI	Continuous; categorical (≥40)	Baseline	First height/weight within 24h
Comorbidity Index	Continuous	Baseline	Charlson Comorbidity Index
History of VTE	Binary	Baseline	Prior DVT or PE
Active malignancy	Binary	Baseline	Solid or hematologic
Baseline anemia	Binary	Baseline	Hgb <10 g/dL
Platelet count	Continuous	Baseline	Admission platelet count
Creatinine / CrCl	Continuous; categorical	Baseline & daily first 7d	Cockcroft–Gault; ≥50, 30–49, <30

Disease & Severity Variables

Variable	Type	Timing	Definition / Source
Index EGS Diagnosis	Categorical	Baseline	ICD-10 families
AAST EGS severity grade (if available)	Ordinal	Baseline	Grade I–V
Sepsis/septic shock	Binary	Baseline	Sepsis-3 criteria
ICU status	Binary	Admission	ICU vs ward
Mechanical ventilation	Binary	Admission	Ventilated within 24h
Vasopressor use	Binary	Admission	Any pressor within 24h

Operative & Procedural Variables

Variable	Type	Timing	Definition / Source
Operative status	Binary	During stay	Any OR procedure
Time to first OR	Continuous	During stay	Hours from admission
Procedure type	Categorical	OR	Major abdominal vs minor
Neuraxial anesthesia	Binary	Peri-op	Epidural/spinal present
Epidural start/stop times	Continuous	Peri-op	For AC timing adjustment

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Exposure & Process-of-Care Variables (Key Confounders)

Variable	Type	Timing	Definition / Source
Initial prophylaxis exposure	Binary	≤24h	UFH vs LMWH
Time to first dose	Continuous	Admission	Hours from admission
Prophylaxis dose	Continuous	Daily	Units (UFH) or mg (LMWH)
LMWH dosing schema	Categorical	Daily	Standard vs BMI-adjusted
UFH dosing schema	Categorical	Daily	q8h vs q12h
Missed doses	Count	Daily	Scheduled but not given
Reason for missed/held dose	Categorical	Daily	OR, bleeding, epidural, renal, policy default
Duration of AC hold	Continuous	Peri-op	Total hours held
Mechanical prophylaxis	Binary / Continuous	Daily	IPC ordered and hours/day
Anti-Xa monitoring (if used)	Binary	Daily	Anti-Xa obtained (Y/N)

Institutional / Policy Variables (Center-Level Confounding)

Variable	Type	Timing	Definition
Center ID	Categorical	Baseline	Participating site
Default VTE prophylaxis policy	Categorical	Quarterly	LMWH-first vs UFH-first
Renal restriction policy	Binary	Quarterly	LMWH avoided if CrCl <30
BMI-based dosing policy	Binary	Quarterly	Yes / No
Neuraxial AC restriction policy	Binary	Quarterly	Standard timing rules
Routine DVT screening policy	Binary	Quarterly	Yes / No
VTE surveillance intensity index	Continuous	Quarterly	US/CTPA rate per 100 admissions
Policy change during study	Binary	As occurs	Date-stamped

Outcomes

Variable	Type	Timing	Definition
Primary Outcome: Symptomatic VTE	Binary; time-to-event	≤30 days	Imaging-confirmed DVT or PE with documented symptoms
VTE classification	Categorical	Event	Symptomatic vs screen-detected vs incidental
Major bleeding (ISTH)	Binary; time-to-event	In-hospital	ISTH definition
Transfusion	Binary; count	In-hospital	Units PRBC after first dose
Return to OR for bleeding	Binary	In-hospital	Unplanned return
HIT (suspected/confirmed)	Binary	In-hospital	4Ts + PF4/SRA
ICU-free days	Continuous	Index stay	Days alive and out of ICU
ICU LOS	Continuous	Index stay	ICU days
Hospital LOS	Continuous	Index stay	Total LOS
30-day all-cause mortality	Binary; time-to-event	≤30 days	Death from any cause

Standardized definitions for outcomes:

- VTE within 30 days of admission (composite of objectively confirmed DVT by ultrasound and/or PE by CT.
  - DVT: confirmed by venous duplex ultrasound
  - PE: confirmed by computed tomography pulmonary embolism protocol
  - Identified after the index hospitalization or following discharge
- in-hospital major bleeding (ISTH definition)
  - Fatal bleeding
  - Symptomatic bleeding in a critical site (intracranial, intraspinal, intraocular, retroperitoneal, pericardial, or intramuscular with compartment syndrome)
  - Bleeding resulting in a hemoglobin decrease ≥2 g/dL within 24 hours
  - Bleeding requiring transfusion of ≥2 units of packed red blood cells
- Any allogeneic transfusion ≥1-unit pRBC after first prophylactic dose
  - Transfusion of ≥1 unit of pRBCs after administration of the first pharmacologic VTE prophylaxis dose during the hospitalization
- Return to OR for invasive procedure for bleeding
  - Any unplanned return to the operating room or interventional radiology suite for a procedure to control hemorrhage during the hospitalization
- 30-day all-cause mortality
  - Death from any cause occurring within 30 days of hospital admission

- ICU-free days to day 28
    - The number of days from hospital admission to day 28 during which the patient is alive and not in an intensive care unit
- hospital length of stay
    - The number of days from hospital admission to hospital discharge
- time-to-first chemoprophylaxis dose
    - The time from hospital admission to administration of the first dose of pharmacologic VTE prophylaxis
- % on-time doses (±2h)
    - The percentage of scheduled pharmacologic prophylaxis doses administered within 2 hours of the ordered administration time
- missed-dose rate with reasons
    - The percentage of scheduled pharmacologic prophylaxis doses not administered
- peri-op holds/resume timing
    - Time from last administered prophylaxis dose to surgical incision
    - Time from surgical end time to first postoperative prophylaxis dose
- renal (CrCl-based) and BMI-based dosing compliance
    - congruence between prescribed pharmacologic prophylaxis dose and recommended dosing based on renal function and bmi
- mechanical prophylaxis (IPC) adherence
    - The proportion of hospital days during which SCD devices were documented in use
- Suspected/confirmed HIT
    - Suspected HIT: Clinical concern leading to heparin discontinuation and lab testing.
      Confirmed HIT: Positive lab testing

Complete list of ICD-10 codes:

K81.0 ◇ 575.0 ◇ Gallbladder gangrene
K81.0 ◇ NA ◇ Acute cholecystitis
K81.1 ◇ 575.11 ◇ Cholecystitis, chronic
K81.1 ◇ NA ◇ Chronic cholecystitis
K81.2 ◇ 575.12 ◇ Acute cholecystitis with chronic cholecystitis
K81.2 ◇ NA ◇ Acute cholecystitis with chronic cholecystitis
K81.9 ◇ 575.10 ◇ Cholecystitis
K81.9 ◇ NA ◇ Cholecystitis, unspecified
K85.90, K80.50 ◇ 577.0 ◇ Pancreatitis due to common bile duct stone
K80.00 ◇ 574.00 ◇ Calculus of gallbladder with acute cholecystitis
K80.00 ◇ NA ◇ Calculus of gallbladder with acute cholecystitis without obstruction
K80.01 ◇ 574.01 ◇ Cholelithiasis and acute cholecystitis with obstruction
K80.01 ◇ NA ◇ Calculus of gallbladder with acute cholecystitis with obstruction
K80.10 ◇ 574.10 ◇ Calculus of gallbladder with cholecystitis without biliary obstruction
K80.10 ◇ NA ◇ Calculus of gallbladder with chronic cholecystitis without obstruction
K80.11 ◇ 574.11 ◇ Calculus of gallbladder with cholecystitis with biliary obstruction
K80.11 ◇ NA ◇ Calculus of gallbladder with chronic cholecystitis with obstruction
K80.12 ◇ 574.00, 574.10 ◇ Calculus of gallbladder with acute and chronic cholecystitis without obstruction
K80.12 ◇ NA ◇ Calculus of gallbladder with acute and chronic cholecystitis without obstruction
K80.13 ◇ 574.01, 574.11 ◇ Calculus of gallbladder with acute on chronic cholecystitis with obstruction

K80.13 ◇ NA ◇ Calculus of gallbladder with acute and chronic cholecystitis with obstruction
K80.18 ◇ 574.10 ◇ Calculus of gallbladder with cholecystitis of other acuity without obstruction
K80.18 ◇ NA ◇ Calculus of gallbladder with other cholecystitis without obstruction
K80.19 ◇ 574.11 ◇ Gallstones and inflammation of gallbladder with obstruction
K80.20 ◇ 574.20 ◇ Calculus of gallbladder without cholecystitis
K80.20 ◇ NA ◇ Calculus of gallbladder without cholecystitis without obstruction
K80.21 ◇ 574.21 ◇ Gallbladder calculus with obstruction
K80.21 ◇ NA ◇ Calculus of gallbladder without cholecystitis with obstruction
K80.30 ◇ 574.50, 576.1 ◇ Calculus of bile duct with cholangitis without obstruction, unspecified cholangitis acuity
K80.30 ◇ NA ◇ Calculus of bile duct with cholangitis, unspecified, without obstruction
K80.31 ◇ 574.51, 576.1 ◇ Calculus of bile duct with cholangitis and obstruction, unspecified cholangitis acuity
K80.31 ◇ NA ◇ Calculus of bile duct with cholangitis, unspecified, with obstruction
K80.32 ◇ NA ◇ Calculus of bile duct with acute cholangitis without obstruction
K80.33 ◇ 576.1, 574.51 ◇ Acute cholangitis due to calculus of bile duct with obstruction
K80.33 ◇ NA ◇ Calculus of bile duct with acute cholangitis with obstruction
K80.34 ◇ NA ◇ Calculus of bile duct with chronic cholangitis without obstruction
K80.35 ◇ NA ◇ Calculus of bile duct with chronic cholangitis with obstruction
K80.40 ◇ 574.40 ◇ Calculus of bile duct with other cholecystitis, without mention of obstruction
K80.40 ◇ NA ◇ Calculus of bile duct with cholecystitis, unspecified, without obstruction
K80.41 ◇ 574.41 ◇ Calculus of bile duct with other cholecystitis and obstruction
K80.41 ◇ NA ◇ Calculus of bile duct with cholecystitis, unspecified, with obstruction
K80.42 ◇ 574.30 ◇ Choledocholithiasis with acute cholecystitis
K80.42 ◇ NA ◇ Calculus of bile duct with acute cholecystitis without obstruction
K80.43 ◇ 574.31 ◇ Calculus of bile duct with acute cholecystitis and obstruction
K80.43 ◇ NA ◇ Calculus of bile duct with acute cholecystitis with obstruction
K80.44 ◇ 574.40 ◇ Choledocholithiasis with chronic cholecystitis
K80.44 ◇ NA ◇ Calculus of bile duct with chronic cholecystitis without obstruction
K80.45 ◇ NA ◇ Calculus of bile duct with chronic cholecystitis with obstruction
K80.46 ◇ NA ◇ Calculus of bile duct with acute and chronic cholecystitis without obstruction
K80.47 ◇ NA ◇ Calculus of bile duct with acute and chronic cholecystitis with obstruction
K80.50 ◇ 574.20 ◇ Colic, biliary
K80.50 ◇ 574.50 ◇ Intrahepatic bile duct stones
K80.50 ◇ NA ◇ Calculus of bile duct without cholangitis or cholecystitis without obstruction
K80.51 ◇ 574.51 ◇ Choledocholithiasis with obstruction
K80.51 ◇ NA ◇ Calculus of bile duct without cholangitis or cholecystitis with obstruction
K80.60 ◇ 574.70 ◇ Calculus of gallbladder and bile duct with other cholecystitis, without mention of obstruction
K80.60 ◇ NA ◇ Calculus of gallbladder and bile duct with cholecystitis, unspecified, without obstruction
K80.61 ◇ 574.51 ◇ Multiple obstructing stones in biliary tract
K80.61 ◇ 574.71 ◇ Calculus of gallbladder and bile duct with other cholecystitis, with obstruction
K80.61 ◇ NA ◇ Calculus of gallbladder and bile duct with cholecystitis, unspecified, with obstruction
K80.62 ◇ 574.60 ◇ Calculus of gallbladder and bile duct with acute cholecystitis without obstruction
K80.62 ◇ NA ◇ Calculus of gallbladder and bile duct with acute cholecystitis without obstruction
K80.63 ◇ 574.61 ◇ Gallbladder & bile duct stone, acute cholecystitis and obstruction
K80.63 ◇ NA ◇ Calculus of gallbladder and bile duct with acute cholecystitis with obstruction

K80.64 ◇ 574.70 ◇ Calculus of gallbladder and bile duct with chronic cholecystitis without obstruction
K80.64 ◇ NA ◇ Calculus of gallbladder and bile duct with chronic cholecystitis without obstruction
K80.65 ◇ NA ◇ Calculus of gallbladder and bile duct with chronic cholecystitis with obstruction
K80.66 ◇ 574.80 ◇ Calculus of gallbladder and bile duct with acute and chronic cholecystitis, without mention of obstruction
K80.66 ◇ NA ◇ Calculus of gallbladder and bile duct with acute and chronic cholecystitis without obstruction
K80.67 ◇ 574.81 ◇ Calculus of gallbladder and bile duct with acute and chronic cholecystitis, with obstruction
K80.67 ◇ NA ◇ Calculus of gallbladder and bile duct with acute and chronic cholecystitis with obstruction
K80.70 ◇ 574.90 ◇ Calculus of gallbladder and bile duct without cholecystitis
K80.70 ◇ NA ◇ Calculus of gallbladder and bile duct without cholecystitis without obstruction
K80.71 ◇ 574.91 ◇ Gallbladder & bile duct stone with obstruction
K80.71 ◇ NA ◇ Calculus of gallbladder and bile duct without cholecystitis with obstruction
K80.80 ◇ 574.20 ◇ Biliary calculus of other site without obstruction
K80.80 ◇ NA ◇ Other cholelithiasis without obstruction
K80.81 ◇ 574.21 ◇ Biliary calculus of other site with obstruction
K80.81 ◇ NA ◇ Other cholelithiasis with obstruction
O26.613, K80.20 ◇ 646.73, 574.20 ◇ Cholelithiasis affecting pregnancy in third trimester, antepartum
K35.890 ◇ NA ◇ Other acute appendicitis without perforation or gangrene
K35.891 ◇ 540.9 ◇ Gangrenous appendicitis
K35.891 ◇ NA ◇ Other acute appendicitis without perforation, with gangrene
K35.2 ◇ NA ◇ Acute appendicitis with generalized peritonitis
K35.20 ◇ 540.0 ◇ Acute appendicitis with generalized peritonitis
K35.20 ◇ NA ◇ Acute appendicitis with generalized peritonitis, without abscess
K35.21 ◇ 540.1 ◇ Acute appendicitis with perforation, generalized peritonitis, abscess, and gangrene
K35.21 ◇ NA ◇ Acute appendicitis with generalized peritonitis, with abscess
K35.3 ◇ NA ◇ Acute appendicitis with localized peritonitis
K35.30 ◇ 540.0 ◇ Acute appendicitis with localized peritonitis without abscess
K35.30 ◇ 540.1 ◇ Acute appendicitis with localized peritonitis
K35.30 ◇ 540.9 ◇ Acute appendicitis with localized peritonitis, without perforation, abscess, or gangrene
K35.30 ◇ NA ◇ Acute appendicitis with localized peritonitis, without perforation or gangrene
K35.31 ◇ 540.0 ◇ Acute appendicitis with localized peritonitis and gangrene, without perforation or abscess
K35.31 ◇ NA ◇ Acute appendicitis with localized peritonitis and gangrene, without perforation
K35.32 ◇ 540.0 ◇ Acute appendicitis with perforation and localized peritonitis, without abscess
K35.32 ◇ NA ◇ Acute appendicitis with perforation, localized peritonitis, and gangrene, without abscess
K35.33 ◇ 540.0 ◇ Appendicitis with peritonitis
K35.33 ◇ 540.1 ◇ Acute appendicitis with peritoneal abscess
K35.33 ◇ NA ◇ Acute appendicitis with perforation, localized peritonitis, and gangrene, with abscess
K35.80 ◇ 540.9 ◇ Acute appendicitis
K35.80 ◇ NA ◇ Unspecified acute appendicitis
K35.89 ◇ NA ◇ Other acute appendicitis
K35.890 ◇ 540.9 ◇ Other acute appendicitis
K56.0 ◇ 560.1 ◇ Adynamic ileus (HCC)
K56.0 ◇ NA ◇ Paralytic ileus
K56.1 ◇ 560.0 ◇ Intussusception of small intestine (HCC)
K56.1 ◇ NA ◇ Intussusception

K56.2 ◇ 560.2 ◇ Small bowel volvulus (HCC)
K56.2 ◇ NA ◇ Volvulus
K56.3 ◇ 560.31 ◇ Gallstone ileus (HCC)
K56.3 ◇ NA ◇ Gallstone ileus
K56.41 ◇ 560.32 ◇ Fecal impaction in rectum (HCC)
K56.41 ◇ 564.02 ◇ Obstructive defecation (HCC)
K56.41 ◇ NA ◇ Fecal impaction
K56.49 ◇ 560.30 ◇ Impaction, bowel (HCC)
K56.49 ◇ 560.39 ◇ Other impaction of intestine (HCC)
K56.49 ◇ NA ◇ Other impaction of intestine
K56.5 ◇ NA ◇ Intestinal adhesions (bands) with obstruction (postinfection)
K56.50 ◇ 560.81 ◇ Small bowel obstruction due to adhesions (HCC)
K56.50 ◇ NA ◇ Intestinal adhesions (bands), unspecified as to partial versus complete obstruction
K56.51 ◇ 560.81 ◇ Intestinal adhesions with partial obstruction (HCC)
K56.51 ◇ NA ◇ Intestinal adhesions (bands), with partial obstruction
K56.52 ◇ 560.81 ◇ Intestinal adhesions with complete obstruction (HCC)
K56.52 ◇ NA ◇ Intestinal adhesions (bands) with complete obstruction
K56.60 ◇ NA ◇ Unspecified intestinal obstruction
K56.600 ◇ 560.9 ◇ Partial bowel obstruction (HCC)
K56.600 ◇ NA ◇ Partial intestinal obstruction, unspecified as to cause
K56.601 ◇ 560.9 ◇ Complete intestinal obstruction (HCC)
K56.601 ◇ NA ◇ Complete intestinal obstruction, unspecified as to cause
K56.609 ◇ 560.9 ◇ Unspecified intestinal obstruction
K56.609 ◇ NA ◇ Unspecified intestinal obstruction, unspecified as to partial versus complete obstruction
K56.69 ◇ 560.89 ◇ Other specified intestinal obstruction(560.89)
K56.69 ◇ NA ◇ Other intestinal obstruction
K56.690 ◇ 560.89 ◇ Other partial intestinal obstruction (HCC)
K56.690 ◇ NA ◇ Other partial intestinal obstruction
K56.691 ◇ 560.89 ◇ Other complete intestinal obstruction (HCC)
K56.691 ◇ NA ◇ Other complete intestinal obstruction
K56.699 ◇ 560.89 ◇ Other intestinal obstruction unspecified as to partial versus complete obstruction (HCC)
K56.699 ◇ 560.9 ◇ Small bowel stricture (HCC)
K56.699 ◇ NA ◇ Other intestinal obstruction unspecified as to partial versus complete obstruction
K56.7 ◇ 560.1 ◇ Ileus (HCC)
K56.7 ◇ NA ◇ Ileus, unspecified
K56.7, T50.905A ◇ 560.1, E947.9 ◇ Drug-induced ileus (HCC)
K91.81, K56.690 ◇ 997.49, 560.9 ◇ Intraoperative partial intestinal obstruction (HCC)
K91.89, K56.7 ◇ 997.49, 560.1 ◇ Ileus following gastrointestinal surgery (HCC)
K27.9, K56.609 ◇ 533.91 ◇ Peptic ulcer without hemorrhage or perforation but with obstruction (HCC)
K62.3, K56.1 ◇ 569.1 ◇ Internal complete rectal prolapse with intussusception of rectosigmoid (HCC)
K57.00 ◇ 562.00 ◇ Perforated diverticulum of duodenum
K57.00 ◇ 562.01 ◇ Diverticulitis of small intestine with perforation and abscess without bleeding
K50.10, K57.30 ◇ 555.1, 562.10 ◇ Segmental colitis associated with diverticulosis (HCC)
K57.00 ◇ 562.01, 569.5 ◇ Diverticulitis of small intestine with abscess without bleeding
K57.00 ◇ 562.01, 569.83 ◇ Diverticulitis of small intestine with perforation without bleeding

K57.00 ◇ NA ◇ Diverticulitis of small intestine with perforation and abscess without bleeding
K57.10 ◇ 562.00 ◇ Ileal diverticulum
K57.10 ◇ NA ◇ Diverticulosis of small intestine without perforation or abscess without bleeding
K57.11 ◇ 562.02 ◇ Diverticulosis of small intestine with hemorrhage
K57.11 ◇ NA ◇ Diverticulosis of small intestine without perforation or abscess with bleeding
K57.12 ◇ 562.01 ◇ Diverticulitis of small intestine
K57.12 ◇ NA ◇ Diverticulitis of small intestine without perforation or abscess without bleeding
K57.20 ◇ 562.10 ◇ Perforated diverticulum of large intestine
K57.20 ◇ 562.11 ◇ Diverticulitis of colon with perforation
K57.20 ◇ 562.11, 569.5 ◇ Diverticulitis of large intestine with abscess
K57.20 ◇ 562.11, 569.83 ◇ Diverticulitis of large intestine with perforation without abscess, unspecified bleeding status
K57.20 ◇ NA ◇ Diverticulitis of large intestine with perforation and abscess without bleeding
K57.21 ◇ 562.13, 569.83 ◇ Diverticulitis of large intestine with perforation with bleeding
K57.21 ◇ NA ◇ Diverticulitis of large intestine with perforation and abscess with bleeding
K57.30 ◇ 562.10 ◇ Diverticulosis of colon without hemorrhage
K57.30 ◇ NA ◇ Diverticulosis of large intestine without perforation or abscess without bleeding
K57.31 ◇ 562.12 ◇ Diverticulosis of colon with hemorrhage
K57.31 ◇ NA ◇ Diverticulosis of large intestine without perforation or abscess with bleeding
K57.32 ◇ 562.11 ◇ Diverticulitis large intestine
K57.32 ◇ NA ◇ Diverticulitis of large intestine without perforation or abscess without bleeding
K57.33 ◇ 562.13 ◇ Diverticulitis of large intestine without perforation or abscess with bleeding
K57.33 ◇ NA ◇ Diverticulitis of large intestine without perforation or abscess with bleeding
K57.40 ◇ 562.10 ◇ Diverticular disease small and large intestine, perforation, abscess
K57.40 ◇ NA ◇ Diverticulitis of both small and large intestine with perforation and abscess without bleeding
K57.50 ◇ 562.00, 562.10 ◇ Diverticulosis of both small and large intestine without bleeding
K57.50 ◇ 562.10 ◇ Diverticular disease of both small and large intestine
K57.50 ◇ NA ◇ Diverticulosis of both small and large intestine without perforation or abscess without bleeding
K57.51 ◇ NA ◇ Diverticulosis of both small and large intestine without perforation or abscess with bleeding
K57.52 ◇ NA ◇ Diverticulitis of both small and large intestine without perforation or abscess without bleeding
K57.80 ◇ 562.10 ◇ Perforated diverticulum
K57.80 ◇ 562.11 ◇ Diverticulitis of intestine with perforation
K57.80 ◇ 562.11, 569.5 ◇ Diverticulitis of intestine with abscess
K57.80 ◇ 562.11, 569.83 ◇ Diverticulitis of intestine with perforation without bleeding
K57.80 ◇ 569.83, 562.11 ◇ Perforation of intestine due to diverticulitis of gastrointestinal tract
K57.80 ◇ NA ◇ Diverticulitis of intestine, part unspecified, with perforation and abscess without bleeding
K57.81 ◇ NA ◇ Diverticulitis of intestine, part unspecified, with perforation and abscess with bleeding
K57.90 ◇ 562.10 ◇ Diverticulosis of intestine
K57.90 ◇ NA ◇ Diverticulosis of intestine, part unspecified, without perforation or abscess without bleeding
K57.91 ◇ 562.12 ◇ Diverticulosis of intestine with bleeding
K57.91 ◇ NA ◇ Diverticulosis of intestine, part unspecified, without perforation or abscess with bleeding
K57.92 ◇ 562.11 ◇ Diverticulitis of intestine without perforation or abscess without bleeding
K57.92 ◇ NA ◇ Diverticulitis of intestine, part unspecified, without perforation or abscess without bleeding
K57.93 ◇ 562.13 ◇ Diverticulitis of intestine without perforation or abscess with bleeding
K57.93 ◇ NA ◇ Diverticulitis of intestine, part unspecified, without perforation or abscess with bleeding

K25.1 ◇ 531.10 ◇ Acute gastric ulcer with perforation (HCC)
K25.1 ◇ NA ◇ Acute gastric ulcer with perforation
K26.1 ◇ 532.10 ◇ Acute duodenal ulcer with perforation, without mention of obstruction (HCC)
K26.1 ◇ NA ◇ Acute duodenal ulcer with perforation
K27.0 ◇ 533.00 ◇ Acute peptic ulcer with hemorrhage
K27.0 ◇ NA ◇ Acute peptic ulcer, site unspecified, with hemorrhage
K27.3 ◇ 533.30 ◇ Acute peptic ulcer, unspecified site, without mention of hemorrhage, perforation, or obstruction
K27.3 ◇ NA ◇ Acute peptic ulcer, site unspecified, without hemorrhage or perforation
K27.4 ◇ 533.40 ◇ Peptic ulcer disease with hemorrhage
K27.4 ◇ NA ◇ Chronic or unspecified peptic ulcer, site unspecified, with hemorrhage
K27.5 ◇ 533.50 ◇ Perforated peptic ulcer (HCC)
K27.5 ◇ NA ◇ Chronic or unspecified peptic ulcer, site unspecified, with perforation
K27.6 ◇ 533.60 ◇ Chronic or unspecified peptic ulcer, unspecified site, with hemorrhage and perforation, without mention of obstruction
K27.7 ◇ 533.70 ◇ Chronic peptic ulcer
K27.7 ◇ 533.91 ◇ Peptic ulcer, unspecified site, unspecified as acute or chronic, without mention of hemorrhage or perforation, with obstruction
K27.7 ◇ NA ◇ Chronic peptic ulcer, site unspecified, without hemorrhage or perforation
K27.9 ◇ 533.90 ◇ Ulcer, peptic, acute or chronic
K27.9 ◇ NA ◇ Peptic ulcer, site unspecified, unspecified as acute or chronic, without hemorrhage or perforation
K27.9, B96.81 ◇ 533.90, 041.86 ◇ Peptic ulcer due to Helicobacter pylori
K28.0 ◇ 534.00 ◇ Acute gastrojejunal ulcer with hemorrhage, without mention of obstruction
K28.0 ◇ NA ◇ Acute gastrojejunal ulcer with hemorrhage
K28.3 ◇ 534.30 ◇ Acute gastrojejunal ulcer without mention of hemorrhage, perforation, or obstruction
K28.3 ◇ NA ◇ Acute gastrojejunal ulcer without hemorrhage or perforation
K28.4 ◇ 533.40 ◇ Bleeding ulcer
K28.4 ◇ 534.40 ◇ Chronic or unspecified gastrojejunal ulcer with hemorrhage, without mention of obstruction
K28.4 ◇ NA ◇ Chronic or unspecified gastrojejunal ulcer with hemorrhage
K28.5 ◇ NA ◇ Chronic or unspecified gastrojejunal ulcer with perforation
K28.7 ◇ 534.70 ◇ Chronic marginal ulcer
K28.7 ◇ NA ◇ Chronic gastrojejunal ulcer without hemorrhage or perforation
K28.9 ◇ 534.90 ◇ Gastrojejunal ulcer
K28.9 ◇ 534.91 ◇ Gastrojejunal ulcer, unspecified as acute or chronic, without mention of hemorrhage or perforation, with obstruction
K28.9 ◇ NA ◇ Gastrojejunal ulcer, unspecified as acute or chronic, without hemorrhage or perforation
K28.9, B96.81 ◇ 534.90, 041.86 ◇ Gastrointestinal ulcer due to Helicobacter pylori
T85.898A, K28.9 ◇ 534.90 ◇ Ulcer at site of surgical anastomosis following bypass of stomach
K40.00 ◇ 550.12 ◇ Bilateral inguinal hernia with obstruction and without gangrene
K40.00 ◇ NA ◇ Bilateral inguinal hernia, with obstruction, without gangrene, not specified as recurrent
K40.01 ◇ 550.13 ◇ Bilateral recurrent inguinal hernia with obstruction and without gangrene
K40.01 ◇ NA ◇ Bilateral inguinal hernia, with obstruction, without gangrene, recurrent
K40.10 ◇ 550.02 ◇ Non-recurrent bilateral inguinal hernia with gangrene
K40.20 ◇ 550.92 ◇ Bilateral inguinal hernia without obstruction or gangrene
K40.20 ◇ NA ◇ Bilateral inguinal hernia, without obstruction or gangrene, not specified as recurrent

K40.21 ◇ 550.93 ◇ Recurrent bilateral inguinal hernia (BIH)
K40.21 ◇ NA ◇ Bilateral inguinal hernia, without obstruction or gangrene, recurrent
K40.30 ◇ 550.10 ◇ Unilateral inguinal hernia with obstruction and without gangrene
K40.30 ◇ 550.12 ◇ Inguinal hernia with obstruction, without mention gangrene, bilateral, (not specified as recurrent)
K40.30 ◇ NA ◇ Unilateral inguinal hernia, with obstruction, without gangrene, not specified as recurrent
K40.31 ◇ 550.11 ◇ Recurrent unilateral inguinal hernia with obstruction and without gangrene
K40.31 ◇ 550.13 ◇ Inguinal hernia with obstruction, without mention of gangrene, recurrent bilateral
K40.31 ◇ NA ◇ Unilateral inguinal hernia, with obstruction, without gangrene, recurrent
K40.40 ◇ 550.00 ◇ Unilateral inguinal hernia with gangrene, recurrence not specified
K40.40 ◇ NA ◇ Unilateral inguinal hernia, with gangrene, not specified as recurrent
K40.41 ◇ 550.01 ◇ Inguinal hernia with gangrene, recurrent unilateral or unspecified inguinal hernia
K40.90 ◇ 550.90 ◇ Inguinal hernia
K40.90 ◇ NA ◇ Unilateral inguinal hernia, without obstruction or gangrene, not specified as recurrent
K40.91 ◇ 550.91 ◇ Recurrent unilateral inguinal hernia
K40.91 ◇ NA ◇ Unilateral inguinal hernia, without obstruction or gangrene, recurrent
K41.00 ◇ NA ◇ Bilateral femoral hernia, with obstruction, without gangrene, not specified as recurrent
K41.20 ◇ 553.02 ◇ Femoral hernia without mention of obstruction or gangrene, bilateral
K41.20 ◇ NA ◇ Bilateral femoral hernia, without obstruction or gangrene, not specified as recurrent
K41.30 ◇ 552.00 ◇ Incarcerated femoral hernia
K41.30 ◇ NA ◇ Unilateral femoral hernia, with obstruction, without gangrene, not specified as recurrent
K41.90 ◇ 553.00 ◇ Femoral hernia
K41.90 ◇ NA ◇ Unilateral femoral hernia, without obstruction or gangrene, not specified as recurrent
K41.91 ◇ 553.01 ◇ Unilateral recurrent femoral hernia without obstruction or gangrene
K41.91 ◇ NA ◇ Unilateral femoral hernia, without obstruction or gangrene, recurrent
K42.0 ◇ 552.1 ◇ Umbilical hernia, incarcerated
K42.0 ◇ NA ◇ Umbilical hernia with obstruction, without gangrene
K42.1 ◇ 551.1 ◇ Umbilical hernia with gangrene
K42.1 ◇ NA ◇ Umbilical hernia with gangrene
K42.9 ◇ 553.1 ◇ Umbilical hernia
K42.9 ◇ NA ◇ Umbilical hernia without obstruction or gangrene
K43.0 ◇ 552.21 ◇ Incisional hernia with obstruction
K43.0 ◇ NA ◇ Incisional hernia with obstruction, without gangrene
K43.1 ◇ NA ◇ Incisional hernia with gangrene
K43.2 ◇ 553.21 ◇ Incisional hernia, without obstruction or gangrene
K43.2 ◇ NA ◇ Incisional hernia without obstruction or gangrene
K43.2, Z94.9 ◇ 553.21 ◇ Incisional hernia following transplant
K43.3 ◇ 569.69 ◇ Parastomal hernia with obstruction and without gangrene
K43.3 ◇ NA ◇ Parastomal hernia with obstruction, without gangrene
K43.5 ◇ 569.69 ◇ Parastomal hernia without obstruction or gangrene
K43.5 ◇ NA ◇ Parastomal hernia without obstruction or gangrene
K43.6 ◇ 552.20 ◇ Ventral hernia, unspecified, with obstruction
K43.6 ◇ 552.29 ◇ Other ventral hernia with obstruction
K43.6 ◇ NA ◇ Other and unspecified ventral hernia with obstruction, without gangrene
K43.7 ◇ 551.20 ◇ Ventral hernia with gangrene

K43.7 ◇ NA ◇ Other and unspecified ventral hernia with gangrene
K43.9 ◇ 553.20 ◇ Ventral hernia
K43.9 ◇ 553.29 ◇ Uncomplicated epigastric hernia
K43.9 ◇ 553.9 ◇ Supraumbilical hernia
K43.9 ◇ NA ◇ Ventral hernia without obstruction or gangrene
K94.19, K43.5 ◇ 569.69 ◇ Para-ileostomy hernia (HCC)
K45.0 ◇ 552.8 ◇ Incarcerated hernia of abdominal cavity
K45.0 ◇ NA ◇ Other specified abdominal hernia with obstruction, without gangrene
K45.8 ◇ 553.8 ◇ Internal hernia
K45.8 ◇ NA ◇ Other specified abdominal hernia without obstruction or gangrene
K94.09, K46.9 ◇ 569.69 ◇ Hernia due to colostomy (HCC)
K46.0 ◇ 550.10 ◇ Hernia with strangulation
K46.0 ◇ 552.20 ◇ Abdominal hernia with obstruction and without gangrene
K46.0 ◇ 552.8 ◇ Obstruction concurrent with and due to internal hernia of abdomen
K46.0 ◇ 552.9 ◇ Incarcerated hernia
K46.0 ◇ NA ◇ Unspecified abdominal hernia with obstruction, without gangrene
K46.1 ◇ 551.9 ◇ Hernia of unspecified site, with gangrene
K46.1 ◇ NA ◇ Unspecified abdominal hernia with gangrene
K46.9 ◇ 553.20 ◇ Abdominal hernia without obstruction or gangrene
K46.9 ◇ 553.9 ◇ Hernia, abdominal
K46.9 ◇ NA ◇ Unspecified abdominal hernia without obstruction or gangrene
K65.4 ◇ 567.82 ◇ Idiopathic sclerosing mesenteritis (HCC)
K65.0 ◇ 567.21 ◇ Peritonitis, acute generalized (HCC)
K65.0 ◇ 567.22 ◇ Perihepatic abscess (HCC)
K65.0 ◇ 567.29 ◇ Phlegmonous peritonitis (HCC)
K65.0 ◇ 567.9 ◇ Acute peritonitis (HCC)
K65.0 ◇ NA ◇ Generalized (acute) peritonitis
K65.1 ◇ 567.21 ◇ Peritonitis due to abscess (HCC)
K65.1 ◇ 567.22 ◇ Right lower quadrant abdominal abscess (HCC)
K65.1 ◇ 682.8 ◇ Abdominal visceral abscess (HCC)
K65.1 ◇ NA ◇ Peritoneal abscess
K65.2 ◇ 567.23 ◇ Peritonitis, spontaneous bacterial (HCC)
K65.2 ◇ NA ◇ Spontaneous bacterial peritonitis
K65.3 ◇ 567.81 ◇ Peritonitis due to bile (HCC)
K65.4 ◇ NA ◇ Sclerosing mesenteritis
K65.8 ◇ 567.29 ◇ Other suppurative peritonitis(567.29)
K65.8 ◇ 567.89 ◇ Fecal peritonitis (HCC)
K65.8 ◇ 567.9 ◇ Sclerosing encapsulating peritonitis (HCC)
K65.8 ◇ 569.89 ◇ Serositis (HCC)
K65.8 ◇ NA ◇ Other peritonitis
K65.8, T80.89XA ◇ 567.89, 999.88 ◇ Sclerosing peritonitis as complication of peritoneal dialysis (HCC)
K65.9 ◇ 567.21 ◇ Acute bacterial peritonitis (HCC)
K65.9 ◇ 567.29 ◇ Bacterial peritonitis (HCC)
K65.9 ◇ 567.9 ◇ Peritonitis (HCC)
K65.9 ◇ NA ◇ Peritonitis, unspecified

K65.9, K68.9 ◇ 567.9 ◇ Peritonitis and retroperitoneal infections (HCC)
K65.3 ◇ NA ◇ Choleperitonitis
K85.80 ◇ 577.0 ◇ Other acute pancreatitis without infection or necrosis
K85.80 ◇ NA ◇ Other acute pancreatitis without necrosis or infection
K85.81 ◇ 577.0 ◇ Other acute pancreatitis with uninfected necrosis
K85.81 ◇ NA ◇ Other acute pancreatitis with uninfected necrosis
K85.82 ◇ 577.0 ◇ Other acute pancreatitis with infected necrosis
K85.82 ◇ NA ◇ Other acute pancreatitis with infected necrosis
K85.9 ◇ NA ◇ Acute pancreatitis, unspecified
K85.90 ◇ 577.0 ◇ Acute pancreatitis
K85.90 ◇ NA ◇ Acute pancreatitis without necrosis or infection, unspecified
K85.90, K83.1 ◇ 577.0 ◇ Pancreatitis due to biliary obstruction
K85.90, K86.1 ◇ 577.0, 577.1 ◇ Acute on chronic pancreatitis (HCC)
K85.91 ◇ 577.0 ◇ Pancreatitis, necrotizing
K85.91 ◇ NA ◇ Acute pancreatitis with uninfected necrosis, unspecified
K85.92 ◇ 577.0 ◇ Acute pancreatitis with infected necrosis, unspecified pancreatitis type
K85.92 ◇ NA ◇ Acute pancreatitis with infected necrosis, unspecified
K91.89, K85.90 ◇ 997.49, 577.0 ◇ Post-ERCP acute pancreatitis
K85.0 ◇ NA ◇ Idiopathic acute pancreatitis
K85.00 ◇ 577.0 ◇ Idiopathic acute pancreatitis
K85.00 ◇ NA ◇ Idiopathic acute pancreatitis without necrosis or infection
K85.01 ◇ 577.0 ◇ Idiopathic acute pancreatitis with uninfected necrosis
K85.01 ◇ NA ◇ Idiopathic acute pancreatitis with uninfected necrosis
K85.02 ◇ 577.0 ◇ Idiopathic acute pancreatitis with infected necrosis
K85.02 ◇ NA ◇ Idiopathic acute pancreatitis with infected necrosis
K85.1 ◇ NA ◇ Biliary acute pancreatitis
K85.10 ◇ 577.0 ◇ Acute biliary pancreatitis
K85.10 ◇ 577.0, 574.20 ◇ Pancreatitis, gallstone
K85.10 ◇ NA ◇ Biliary acute pancreatitis without necrosis or infection
K85.11 ◇ 577.0 ◇ Acute biliary pancreatitis with uninfected necrosis
K85.11 ◇ NA ◇ Biliary acute pancreatitis with uninfected necrosis
K85.12 ◇ 577.0 ◇ Acute biliary pancreatitis with infected necrosis
K85.12 ◇ NA ◇ Biliary acute pancreatitis with infected necrosis
K85.2 ◇ NA ◇ Alcohol induced acute pancreatitis
K85.20 ◇ 577.0 ◇ Alcoholic pancreatitis
K85.20 ◇ NA ◇ Alcohol induced acute pancreatitis without necrosis or infection
K85.21 ◇ 577.0 ◇ Alcohol-induced acute pancreatitis with uninfected necrosis
K85.21 ◇ NA ◇ Alcohol induced acute pancreatitis with uninfected necrosis
K85.22 ◇ 577.0 ◇ Alcohol-induced acute pancreatitis with infected necrosis
K85.22 ◇ NA ◇ Alcohol induced acute pancreatitis with infected necrosis
K85.3 ◇ NA ◇ Drug induced acute pancreatitis
K85.30 ◇ 577.0 ◇ Drug-induced pancreatitis
K85.30 ◇ 577.0, E980.5 ◇ Drug-induced acute pancreatitis
K85.30 ◇ NA ◇ Drug induced acute pancreatitis without necrosis or infection
K85.8 ◇ NA ◇ Other acute pancreatitis

M72.6 ◇ 728.86 ◇ Flesh-eating bacteria (HCC)
M72.6 ◇ NA ◇ Necrotizing fasciitis
M72.6, B95.0 ◇ 728.86, 041.01 ◇ Necrotizing fasciitis due to Streptococcus pyogenes (HCC)
L03.032, L02.612 ◇ 681.10 ◇ Cellulitis and abscess of toe of left foot
L03.039, L02.619 ◇ 681.10 ◇ Cellulitis and abscess of toe
L03.115, L02.415 ◇ 682.6 ◇ Cellulitis and abscess of right leg
L03.116, L02.416 ◇ 682.6 ◇ Cellulitis and abscess of left leg
L03.119, L02.419 ◇ 682.3 ◇ Cellulitis and abscess of upper extremity
L03.119, L02.419 ◇ 682.6 ◇ Cellulitis and abscess of leg
L03.119, L02.519 ◇ 682.4 ◇ Cellulitis and abscess of hand
L03.119, L02.619 ◇ 682.7 ◇ Cellulitis and abscess of foot excluding toe
L03.211, L02.01 ◇ 682.0 ◇ Cellulitis and abscess of face
L03.221, L02.11 ◇ 682.1 ◇ Cellulitis and abscess of neck
L03.319, L02.219 ◇ 682.2 ◇ Cellulitis and abscess of trunk
L03.811, L02.811 ◇ 682.8 ◇ Cellulitis and abscess of head
L03.818, L02.818 ◇ 682.8 ◇ Cellulitis and abscess of other specified site
L03.90, L02.91 ◇ 682.9 ◇ Cellulitis and abscess of unspecified site
L02.01 ◇ 682.0 ◇ Abscess of cheek
L02.01 ◇ NA ◇ Cutaneous abscess of face
L02.01, Q18.1 ◇ 682.0, 744.46 ◇ Abscess of preauricular sinus
L02.02 ◇ 680.0 ◇ Boil, face
L02.02 ◇ NA ◇ Furuncle of face
L02.03 ◇ 680.0 ◇ Carbuncle of face
L02.03 ◇ NA ◇ Carbuncle of face
L02.03, L02.02 ◇ 680.0 ◇ Carbuncle and furuncle of face
L02.11 ◇ 682.1 ◇ Abscess of skin of neck
L02.11 ◇ NA ◇ Cutaneous abscess of neck
L02.12 ◇ 680.1 ◇ Boil of neck
L02.12 ◇ NA ◇ Furuncle of neck
L02.12, L02.13 ◇ 680.1 ◇ Carbuncle and furuncle of neck
L02.13 ◇ NA ◇ Carbuncle of neck
L02.211 ◇ 682.2 ◇ Abscess of skin of abdomen
L02.211 ◇ NA ◇ Cutaneous abscess of abdominal wall
L02.212 ◇ 682.2 ◇ Back abscess
L02.212 ◇ NA ◇ Cutaneous abscess of back (any part, except buttock)
L02.213 ◇ 682.2 ◇ Cutaneous abscess of chest wall
L02.213 ◇ NA ◇ Cutaneous abscess of chest wall
L02.214 ◇ 682.2 ◇ Cutaneous abscess of groin
L02.214 ◇ NA ◇ Cutaneous abscess of groin
L02.215 ◇ 682.2 ◇ Cutaneous abscess of perineum
L02.215 ◇ NA ◇ Cutaneous abscess of perineum
L02.216 ◇ 682.2 ◇ Cutaneous abscess of umbilicus
L02.216 ◇ NA ◇ Cutaneous abscess of umbilicus
L02.219 ◇ 682.2 ◇ Soft tissue abscess of suprapubic region
L02.219 ◇ NA ◇ Cutaneous abscess of trunk, unspecified

L02.221 ◇ 680.2 ◇ Furunculosis of abdominal wall
L02.221 ◇ NA ◇ Furuncle of abdominal wall
L02.222 ◇ 680.2 ◇ Boil, back
L02.222 ◇ NA ◇ Furuncle of back (any part, except buttock)
L02.223 ◇ NA ◇ Furuncle of chest wall
L02.224 ◇ 680.2 ◇ Boil, groin
L02.224 ◇ NA ◇ Furuncle of groin
L02.229 ◇ 680.2 ◇ Boil of trunk
L02.229 ◇ NA ◇ Furuncle of trunk, unspecified
L02.231 ◇ 680.2 ◇ Carbuncle of abdominal wall
L02.232 ◇ 680.2 ◇ Carbuncle of back
L02.239, L02.229 ◇ 680.2 ◇ Carbuncle and furuncle of trunk
L02.31 ◇ 682.5 ◇ Abscess of gluteal cleft
L02.31 ◇ NA ◇ Cutaneous abscess of buttock
L02.31, L03.317 ◇ 682.5 ◇ Cellulitis and abscess of buttock
L02.32 ◇ 680.5 ◇ Furunculosis of buttock
L02.32 ◇ NA ◇ Furuncle of buttock
L02.33 ◇ 680.5 ◇ Carbuncle of buttock
L02.33 ◇ NA ◇ Carbuncle of buttock
L02.411 ◇ 682.3 ◇ Cutaneous abscess of right axilla
L02.411 ◇ NA ◇ Cutaneous abscess of right axilla
L02.412 ◇ 682.3 ◇ Cutaneous abscess of left axilla
L02.412 ◇ NA ◇ Cutaneous abscess of left axilla
L02.413 ◇ 682.3 ◇ Cutaneous abscess of right upper extremity
L02.413 ◇ NA ◇ Cutaneous abscess of right upper limb
L02.414 ◇ 682.3 ◇ Abscess of left shoulder
L02.414 ◇ NA ◇ Cutaneous abscess of left upper limb
L02.415 ◇ 682.6 ◇ Abscess of right thigh
L02.415 ◇ NA ◇ Cutaneous abscess of right lower limb
L02.415, L02.416 ◇ 682.6 ◇ Multiple abscesses of both legs
L02.416 ◇ 682.6 ◇ Abscess of leg without foot, left
L02.416 ◇ NA ◇ Cutaneous abscess of left lower limb
L02.419 ◇ 682.3 ◇ Abscess, elbow
L02.419 ◇ 682.4 ◇ Abscess, wrist
L02.419 ◇ 682.6 ◇ Prepatellar abscess
L02.419 ◇ NA ◇ Cutaneous abscess of limb, unspecified
L02.421 ◇ 680.3 ◇ Furuncle of right axilla
L02.421 ◇ NA ◇ Furuncle of right axilla
L02.422 ◇ NA ◇ Furuncle of left axilla
L02.423 ◇ NA ◇ Furuncle of right upper limb
L02.425 ◇ NA ◇ Furuncle of right lower limb
L02.426 ◇ NA ◇ Furuncle of left lower limb
L02.429 ◇ 680.3 ◇ Boil, axilla
L02.429 ◇ 680.6 ◇ Furunculosis of multiple sites of lower extremity
L02.429 ◇ NA ◇ Furuncle of limb, unspecified

L02.429, L02.439 ◇ 680.6 ◇ Carbuncle and furuncle of leg
L02.432 ◇ 680.3 ◇ Carbuncle of left axilla
L02.439 ◇ 680.3 ◇ Carbuncle of axilla
L02.439, L02.429 ◇ 680.3 ◇ Carbuncle and furuncle of upper arm and forearm
L02.511 ◇ 681.00 ◇ Abscess of thumb, right
L02.511 ◇ 682.4 ◇ Cutaneous abscess of right hand
L02.511 ◇ NA ◇ Cutaneous abscess of right hand
L02.512 ◇ 681.00 ◇ Abscess of left thumb
L02.512 ◇ 682.4 ◇ Cutaneous abscess of left hand
L02.512 ◇ NA ◇ Cutaneous abscess of left hand
L02.519 ◇ 681.00 ◇ Abscess of thumb
L02.519 ◇ 682.4 ◇ Hand abscess
L02.519 ◇ NA ◇ Cutaneous abscess of unspecified hand
L02.539, L02.529 ◇ 680.4 ◇ Carbuncle and furuncle of hand
L02.611 ◇ 681.10 ◇ Abscess of toe of right foot
L02.611 ◇ 682.7 ◇ Cutaneous abscess of right foot
L02.611 ◇ NA ◇ Cutaneous abscess of right foot
L02.612 ◇ 681.10 ◇ Abscess of toe of left foot
L02.612 ◇ 682.7 ◇ Cutaneous abscess of left foot
L02.612 ◇ NA ◇ Cutaneous abscess of left foot
L02.619 ◇ 681.10 ◇ Abscess, toe
L02.619 ◇ 682.7 ◇ Abscess of foot
L02.619 ◇ NA ◇ Cutaneous abscess of unspecified foot
L02.811 ◇ 682.8 ◇ Scalp abscess
L02.811 ◇ NA ◇ Cutaneous abscess of head (any part, except face)
L02.818 ◇ 682.8 ◇ Cutaneous abscess of other site
L02.818 ◇ NA ◇ Cutaneous abscess of other sites
L02.821 ◇ 680.8 ◇ Boil of scalp
L02.821 ◇ NA ◇ Furuncle of head (any part, except face)
L02.828 ◇ NA ◇ Furuncle of other sites
L02.828, L02.838 ◇ 680.8 ◇ Carbuncle and furuncle of other specified sites
L02.91 ◇ 682.8 ◇ Soft tissue abscess
L02.91 ◇ 682.9 ◇ Abscess of skin
L02.91 ◇ NA ◇ Cutaneous abscess, unspecified
L02.92 ◇ 680.9 ◇ Boils
L02.92 ◇ NA ◇ Furuncle, unspecified
L02.92, L02.93 ◇ 680.9 ◇ Carbuncle and furuncle
L02.93 ◇ 680.9 ◇ Recurrent boils
L02.93 ◇ NA ◇ Carbuncle, unspecified
L03.019, L02.519 ◇ 681.00 ◇ Cellulitis and abscess of finger, unspecified
L03.031, L02.611 ◇ 681.10 ◇ Cellulitis and abscess of toe of right foot

1. Early discharge window may dilute event capture. Including patients with LOS 24–48 hours may artificially lower symptomatic VTE rates due to limited time for clinical events and diagnostic testing. Consider excluding LOS that has been used in another study of medical patients.

We will use a LOS>48 hours to ensure that we are not artificially lowering our symptomatic VTE rates, similar to the 48-hour branch point in TQIP and other Trauma databases for early vs. late VTE.

2. Clarify definition of "symptomatic VTE"
- Symptomatic VTE: Ultrasound or CT confirmed DVT or PE obtained because of the following clinical signs, symptoms, or findings: unilateral leg swelling or pain, erythema, tachycardia, hypoxia, pleuritic chest pain, hemoptysis, syncope, or evidence of right ventricular strain on echocardiography or CT
-Asymptomatic VTE: Ultrasound or CT confirmed DVT or PE identified incidentally performed for other indications

Splanchnic thrombosis will be reported as a secondary outcome and will not be considered a primary endpoint with other VTE.

3. Clarify anticoagulation details and outcome definitions
Please clarify how below-knee DVT will be assessed and managed, and whether upper extremity or line-associated thrombosis will be grouped with general DVT outcomes or analyzed separately.
-Symptomatic and asymptomatic below knee DVT will be assessed with ultrasound. Below knee DVT will include any DVT in the following vessels: peroneal, posterior tibial, anterior tibial, gastrocnemius, and soleal veins. These will be grouped with general DVT outcomes.
-Line-associated thrombosis will be excluded from general DVT outcomes and analyzed separately.

4. ***Clarify whether the enoxaparin group will include all dosing strategies (e.g., 40 mg daily, 40 mg twice daily, 30 mg daily) or whether these regimens will be subdivided. Please also describe anti–factor Xa monitoring protocols, dosing strategies, and whether specific LMWH agents (e.g., enoxaparin, dalteparin, tinzaparin) will be grouped together or analyzed separately. Clarify whether patients requiring therapeutic anticoagulation will be excluded****.*

All dosing strategies for enoxaparin will be included and analyzed as one group. All LMWH agents will be analyzed together. Patients requiring therapeutic anticoagulation will be excluded. Given the inconsistency of Anti-Xa monitoring protocols at centers, we had not intended to include this in the study.

5. Feasibility of enrollment
The proposed sample size (n = 3,700) will require sustained accrual across multiple centers. Please confirm sites willing to participate and provide projected enrollment per site and anticipated study timeline to demonstrate feasibility.

Our target for site participation is between 20-30 sites. If each site is able to contribute 150 patients, we will have ~3,000-4,500 patients. We have verbal confirmation from UCLA and Harbor-UCLA Medical Center as one site, but have deferred contacting other sites until further discussion with EAST.

We are completing a single site retrospective review examining this topic, and over a 5-year period of time we were able to identify ~3,200 unique patients that met the inclusion/exclusion criteria for this study. Given these numbers, we anticipate that the contribution of 150 patients per site to this study should be feasible.

A sample timeline is included below:

0-3 months: Start-up and Site Activation: Site recruitment, Local IRB approval, DUA execution

3-12 months: Patient enrollment

12-15 months: Follow up and Data completion

16-18 months: Analysis and Manuscript

4. ***Clarification of primary analytic framework***
   The observational design introduces potential treatment-selection bias (e.g., UFH vs LMWH chosen based on renal function, bleeding risk, or institutional practice). Propensity weighting and hierarchical modeling are appropriate, but the analytic population is not fully specified. Please clarify how UFH versus LMWH exposure will be defined in the primary analysis, particularly for patients who switch agents or receive both during hospitalization (e.g., initial exposure, as-treated, or time-varying approach). Please also specify how crossovers will be handled and whether sensitivity analyses using alternative exposure definitions are planned.

The primary exposure will be an as-treated, time-varying approach, where each day will be reported as either LMWH exposed, UFH-exposed, both, or neither.

Patients who receive both agents during the hospitalization will remain in the analysis. Crossovers will be modeled according to their actual prophylaxis exposure over time, with exposure status noted daily and incorporated into multivariable models that adjust for patient-level covariates and center-level clustering.

We will also perform prespecified sensitivity analyses using alternative exposure definitions, including: initial prophylaxis agent**,** predominant hospitalization exposure**,** and per-protocol exposure excluding patients with early crossover or substantial mixed exposure. These analyses will test whether the primary findings are robust to different clinically plausible definitions of UFH versus LMWH exposure and will help distinguish treatment-selection effects from true differences in prophylaxis effectiveness.

Aspirin exposure will be measured. If there are a significant number of patients receiving ASA in place of LMWH or UFH, we will analyze these patients as a subgroup.

5. ***Diagnosis heterogeneity and event rate assumptions***
   The broad EGS inclusion increases generalizability but may dilute effect size due to variable baseline VTE risk across diagnoses. Please clarify expected overall versus high-risk event rates and specify how diagnosis category will be incorporated into the primary modeling.

We anticipate an overall event rate of 2-3% with a high-risk event rate of 5-8%. The primary analysis will therefor adjust for diagnosis category(e.g. normal risk, high risk) to ensure adequate treatment effects across this clinically varied cohort. These categories will be included as a prespecified covariate in the primary hierarchical model. We will perform a prespecified subgroup and interaction analyses comparing all EGS patients to those in the high risk subgroups.

6. ***Multiple secondary and subgroup analyses***
Multiple secondary and subgroup analyses are planned. Please explicitly define the hierarchy of primary, key secondary, and exploratory analyses to preserve interpretability.

The primary analysis will compare LMWH versus UFH for the primary effectiveness outcome of symptomatic VTE during the index hospitalization or within 30 days, using the prespecified adjusted hierarchical model.

Secondary analyses will evaluate major bleeding, transfusion requirements, PE, proximal DVT, distal DVT, mortality, and prophylaxis adherence/interruption.

Subgroup analyses will be explicitly labeled as exploratory unless otherwise prespecified as key secondary, and will include renal dysfunction, obesity, ICU admission, emergency laparotomy, malignancy, high-risk EGS diagnosis category, and center-level prophylaxis practice. We will interpret these analyses as hypothesis-generating and will report effect estimates with confidence intervals.