SUPPLEMENTARY FILE 1: COMPLETE SURVEY QUESTIONNAIRE

SECTION A: DEMOGRAPHIC INFORMATION

A1. Country of current practice:

- □ Afghanistan
- □ Albania
- □ Algeria
- □ Argentina
- □ Australia
- □ Austria
- □ Bangladesh
- □ Belgium
- □ Brazil
- □ Canada
- □

China
- □

Denmark
- □

Egypt
- □

Finland
- □

France
- □

Germany
- □

Greece
- □

India
- □

Iran
- □

Iraq
- □

Ireland
- □

Italy
- □

Japan
- □

Jordan
- □

Kuwait
- □

Lebanon

- □

  Malaysia
- □

  Mexico
- □

  Netherlands
- □

  New Zealand
- □

  Nigeria
- □

  Norway
- □

  Oman
- □

  Pakistan
- □

  Philippines
- □

  Poland
- □

  Portugal
- □

  Qatar
- □

  Russia
- □

  Saudi Arabia
- □

  Singapore
- □

South Africa

- □

South Korea

- □

Spain

- □

Sudan

- □

Sweden

- □

Switzerland

- □

Syria

- □

Taiwan

- □

Thailand

- □

Turkey

- □

UAE

- □

UK

- □

USA

- □

Yemen

- □

Other (please specify): _____

A2. What is your current professional position?

- □ Surgical Resident (PGY-1 to PGY-5)
- □ Board-certified surgeon / Attending
- □ Senior Consultant
- □ Division Chief / Head of Department
- □ Other (please specify): _____

A3. What is your primary surgical specialty?

- □ General Surgery
- □ Trauma and Acute Care Surgery
- □ Orthopaedic Surgery
- □ Vascular Surgery
- □ Thoracic Surgery
- □ HPB Surgery and Liver Transplant
- □ Emergency and Intensive Care
- □

Neurosurgery

- □

Urology

- □

Plastic Surgery

- □

Other (please specify): _____

A4. What type of hospital do you primarily practice in?

- □

University / Academic Hospital

- □

Community-Teaching Hospital

- □

Community Hospital

- □

Private Center

- □

Military Hospital

- □

Other (please specify): _____

A5. Does your department manage both elective and emergency surgery?

- □

Yes

- □

No

A6. How many years of experience do you have in surgical practice (post-residency)?

- □

  < 5 years
- □

  5-10 years
- □

  11-20 years
- □

  > 20 years

SECTION B: GENERAL ATTITUDES TOWARD BLOOD TEST UTILITY

B1. In your daily practice, do you ever think that ordered blood tests are not useful?

- □

  Always essential
- □

  Sometimes non-essential
- □

  Often non-essential
- □

  Always non-essential

B2. In your opinion, what percentage of routine blood tests ordered in emergency surgery are unnecessary?

- □

  0-10%
- □

  11-25%
- □

  26-50%
- □

  51-75%
- □

  > 75%

B3. How often do you question the clinical necessity of blood tests ordered by junior colleagues?

- □

  Never
- □

  Rarely
- □

  Sometimes
- □

  Often
- □

  Always

SECTION C: BLOOD TEST ORDERING TRIGGERS AND CRITERIA

C1. What factors trigger you to order blood tests in emergency surgical patients? (Select all that apply)

- □ Routine postoperative day (e.g., POD 1, POD 3 protocols)
- □ Pre-discharge panel regardless of clinical status
- □ Clinical improvement or recovery milestone
- □ Clinical deterioration (e.g., fever, hypotension, tachycardia)
- □ Re-checking a previously abnormal result
- □ Change in patient's vital signs
- □ Surgical drain output changes (color, volume)
- □ Patient complaint (e.g., pain, nausea, dyspnea)
- □ Suspected hemorrhage
- □ Suspected surgical sepsis / infection
- □ Suspected organ dysfunction (renal, hepatic, cardiac)
- □ Medication monitoring (e.g., anticoagulants, antibiotics)
- □ On admission to ICU

- □

  On transfer from ICU to ward
- □

  Medicolegal reasons (documentation)
- □

  Teaching purposes (for residents)
- □

  Routine daily morning blood draw
- □

  Other (please specify): _____

C2. How often do you order blood tests based on the following criteria? (Scale: Never, Rarely, Sometimes, Often, Always)

Criterion	Never	Rarely	Sometimes	Often	Always
Postoperative day protocol	☐	☐	☐	☐	☐
Pre-discharge panel	☐	☐	☐	☐	☐
Clinical changes (vitals, exam)	☐	☐	☐	☐	☐
Re-checking abnormal values	☐	☐	☐	☐	☐
Surgical drain output changes	☐	☐	☐	☐	☐

C3. When prioritizing factors to determine the need for blood tests, what is more important?

- □

The specific surgical procedure performed

- □

The patient's clinical circumstance and condition

- □

Both equally

- □

Neither / Other (please specify): _____

C4. Do you recognize the clinical concept of "failure-to-progress" as a criterion for identifying severely ill surgical patients who are not recovering normally?

- □

Yes

- □

No

- □

Not sure

C5. In your practice, what are the most common pathological symptoms that trigger new blood test requests? (Select up to 3)

- □

Hemorrhage (drop in hemoglobin, hematocrit)

- □

Surgical sepsis (elevated WBC, CRP, procalcitonin)

- □

Renal impairment (elevated creatinine, urea)

- □

Hepatic dysfunction (elevated liver enzymes)

- □ Cardiac ischemia (elevated troponin)
- □ Coagulopathy (prolonged INR, PTT)
- □ Electrolyte imbalance
- □ Acid-base disturbance (ABG abnormalities)
- □ Respiratory insufficiency (ABG abnormalities)
- □ Other (please specify): _____

SECTION D: DECISION-MAKING LEADERSHIP AND TEAM DYNAMICS

D1. Who typically orders the blood tests in your department? (Select all that apply)

- □ Surgical Resident (Junior / Senior)
- □ Attending Surgeon / Consultant
- □ Nurse Practitioner / Physician Assistant
- □ Medical Intern
- □ Clinical Fellow
- □ Other (please specify): _____

D2. Who typically makes the clinical decisions based on blood test results? (Select all that apply)

- □ Surgical Resident (Junior / Senior)
- □ Attending Surgeon / Consultant
- □ Nurse Practitioner / Physician Assistant
- □ Medical Intern
- □ Clinical Fellow
- □ Multidisciplinary team / Collegial briefing
- □ Other (please specify): _____

D3. How often are clinical decisions made during collegial team briefings (e.g., morning rounds, handover) versus individual provider decisions?

Setting	Never	Rarely	Sometimes	Often	Always
Collegial team briefings	☐	☐	☐	☐	☐
Individual attending decision	☐	☐	☐	☐	☐
Resident decision with attending oversight	☐	☐	☐	☐	☐

Setting	Never	Rarely	Sometimes	Often	Always
Protocol-driven algorithm	☐	☐	☐	☐	☐

D4. In your department, are residents actively involved in the interpretation of blood test results and subsequent management decisions?

- □

  Yes, always
- □

  Yes, sometimes
- □

  Rarely
- □

  No, they only order the tests
- □

  Not applicable

D5. Do you believe that involving trainees in the interpretation and decision-making process improves patient outcomes and reduces unnecessary testing?

- □

  Strongly agree
- □

  Agree
- □

  Neutral
- □

Disagree

- □

Strongly disagree

SECTION E: PERCEIVED CLINICAL VALUE OF SPECIFIC BLOOD TESTS

E1. In your opinion, how frequently do you order the following blood tests in emergency surgical patients? (Scale: Never, Rarely, Sometimes, Often, Always)

Test	Never	Rarely	Sometimes	Often	Always
Hemoglobin (Hb)	☐	☐	☐	☐	☐
White Blood Cell Count (WBC)	☐	☐	☐	☐	☐
Platelet Count	☐	☐	☐	☐	☐
C-Reactive Protein (CRP)	☐	☐	☐	☐	☐
Procalcitonin (PCT)	☐	☐	☐	☐	☐
Serum Creatinine / Urea	☐	☐	☐	☐	☐
Liver Function Tests (LFTs)	☐	☐	☐	☐	☐
Lactate Dehydrogenase (LDH)	☐	☐	☐	☐	☐
Coagulation Profile (INR, PTT)	☐	☐	☐	☐	☐
Arterial Blood Gas (ABG) - pH	☐	☐	☐	☐	☐
Arterial Blood Gas (ABG) - Lactate	☐	☐	☐	☐	☐

Test	Never	Rarely	Sometimes	Often	Always
Arterial Blood Gas (ABG) - Base Excess	☐	☐	☐	☐	☐
Serum Electrolytes (Na, K, Cl)	☐	☐	☐	☐	☐
Cardiac Enzymes (Troponin)	☐	☐	☐	☐	☐
Amylase / Lipase	☐	☐	☐	☐	☐
Blood Culture	☐	☐	☐	☐	☐
D-Dimer	☐	☐	☐	☐	☐

E2. In your opinion, how clinically useful are the following blood tests in guiding surgical decision-making? (Scale: Not useful, Slightly useful, Moderately useful, Very useful, Extremely useful)

Test	Not Useful	Slightly Useful	Moderately Useful	Very Useful	Extremely Useful
Hemoglobin (Hb)	☐	☐	☐	☐	☐
White Blood Cell Count (WBC)	☐	☐	☐	☐	☐
Platelet Count	☐	☐	☐	☐	☐
C-Reactive Protein (CRP)	☐	☐	☐	☐	☐
Procalcitonin (PCT)	☐	☐	☐	☐	☐

Test	Not Useful	Slightly Useful	Moderately Useful	Very Useful	Extremely Useful
Serum Creatinine / Urea	☐	☐	☐	☐	☐
Liver Function Tests (LFTs)	☐	☐	☐	☐	☐
Lactate Dehydrogenase (LDH)	☐	☐	☐	☐	☐
Coagulation Profile (INR, PTT)	☐	☐	☐	☐	☐
Arterial Blood Gas (ABG) - pH	☐	☐	☐	☐	☐
Arterial Blood Gas (ABG) - Lactate	☐	☐	☐	☐	☐
Arterial Blood Gas (ABG) - Base Excess	☐	☐	☐	☐	☐
Serum Electrolytes (Na, K, Cl)	☐	☐	☐	☐	☐
Cardiac Enzymes (Troponin)	☐	☐	☐	☐	☐
Amylase / Lipase	☐	☐	☐	☐	☐
Blood Culture	☐	☐	☐	☐	☐
D-Dimer	☐	☐	☐	☐	☐

E3. Among the following, which THREE blood tests do you consider MOST important for clinical decision-making in emergency surgery? (Select exactly 3)

- □ Hemoglobin (Hb)
- □ White Blood Cell Count (WBC)
- □ Platelet Count
- □ C-Reactive Protein (CRP)
- □ Procalcitonin (PCT)
- □ Serum Creatinine / Urea
- □ Liver Function Tests (LFTs)
- □ Lactate Dehydrogenase (LDH)
- □ Coagulation Profile (INR, PTT)
- □ ABG - Lactate
- □ ABG - pH
- □ ABG - Base Excess
- □ Serum Electrolytes (Na, K, Cl)

Cardiac Enzymes (Troponin)

- □

Amylase / Lipase

- □

Blood Culture

- □

D-Dimer

E4. Among the following, which THREE blood tests do you consider LEAST useful for clinical decision-making in emergency surgery? (Select exactly 3)

- □

Hemoglobin (Hb)

- □

White Blood Cell Count (WBC)

- □

Platelet Count

- □

C-Reactive Protein (CRP)

- □

Procalcitonin (PCT)

- □

Serum Creatinine / Urea

- □

Liver Function Tests (LFTs)

- □

Lactate Dehydrogenase (LDH)

- □

Coagulation Profile (INR, PTT)

- □

ABG - Lactate

- □

ABG - pH

- □

ABG - Base Excess

- □

Serum Electrolytes (Na, K, Cl)

- □

Cardiac Enzymes (Troponin)

- □

Amylase / Lipase

- □

Blood Culture

- □

D-Dimer

SECTION F: USE OF CLINICAL SCORING SYSTEMS

F1. Do you routinely use any clinical scoring system to assess surgical patients?

- □

Yes

- □

No

- □

Not sure

F2. If yes, which scoring systems do you use? (Select all that apply)

- □

  SOFA (Sequential Organ Failure Assessment)
- □

  APACHE II (Acute Physiology and Chronic Health Evaluation II)
- □

  NEWS / MEWS (National Early Warning Score / Modified Early Warning Score)
- □

  qSOFA (Quick Sequential Organ Failure Assessment)
- □

  POSSUM / P-POSSUM (Physiological and Operative Severity Score for the enUmeration of Mortality and Morbidity)
- □

  SRS (Surgical Risk Scale)
- □

  ESS (Emergency Surgery Score)
- □

  Other (please specify): _____

F3. How often do clinical scoring systems influence your decision to order or withhold blood tests?

- □

  Never
- □

  Rarely
- □

  Sometimes
- □

  Often
- □

Always

F4. What are the barriers to using clinical scoring systems in your practice? (Select all that apply)

- □ Lack of familiarity / training
- □ Time constraints
- □ Complexity of calculation
- □ Perceived lack of clinical utility
- □ Not available in our electronic health record
- □ Not applicable / No barriers
- □ Other (please specify): _____

SECTION G: COST AWARENESS AND RESOURCE UTILIZATION

G1. Are you aware of the cost of the blood tests you routinely order?

- □ Yes, fully aware
- □ Somewhat aware
- □

Not aware

- □

  Not sure

G2. Approximately, what is the estimated cost of a standard complete blood count (CBC) in your institution?

- □

  < $5 USD
- □

  $5 - $10 USD
- □

  $11 - $20 USD
- □

  $21 - $50 USD
- □

  > $50 USD
- □

  Not sure / Don't know

G3. Approximately, what is the estimated cost of a standard comprehensive metabolic panel (CMP) in your institution?

- □

  < $5 USD
- □

  $5 - $10 USD
- □

  $11 - $20 USD

- □

  $21 - $50 USD
- □

  > $50 USD
- □

  Not sure / Don't know

G4. Approximately, what is the estimated cost of an arterial blood gas (ABG) test in your institution?

- □

  < $5 USD
- □

  $5 - $10 USD
- □

  $11 - $20 USD
- □

  $21 - $50 USD
- □

  > $50 USD
- □

  Not sure / Don't know

G5. Do you know who in your organization is responsible for cost control or laboratory utilization review?

- □

  Yes
- □

No

- □

Not sure

G6. Are you aware of potential strategies to optimize resource allocation and reduce costs associated with blood testing?

- □

Yes

- □

No

G7. If yes, how did you become aware of these cost-saving strategies? (Select all that apply)

- □

Quality improvement projects

- □

In-hospital educational programs

- □

Published literature / journals

- □

Conferences / CME activities

- □

Institutional guidelines or protocols

- □

Colleagues / mentors

- □

Other (please specify): _____

G8. Has your institution implemented any initiatives to reduce unnecessary blood testing?

- □ Yes, and they are effective
- □ Yes, but they are not effective
- □ Yes, but I am not sure of their effectiveness
- □ No
- □ Not sure

G9. If your institution has implemented initiatives, what strategies were used? (Select all that apply)

- □ Educational campaigns
- □ Clinical guidelines / protocols
- □ Electronic health record alerts
- □ Restricting ordering privileges
- □ Displaying test costs in the ordering system
- □ Audit and feedback
- □

Requiring justification for repeat tests

- □

  Other (please specify): _____

SECTION H: EDUCATION, TRAINING, AND PRACTICE IMPROVEMENT

H1. Did your surgical training program include formal education on appropriate laboratory utilization and cost awareness?

- □

  Yes
- □

  No
- □

  Not sure

H2. Do you believe that formal education on appropriate blood test ordering should be included in surgical residency curricula?

- □

  Strongly agree
- □

  Agree
- □

  Neutral
- □

  Disagree
- □

Strongly disagree

H3. What interventions do you believe would be most effective in reducing unnecessary blood test ordering in emergency surgery? (Select top 3)

- □ Evidence-based clinical guidelines
- □ Educational programs for residents and attendings
- □ Electronic health record alerts / clinical decision support
- □ Audit and feedback on ordering practices
- □ Displaying test costs at the point of ordering
- □ Collaborative decision-making (resident-attending discussions)
- □ Restricting ordering privileges for junior residents
- □ Hospital-wide protocols for routine postoperative testing
- □ Quality improvement initiatives
- □ Other (please specify): _____

H4. In your opinion, what is the single most important factor that would reduce unnecessary blood tests in your department?

- □

  Education and training
- □

  Institutional guidelines and protocols
- □

  Electronic health record interventions
- □

  Leadership commitment and enforcement
- □

  Cultural change / habit modification
- □

  Financial incentives / disincentives
- □

  Other (please specify): _____

SECTION I: ADDITIONAL COMMENTS

I1. Are there any additional comments, suggestions, or experiences you would like to share regarding blood test utilization in emergency surgery?

Thank you for taking the time to complete this survey. Your responses are greatly appreciated and will contribute to improving patient care and optimizing resource utilization in emergency surgery worldwide.