

Audit Report: Emergency Orthopedic Cases at Kanuni Sultan Suleyman Training and Research Hospital, Istanbul, Turkey

—Emergency Orthopedics

Ahmed Dervis

Department of Orthopedic Surgery, Kanuni Sultan Suleyman Training and Research Hospital, Istanbul, Türkiye

Email: ahmeddarwish908@yahoo.com

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Abstract

Background: Orthopedic emergencies constitute a major workload in tertiary trauma centers, often requiring rapid intervention to prevent disability or mortality. This audit was conducted to evaluate patterns, timeliness, and outcomes of emergency orthopedic cases at Kanuni Sultan Suleyman Training and Research Hospital, Istanbul, with the aim of identifying strengths and areas for improvement in acute care delivery. **Methods:** A mixed prospective and retrospective audit was performed over 20 months (September 2023 - May 2025). Prospective data included emergency consultations, time-to-intervention records, and resident neurovascular documentation. Retrospective data were obtained from surgical logs, trauma call sheets, and complication registries. All patients presenting with orthopedic emergencies—including open fractures, neurovascular injuries, compartment syndrome, septic arthritis/osteomyelitis, pediatric fractures, and polytrauma—were included. Key performance indicators assessed were time to intervention, appropriateness of prophylactic antibiotics, complication rates, imaging delays, and quality of resident documentation. **Results:** A total of 361 emergency orthopedic cases were analyzed. Open fractures (n = 108) had an average intervention time of 6.5 hours with a 12% complication rate, while fracture-dislocations with neurovascular compromise (n = 47) were managed within 2.8 hours and showed a 6% complication rate. Compartment syndrome (n = 19) was treated with fasciotomy within 4 hours in 74% of cases, though late diagnosis led to a 21% complication rate. Pediatric emergencies (n = 100) had a low complication rate (2%), largely due to strong interdisciplinary coordination. Polytrauma patients (n = 55) received operative care within 3 hours but demonstrated a 15% complication or mortality rate. Positive trends included early consultant involvement

and efficient pediatric trauma handling, while key challenges involved delayed referrals, limited access to urgent MRI/CT, and incomplete neurovascular documentation in 32% of cases. **Conclusion:** Emergency orthopedic care at this tertiary trauma center is generally timely and well-coordinated, particularly in polytrauma and pediatric cases. However, delayed transfers, infection management, and variable recognition of compartment and vascular syndromes remain areas of concern. Targeted simulation training, improved imaging access, standardized documentation, and enhanced regional coordination are recommended to further optimize outcomes in high-stakes orthopedic emergencies.

Keywords

Orthopedic Emergencies, Audit, Open Fractures, Compartment Syndrome, Polytrauma, Istanbul

1. Introduction

This audit, conducted between September 2023 and April 2025, evaluates the patterns, frequency, and management outcomes of orthopedic emergencies seen at Kanuni Sultan Suleyman Training and Research Hospital, a major tertiary trauma referral center in Istanbul. The objective is to assess performance in key domains of emergency orthopedic care and identify areas for improvement in clinical response, training, and resource allocation [1]-[3].

2. Methodology

- **Data Collection:** Prospective and retrospective review of ER orthopedic consultations, emergency surgical logs, radiology reports [4] and trauma call sheets was conducted. To ensure consistency across records and reviewers, a standardized data extraction tool (**Appendix A: Neurovascular Exam Template**) was employed. Prospective data included emergency consultations, time-to-intervention records, and resident neurovascular documentation, while retrospective data were obtained from surgical logs, trauma call sheets, and complication registries.
- **Inclusion Criteria:** All patients presenting with orthopedic emergencies, including open fractures, neurovascular injuries, infections, pediatric fractures, and polytrauma [1] [5] [6].
- **Time Frame:** 20 months (September 2023 - May 2025).
- **Key Metrics Assessed:**
 - Time to intervention.
 - Appropriateness of antibiotic prophylaxis: compliance with established open fracture and infection protocols was observed in 82% of eligible cases. Delays or omissions were most common among patients transferred from peripheral centers, particularly with open fractures and septic arthritis presentations. Inade-

quate timing or selection of antibiotics correlated with higher infection-related complications, especially in Gustilo III open fractures.

- Rate of complications (infection, reoperation, amputation).
- Imaging delays.
- Resident documentation quality [7] [8].

3. Summary of Emergency Case Categories

Emergency Type	No. of Cases	Avg. Time to Intervention	Complication Rate	Notes
Open Fractures (Gustilo I - III)	108	6.5 hours	12% (SSI, debridement)	Prompt debridement was key
Fracture-Dislocations with NV Risk	47	2.8 hours	6% (delayed recovery)	Mostly elbow/knee; some missed pulses
Acute Compartment Syndrome	19	3.2 hours	21% (foot drop, fibrosis)	Early signs sometimes missed by juniors
Septic Arthritis/Osteomyelitis	32	5.5 hours (aspiration)	9% (reoperation)	Mostly hip and knee; some delayed IV antibiotics
Pediatric Ortho Emergencies	100	4.1 hours	2% (mild deformity)	Supracondylar fractures were most common
Polytrauma with Ortho Involvement	55	3 hours (to OR)	15% (infection, mortality)	Team communication was critical

4. Audit Findings

4.1. Positive Trends

- **Early Consultant Involvement:** In >90% of polytrauma cases, orthopedic consultants participated within 60 minutes of notification [3].
- **Compartment Syndrome Response:** Despite diagnostic difficulty, time to fasciotomy was under 4 hours in 74% of cases [2].
- **Pediatric Case Handling:** Low complication rate due to strong coordination with pediatric surgery and radiology [6].

4.2. Challenges Noted

- **Delayed Transfers:** Patients referred from peripheral centers often arrived late (>12 hrs post-injury), impacting open fracture and infection outcomes [1] [5].
- **Limited CT or MRI Access:** MRI not always available emergently, delaying osteomyelitis and pediatric epiphyseal injury assessments [4].
- **Documentation Gaps:** 32% of compartment syndrome cases lacked serial neurovascular assessments in the first 6 hours [7].
- **Resident Skill Variability:** Some delays in recognizing subtle vascular injuries (especially in supracondylar fractures) [6] [8].
- **Antibiotic Prophylaxis Gaps:** Approximately 18% of cases, mainly late referrals, did not receive timely or guideline-concordant antibiotic prophylaxis, which contributed to infection risk in complex open fractures and septic arthritis.

5. Recommendations

- 1) Standardize early neurovascular documentation [2] [7].
- 2) Implement compartment syndrome simulation training and structured teaching modules to improve resident recognition of subtle vascular injuries, particularly in high-risk cases such as pediatric supracondylar fractures [2] [6] [8].
- 3) Improve access to urgent imaging [4].
- 4) Establish fast-track infection protocol [5].
- 5) Strengthen liaison with EMS and regional hospitals [3] [8].
- 6) Mandate and standardize frequent (e.g., hourly for the first 6 hours) serial neurovascular examinations in suspected compartment syndrome, with structured documentation using the standardized audit tool [2] [7].

6. Conclusion

This audit underscores both the breadth and complexity of orthopedic emergencies managed at Kanuni Sultan Suleyman Training and Research Hospital. While trauma care is generally prompt and well-coordinated, delays in infection management and diagnostic ambiguity in early vascular/compartment syndromes remain key areas for improvement. Delays in infection management were evident, with an average of 5.5 hours to joint aspiration in septic arthritis/osteomyelitis cases, exceeding the institutional goal of intervention within 2 - 3 hours. These delays, along with instances of postponed intravenous antibiotic initiation, contributed to a 9% reoperation rate. Addressing such gaps through a fast-track infection protocol and closer coordination with microbiology and emergency services is essential. Through targeted education and process optimization, orthopedic teams can continue improving outcomes in this high-stakes domain [1]-[8].

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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Appendices

Appendix A: Case Audit Tool (Neurovascular Exam Template for Trauma Documentation)

This standardized form is intended for initial and serial assessment of neurovascular status in patients with extremity trauma, especially fractures and dislocations. Accurate documentation aids early diagnosis of vascular compromise and compartment syndrome, and ensures medico-legal safety.

Patient Information

Name: _____ Hospital ID/MRN: _____

Date & Time: _____ Examiner (Name & Title): _____

Injury Side: ☐ Left ☐ Right Limb: ☐ Upper Extremity ☐ Lower Extremity

1) Vascular Examination

Vessel/Pulse	Present	Absent	Doppler Sound	Comments
Radial (if upper limb)	☐	☐	☐ Yes ☐ No	_____
Ulnar (if upper limb)	☐	☐	☐ Yes ☐ No	_____
Dorsalis Pedis (lower limb)	☐	☐	☐ Yes ☐ No	_____
Posterior Tibial	☐	☐	☐ Yes ☐ No	_____
Capillary Refill Time	☐	☐	☐ Yes ☐ No	_____

2) Motor Examination

Movement	Nerve	Intact	Weak	Absent
Wrist/Finger Extension	Radial	☐	☐	☐
Thumb Opposition	Median	☐	☐	☐
Finger Abduction	Ulnar	☐	☐	☐
Ankle Dorsiflexion	Peroneal	☐	☐	☐
Toe Flexion / Plantar Flexion	Tibial	☐	☐	☐

3) Sensory Examination

Technique: Assess light touch and pinprick sensation in corresponding dermatomes of injured limb.

Findings:

- _____
- _____

4) Compartment Assessment (If Fracture or Crush Injury Present)

Pain out of proportion: ☐ Yes ☐ No

Pain on passive stretch: ☐ Yes ☐ No

Tense swelling: ☐ Yes ☐ No
 Paresthesia: ☐ Yes ☐ No
 Motor weakness: ☐ Yes ☐ No
 Repeat exam in: _____ minutes

Signature: _____
 Designation: _____
 Time Completed: _____

Appendix B: Sample Resident Log Entry for Compartment Syndrome

This sample entry reflects appropriate documentation of compartment syndrome by a resident in a trauma setting. It demonstrates serial neurovascular assessment, decision-making rationale, and timely intervention.

Date/Time: 2024-10-05, 14:20

Patient: Male, 26 years old, motor vehicle collision – closed tibial shaft fracture

Initial Exam:

- Severe pain despite analgesia
- Pain with passive stretch of toes
- Tense anterior and lateral compartments
- Distal pulses present (Dorsalis Pedis + Posterior Tibial)

Serial Monitoring:

- 15:00: Pain increased, paresthesia noted over dorsum of foot
- 15:30: Increasing swelling, patient screams with passive dorsiflexion
- Pulses maintained but motor testing limited by pain

Decision:

Clinical diagnosis of acute compartment syndrome confirmed based on pain, paresthesia, and tense compartments.

Action Taken:

Fasciotomy performed at 16:00 by orthopedic senior resident and attending surgeon.

Outcome:

Anterior and lateral compartments decompressed. Muscle bulks preserved. No evidence of muscle necrosis. Foot drop ruled out at 48-hour follow-up.

Resident: Ahmed Dervis (PGY-2)

Consultant: Dr.

Appendix C: Flowchart—Pediatric Fracture Triage in ER

Step 1: Initial Assessment

Assess airway, breathing, circulation (ABCs)

Check level of consciousness

Obtain history of injury (mechanism, time, symptoms)

Step 2: Evaluate for Emergency Signs

Open fracture? (Bone protruding through skin)

Neurovascular compromise? (Absent pulse, numbness, paralysis)

Severe deformity or angulation?

Compartment syndrome signs? (Pain out of proportion, tense swelling)

Associated head, chest, or abdominal injury?

If YES to any emergency signs → Immediate orthopedic and trauma team consult → Urgent management

If NO → Proceed to Step 3

Step 3: Clinical Examination of Limb

Inspect for swelling, bruising, deformity

Palpate for tenderness, crepitus

Assess active/passive range of motion

Check distal pulses and sensation

Step 4: Imaging

Obtain appropriate X-rays (include joint above and below injury site)

If suspected complex injury or growth plate involvement, consider advanced imaging (CT/MRI)

Step 5: Fracture Classification & Stability Assessment

Stable fracture (e.g., buckle/torus fractures)

Unstable fracture (displaced, comminuted, involving growth plate)

Step 6: Management Decision

Stable fractures → Immobilization with cast or splint → Discharge with follow-up

Unstable fractures → Orthopedic consult for possible reduction, fixation, or admission

Step 7: Pain Control & Instructions

Administer analgesics as needed

Educate caregivers on limb elevation, signs of complications

Arrange timely orthopedic outpatient follow-up