

Implementation of a Suspected Nasal Bone Fracture Pathway in a Major Trauma Centre

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Abstract

Introduction: Nasal trauma is a common facial injury worldwide and a frequent cause of presentation in the emergency department. At the largest trauma center in Khartoum, Sudan, there was no formalised pathway for the management of patients suspected to have this injury, leading to late referrals to ENT and suboptimal management. This audit assessed whether implementing a standard protocol could improve documentation quality, clarify referral criteria and reduce inappropriate imaging requests and subsequent ENT clinic utilization.

Methods: The first QIP cycle was completed over a four-month period from January to April 2023, and the second loop was done between August and November 2024. Adult patients (≥ 16 years old) presenting to A&E with suspected nasal fracture or nasal trauma were included. In the second loop, a nasal trauma protocol was introduced, emphasizing a pathway for exclusion of red flags, reinforcement that isolated nasal bone fractures do not require plain radiographs and appropriate triage to ENT services.

Results: A total of 48 patients were included (Cycle 1: $n = 21$; Cycle 2: $n = 27$). Nasal exam documentation improved considerably following protocol implementation, increasing from 41% to 79% ($p=0.018$), with red-flag documentation increasing from 29% (6/21) in Cycle 1 to 85% (23/27) in Cycle 2 ($p<0.001$). Requests for inappropriate scans (x-rays not fitting criteria) reduced from 95% to 11% ($p<0.001$).

Conclusion: Implementation of a standardised nasal fracture protocol considerably improved accuracy of clerking documentation, reduced unnecessary imaging and radiation exposure and enhanced overall pathway adherence for follow-up and definite management. The improvements supported a more efficient utilization of the ENT fracture clinic and reduced unnecessary exposure to radiation. Continuous auditing, staff education due to high turnover and overall monitoring are prudent to maintain this level of adherence, and evaluation of the long-term effect on ENT clinic utilization and manipulation success rate is recommended.

Keywords: ENT; Nasal fracture; Epistaxis; Nasal bone

1. Introduction

Nasal trauma is a common facial injury worldwide and a frequent cause of presentation in the emergency department [1-4]. Examination should also include assessment for nasal obstruction, septal hematoma or septal deviation, as these carry the highest morbidity rate with potential complications such as abscess formation, cartilage necrosis and severe infection [5].

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Hospitals should have a timely protocol for suspected nasal bone fractures in which patients are reviewed by the ENT team for either continuation of conservative management or manipulation under anesthesia [6]. Nasal manipulation can be done under local anesthetic in outpatient clinics, ideally within 10-14 days from the initial injury, while delayed referrals may warrant surgical intervention under general anesthesia [7].

Furthermore, there is no solid role for plain radiographs in suspected isolated nasal bone fractures, with CT scans not usually warranted unless there is suspicion of maxilla-facial injuries, head injuries or more complex nasal fractures [8].

In Sudan, literature describing nasal fracture management is minimal. At the largest trauma center in Khartoum, a lack of formal assessment protocols resulted in inconsistent documentation, unnecessary imaging and radiation exposure and delayed ENT referrals, which, when combined, resulted in poor ENT clinic utilisation.

This quality improvement project evaluated the practice at the time and introduced a structured nasal fracture protocol

2. Materials and methods

A closed-loop QIP was performed across two four-month cycles at a major tertiary hospital in Khartoum, Sudan. The first cycle was conducted retrospectively between January and April 2023, and the second cycle prospectively between August and November 2024 following protocol implementation.

- **Inclusion Criteria:** Adult patients aged ≥ 16 years presenting to the Emergency Unit with suspected nasal trauma or nasal fracture were included.
- **Data Collection:** This was done retrospectively for the first cycle and prospectively for the second cycle. Eligible cases were identified through A&E patient records. Data were extracted using a structured proforma, including demographics (age, gender), documentation of examination red flags that exclude appropriateness of referral to the ENT fracture clinic (septal haematoma, septal deviation, septal perforation, other maxillofacial injuries), imaging modality and appropriateness, and ENT on-call referral decisions.
- **Intervention:** A standardised "Nasal Trauma Protocol" was introduced ahead of Cycle 2. Key components included: a. Proforma for documentation of examination, b. Emphasis on avoidance of plain radiography for suspected isolated nasal bone fracture, c. Urgent referral criteria to ENT fracture clinic. Furthermore, ENT teaching sessions for A&E clinicians and distribution of the new protocol via department WhatsApp groups, emails and posters was done.
- **Outcome Measures:** The primary outcomes were documentation completeness and rate of inappropriate imaging. Secondary outcomes included appropriateness of ENT clinic referral.
- **Statistical Analysis:** Data were analysed using Microsoft Excel 365. Categorical variables were compared using Fisher's exact test, and descriptive statistics were presented as frequencies and percentages. Statistical significance was set at $p < 0.05$.
- **Governance and Ethics:** This project was registered with the hospital review board and conducted as a service evaluation. Institutional review board was thus waived. All data were anonymised prior to analysis.

3. Results

A total of 48 patients were included (21 in Cycle 1, 27 in Cycle 2). Median age was 21 years (range: 16-53).

3.1. Documentation Completeness

Full nasal examination documentation increased from 41% (9/21) in Cycle 1 to 79% (21/27) in Cycle 2 (Fisher's exact test, $p < 0.001$), with red-flag documentation increasing from 29% (6/21) in Cycle 1 to 85% (23/27) in Cycle 2 (Fisher's exact test, $p < 0.001$) (Table 1). Furthermore, documentation of isolated nasal bone fracture as the final impression (criteria for ENT outpatient referral) increased from 14% (3/21) to 81% (22/27) (Fisher's exact test, $p < 0.001$).

Imaging: Inappropriate plain radiography requests fell markedly following protocol implementation, decreasing from 95% in Cycle 1 to 11% in Cycle 2.

Table 1 Outcomes before and after implementation of a nasal trauma protocol

Outcome	Cycle 1 (n=21)	Cycle 2 (n=27)	p-value
Nasal examination documentation	9/21 (41%)	21/27 (79%)	<0.05
Red flags documented	6/21 (29%)	23/27 (85%)	<0.001
Isolated nasal fracture impression documentation	3/21 (14%)	22/27 (81%)	<0.001
Inappropriate x-rays requested	20/21 (95%)	3/27 (11%)	<0.001
Appropriate ENT clinic referrals (no red flags)	9/21 (41%)	25/27 (92%)	<0.001

Referral Accuracy: Appropriate ENT fracture clinic referrals – defined as cases without red flags and suitable for outpatient follow-up – increased from 9/21 (41%) in Cycle 1 to 25/27 (92%) in Cycle 2 ($p < 0.001$).

Data are presented as n (%), where n represents the number of patients, and % reflects the proportion within that audit cycle. “Inappropriate imaging” was defined as requests not meeting protocol criteria. “Appropriate clinic referral” refers to patients without red flags correctly triaged to the ENT Fracture Clinic. Comparisons between cycles were performed using Fisher’s test, with $p < 0.05$ considered statistically significant.

4. Discussion

Nasal fractures are the most common facial fractures [9]. This means there should be hospital protocols for the timely review of these cases [10]. International evidence reveals there are significant delays in their management, particularly in A&E settings [11].

The first cycle of this audit identified multiple gaps that required action at our trauma center, starting from clinical documentation of nasal examination. which was incomplete in some cases, particularly compared to the rest of the primary and secondary trauma survey. This is assumed to be due to the lesser familiarity of medical graduates with full ENT examinations [12]. However, medicolegally, comprehensive documentation of facial and nasal examination is essential, particularly given the high-stakes nature of missed nasal bone fractures [13].

The 2nd cycle of this audit witnessed a substantial increase in documentation completeness, attributed to the education sessions by ENT specialists regarding nasal trauma examination. Furthermore, there was a dissemination of the protocol pathway through the A&E department email, WhatsApp groups and 2 posters hung in the A&E Trauma Room.

One of the most noticeable documentation improvements was mentioning the presence/absence of red flags, defined as any finding which would warrant urgent ENT on-call referral, including septal haematoma/deviation/perforation and watery rhinorrhoea [14]. Teaching sessions focused on the identification of these red flags were proven to improve overall management [15]. Highlighting the urgency of these findings resulted in improved recognition of conditions requiring early intervention and ultimately helped reduce the risk of missed severe pathology.

Another major operational improvement observed in this audit was the reduction in the number of x-rays requested. Nasal fractures remain a primarily clinical diagnosis, and plain radiographs add very limited value in the diagnosis of cases [16]. CT scans have a sensitivity of 100% when detecting nasal fractures but are not usually required unless more complex facial or cranial injuries are suspected [17]. This was adapted in our study as an essential criterion for requesting scans, thereby significantly reducing the number of unnecessary imaging and supporting the overall reduction in radiation exposure.

Improvement in these aspects led to an influx of criteria-fitting referrals to ENT fracture clinic, allowing the on-call ENT to review emergency cases in a timelier manner and resulting in an overall more efficient utilization of healthcare resources.

5. Conclusion

Implementation of a nasal fracture pathway significantly improved documentation quality, imaging justification, and referral efficiency at Sudan’s largest trauma centre. Continued training and re-audit are essential to sustain improvement.

6. Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

Statement of ethical approval

This study involved an anonymous, non-interventional questionnaire electronically sent to doctors and did not contain clinical data or identifiable personal information. Participation was voluntary, with informed consent about the purpose of the study and participants' right to withdraw at any time. This project was registered with the hospital review board and conducted as a service evaluation. Institutional review board was thus waived. The study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki. All data were anonymised prior to analysis.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

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Appendices

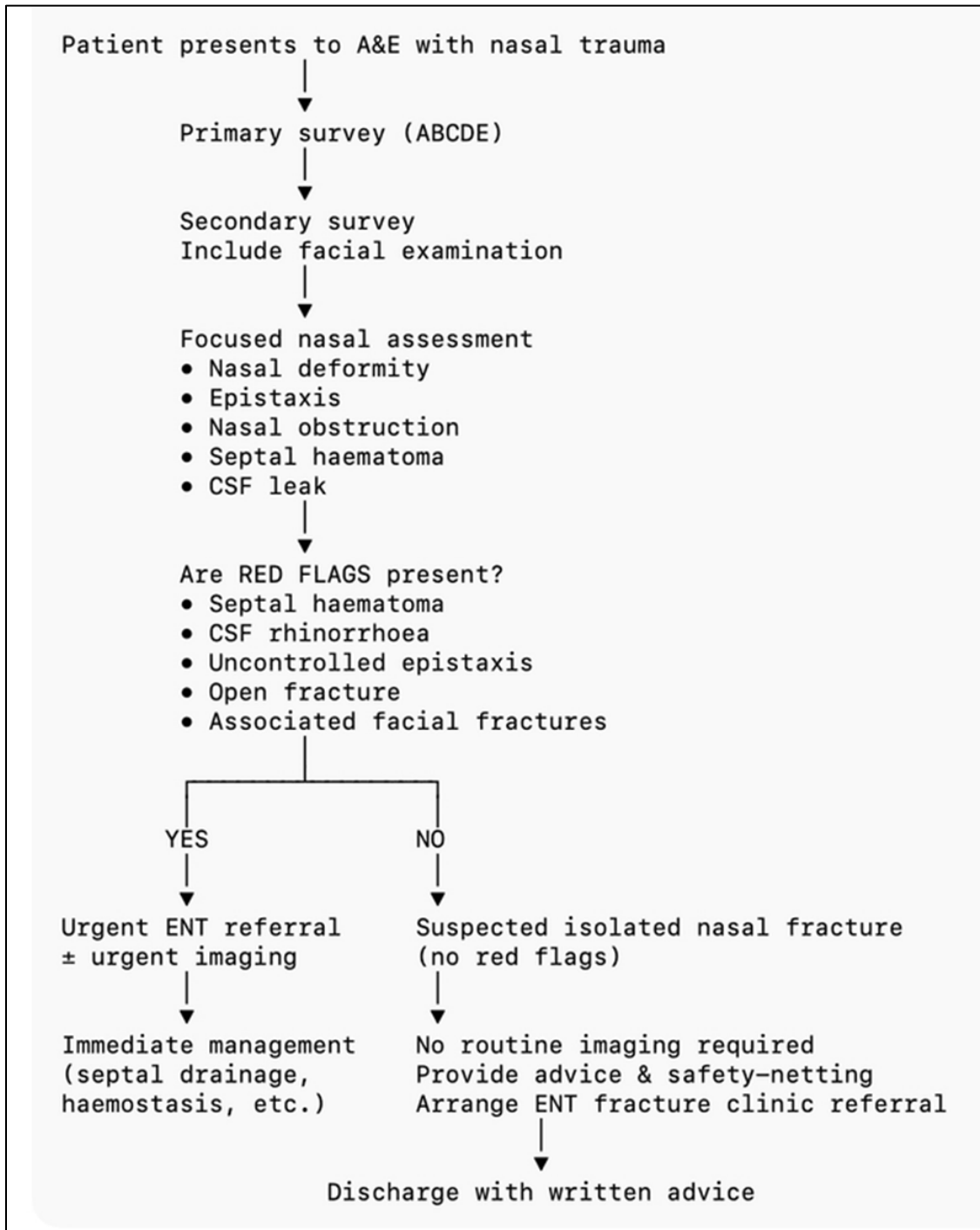


Figure 1 Nasal Fracture Management Flowchart (A&E)

This flowchart outlines the examination and management of patients presenting with nasal trauma. In the absence of red flags, suspected isolated nasal bone fractures are managed clinically without routine imaging, with appropriate ENT fracture clinic referral on discharge and safety-netting advice.