CASE LETTER

Diagnostic error: Missed fractures in emergency medicine

The following incident was submitted to the Emergency Medicine Events Register (EMER – http://www.emer.org.au). EMER is an anonymous, confidential and protected incident-reporting system that is supported by ACEM. Anyone working in emergency medicine can enter a near miss or AE by following the link from the website. It should only take 5 min and will help to inform practice and improve patient safety in emergency medicine.

The case presented in Box 1 demonstrates the failure of an ED registrar to correctly identify a triquetral fracture on X-ray. A diagnostic error is broadly defined as any mistake or failure in the diagnostic process leading to a misdiagnosis, a missed diagnosis or a delayed diagnosis. Failure to diagnose a fracture accounts for up to 80% of ED diagnostic errors, occurs in 1% of all ED visits in a Norwegian hospital (when 3% of fractures were missed) and is a leading cause of litigation. The rate of missed fractures in emergency radiology is highest in the extremities (foot, 7.6%; hand, 5.4%; wrist, 4.1%; ankle, 2.8%), the knee (6.3%), elbow (6.0%) and hip (3.9%).

This missed fracture highlights a system issue (lack of timely X-ray reporting) that could potentially result in significant patient harm. According to Reason (p. 768), a systems approach to error ‘concentrates on the conditions under which individuals work and tries to build defences to avert errors or mitigate their effects’. Such an approach is characteristic of high-reliability organisations, which proactively strive for comprehensive safety management targeting: the person, the team, the task, the workplace and the institution as a whole.

There are numerous operating characteristics of the ED that contribute to errors, including the pace of the work, distractions and the lack of 24/7 access to other medical specialities, such as radiologists, to assist with diagnosis. X-ray interpretation by junior ED staff has high error rates. Missing fractures, even by radiologists, might occur as a result of ‘satisfaction of search’ – the reduced index of suspicion to search for more fractures once a fracture corresponding to the clinical findings has been identified. Guly suggested that fractures might be missed because incorrect radiographs were requested, highlighting the need for a thorough assessment and the need for ED doctors to specify the exact radiographic views that they require, and/or to state exactly the injury that they want to exclude. A lack of cooperation and communication between emergency and radiology departments is also a contributing factor to missed fractures. Additionally, it has been suggested that radiology trainees should have specific training in the interpretation of radio-

BOX 1. Data reported into EMER from an adverse event

Clinical presentation – Injured wrist
Incident description – ED registrar interpreted XR as normal – missed the triquetral fracture
Contributing factors – Small fracture, inexperience, no ED consultant review of XR, delayed reporting of XR
Action taken – Patient phoned to come in, did represent for plaster and referral to fracture clinic
Factors that reduced the impact – XR reported 24 h later by radiology, results phoned through to ED consultant, patient presented for plaster
Prevention – Further education of ED registrars, supervision by ED consultant
Consequence or Outcome – 1-day pain
Time of Incident – 00.00–00.59 hours
Reporter – ED Physician

BOX 2. Summary of Case Study learnings

Learning summary:
1. The extremities are common locations for missed fractures.
2. A lack of 24/7 access to radiologists contributes to fractures being missed.
3. Additional fractures might be missed as a result of ‘satisfaction of search’.
4. Missed fractures error rates are greater during the evening and overnight.
5. Better resourcing and training of ED doctors and radiologists can reduce the frequency of diagnostic error.
graphs, and work under supervision before being allowed to interpret radiographs unsupervised. Junior ED doctors should also, ideally, receive specific training and be tested on their ability to request and interpret radiographs correctly before being allowed to work unsupervised. As with all system issues, opportunities to improve staffing levels and offer additional training might be limited by available resources.

Examination of temporal patterns in diagnostic errors, specifically missed fractures, found no significant difference in error rates between weekdays and weekends, but significantly greater error rates during the evening and overnight, with a peak between 20.00 and 02.00 hours. This time corresponds to potential doctor fatigue and lowest levels of radiology support, indicating that ED doctors must be especially vigilant when assessing a patient for a potential fracture or interpreting radiographs during this time period. In the short term, better training of ED doctors and radiologists is essential to increase diagnostic accuracy and reduce the frequency of diagnostic error.

Although the above case study might appear to be an inconsequential error, the cost to the patient and the organisation can be severe; loss of trust in the healthcare system can have long-lasting effects. Therefore, every diagnosis must be accurate and completed in a timely manner. Box 2 highlights the key learnings based on the above case study.

**Competing interests**

None declared.

**References**


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