



Cohort Study

Documentation of neurovascular assessment in fracture patients in a tertiary care hospital: A retrospective review



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ABSTRACT

Introduction: Neurovascular problems are common in acute fracture. In the emergency room, a thorough clinical evaluation is required, when examined by an orthopedic specialist or emergency doctors.

Materials and methods: we registered our project with the audit department. In the first cycle, we looked at notes from 77 patients from November–December 2020, emphasis to neurovascular documentation from both ED and orthopedic Clerking notes. We submitted our findings at our audit meeting and implemented modifications. Two months later, we re-audited, this time with 82 patients as the sample size.

Results: 77 patient notes were reviewed in the first cycle, 51% male and 49% female. In ED clerking notes, 22% patients had no neurovascular documentation, compared to 3.8% of patients in orthopedic clerking. 39% ED notes had acronyms written for the neurovascular status, such as NVI, to 20.7% of orthopedic notes. 82 notes were reviewed in the second cycle, 44% male and 56% female. 7% of ED clerking notes lacked any neurovascular comments, compared to 0% of orthopedic admission sheets. 10% of the ED sheets contained NVI abbreviation, while 4% of ortho notes had the same. There were specific notes on neurovascular state on 68 of the ED admission sheets evaluated, and 74 of the orthopedic notes did the same.

Conclusion: In fracture patients, documentation of neurovascular condition was lacking. The documentation of the details of the neurovascular assessment was poor. Increased recording of neurovascular assessment and improved emergency department evaluation of patients presenting with upper and lower limb injuries were aided by the introduction of teachings.

1. Introduction

The early detection of neurovascular degeneration or compromise requires a thorough assessment of neurovascular health. Delays in recognizing neurovascular impairment can result in long-term deficits, limb amputation, and even death. After a trauma, surgery, or the placement of a cast, neurovascular degeneration can occur. Initial examination and quick treatment of an injured extremities have a significant impact on the fate of the injury. Delay in recognizing neurovascular impairment can result in the amputation of an extremity

or potentially the patient's death. Having a solid understanding of complete neurovascular function, on the other hand, can provide the nurse with correct assessment skills as well as awareness of the need for prompt treatment. The orthopedic nurse uses this vital orthopedic information on a daily basis to deliver the greatest patient care with the best possible outcome. It's vital that neurovascular findings are well documented in order to identify people who need surgery right away. When it comes to documentation. Pre and post intervention, the sensory and motor function of the damaged nerves must be documented separately, as a blanket statement such as "neurovascular intact" is

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insufficient because it does not imply that each component has been properly tested.

A thorough vascular examination, including capillary refill time, hand color, and the presence or absence of pulses, should be documented. Only a few previous studies on the adequacy of neurovascular documentation have been published. According to circumstantial evidence, neurovascular documentation was often insufficient. The main aim of our study is to look in to the flaws of documentation of such an important aspect of patient clerking with in our own centre, look at what the guidelines recommend and make changes to ensure proper notes are made in this respect.

2. Materials and methods

In the first cycle, we performed a retrospective evaluation of case notes for 77 patients hospitalized to our trauma wards with acute fractures between November 13th and December 13th, 2020, after registering it as an audit with clinical governance and following up-to-date guidelines to assist us [1–3]. When evaluating Orthopedic and Emergency Department admission clerking notes, data was recorded using Microsoft Excel sheets. The neurovascular documentation received special attention. Our findings’ neurovascular documentation was split into three categories: no documentation, neurovascularly intact (NVI) written only, and complete neurovascular descriptions including capillary refill time, pulse color, temperature, motor and sensory supply. A review of the before and post manipulation paperwork was done for all fracture dislocations that were manipulated in the emergency department. All upper and lower limb fracture and dislocation patients admitted to orthopedic wards in an acute setting met the inclusion criteria for our study. Patients who were discharged from the emergency room without receiving orthopedic treatment were not included in the study. At the quarterly audit meeting, we presented our findings and implemented changes based on consultant recommendations, such as posting posters in trauma units, sending generic emails to all ED and orthopedic doctors, and having specialized joint departmental lessons led by consultants for both teams. We finished the second cycle two months after the amendments went into effect, this time looking at case notes from 82 patients from February 1 to March 1, 2021. All inclusion and exclusion criteria remained the same for the re-audit, however patients clerked in by project authors were omitted from the research to reduce bias. Our study is in line with the STROCCS criteria [15]. Project has been registered with UIN research registry 7962.

3. Results

In the first cycle we reviewed at total of 77 case notes. Majority of the trauma patients (85.14%) were of the lower limb while the remaining (14.2%) were of upper limb (Table 2a). 39 of our patients were male while 38 were female (Table 1a). Our results showed that 22.1% of all emergency department (ED) clerking sheets and 3.8% of all trauma and orthopedic notes had no neurovascular documentation (Table 2a). 38.9% of ED clerking and 20.7% of orthopedic case notes had abbreviation “NVI” was used to signify that patient is neurovascularly intact (Table 2a). 30 patients that were clerked in the emergency department and 58 patients seen by the orthopedic department had detailed documentation of the neurovascular examination done (Table 2a). Out of 77 patient notes analyzed, 19 of the patients were fracture dislocations that

Table 1
Summary of demographic for audit given in Table 1a and re-audit given in Table 1b.

Total patients		77	Total patients		82
Sex	Male	39	Sex	Male	36
	Female	38		Female	46
1a			1b		

Table 2
a: summary of audit findings 2b: summary of re-audit finding.

ED	N = 77	ED	N = 82
No documentation	17 (22.1%)	No documentation	6 (7.3%)
NVI only	30 (38.9%)	NVI only	8 (9.7%)
Specific documentation	30 (38.9%)	Specific documentation	68 (82.9%)
Upper limb	11 (14.2%)	Upper limb	14 (17%)
Lower limb	66 (85.14%)	Lower limb	68 (82.9%)
Ortho	N = 77	Ortho	N = 82
No documentation	3 (3.8%)	No documentation	0 (0%)
NVI only	16 (20.7%)	NVI only	4 (3.6%)
Specific documentation	58 (75.3%)	Specific documentation	74 (90.2%)
2a		2b	

were manipulated and casted in the emergency department. 63.2% of the manipulated patients had no post manipulation documentation, 5.3% had abbreviations used and 31.6% of the patients had specific post manipulation documentation (Table 3a).

In the second cycle, 82 case notes were evaluated, with 44% of the sample being male and 56% being female (Table 1b). Only 7.3% of ED clerking notes were missing neurovascular comments, whereas 0% of orthopedic admission sheets were missing them (Table 2b). Only 10% of the ED sheets tested had NVI as an abbreviation, whereas 3.6% of orthopedic notes had the same issue (Table 2b). On 68 (82.9%) of the ED admission sheets examined, there were specific notes on neurovascular status, and 74 (90.2%) of the orthopedic notes did the same (Table 2b). 22 patients had presented with fracture dislocations that were manipulated and put in casts. 31.8% of these casted patients had no post manipulation documentation in their clerking, 18.1% of patients had abbreviations used and 50% of patients had detailed documentations of neurovascular status in their clerking sheets (Table 3b).

4. Discussion

Fractures are one of the commonest causes of presentation to the emergency department in the UK. A large scale 2008 epidemiological study reported an annual incidence of fractures at 3.6% and age standardized fracture prevalence at 38.2% [7]. Therefore, it is essential that all medical and nursing staff expected to provide care to patients with fractures have been trained in assessment and monitoring of these patients. Documentation is essential for good medical care as well as defense in the event of legal concerns. For the rationale and defense of acceptable medical care, physician documentation is essential. Proper documentation is also necessary for appropriate monitoring of patients and to ensure patients with deteriorating symptoms and signs receive timely intervention.

Performing a neurovascular examination can be difficult on some occasions due to pain, anxiety and in paediatric patients with fractures such as supracondylar elbow fractures but it makes it even more important to identify and properly document these findings [4]. A neurovascular examination performed at time of admission serves as a baseline for patient monitoring. The neurovascular status of the injured limb is sometimes simplified to include assessment of pulselessness,

Table 3
a summary of post manipulation ED neurovascular documentation audit, Table 3b summary of post manipulation ED neurovascular documentation re-audit.

ED Post Manipulation/ casting	N = 19	ED Post Manipulation/ casting	N = 22
No documentation	12 (63.2%)	No documentation	7 (31.8%)
NVI only	1 (5.3%)	NVI only	4 (18.1%)
Specific documentation	6 (31.6%)	Specific documentation	11 (50%)
3a		3b	

pallo, paralysis, paraesthesia, pain and poikilothermia while provision of routine nursing care on the wards [5]. A medical assessment of the neurovascular assessment should elaborate that the perfusion of the limb is assessed properly with documentation regarding pulses and the sensory as well as motor functions of relevant nerves have been assessed and documented. In the absence of informed neurovascular examination and monitoring in patients presenting with fractures, severe adverse outcomes can include long term functional impairment, compartment syndrome and limb loss due to amputation [6].

In view of above complications, it is necessary for healthcare systems to ensure that medical staff are well trained. In the initial audit cycle we observed that the documentation of neurovascular status was quite poor among emergency department staff. Gaps were identified in the documentation by Orthopaedics staff as well. This situation was somewhat alarming as absence of documentation could mean that this important part of assessment in patients with fractures may have been missed. Incomplete documentation where the neurovascular status was only documented as intact without specific documentation of sensory and motor components of the related nerves as well absence of documentation of distal pulses raises concerns whether the examination was not properly completed. After we reviewed the results of our study, we found it essential that we have to disseminate our results and make our recommendations. With the flurry of information in today's healthcare systems we understood that we need to develop a strategy to achieve our aims to improve service provision. We developed a three-pronged strategy where we disseminated posters in the emergency department, sent generic educational emails and held joint teaching sessions with the emergency department staff in a strategic dissemination campaign [11, 12].

Emergency department doctors and Emergency Nurse Practitioners are usually the first point of contact in our healthcare system in the United Kingdom. Hence, we focused firstly on providing educational posters to the emergency department regarding neurovascular assessment. Well-designed posters are an effective method of dissemination of knowledge in a non-judgmental and relaxed manner to colleagues [8]. The provision of guidelines and education to emergency department staff is known to improve documentation as well as management of patients in a wide variety of patient presentations [9].

Another intervention we decided to utilize was to use generic emails to all ED and Orthopaedics doctors regarding the importance of neurovascular assessment and its documentation. We wrote emails detailing the shortcomings in the documentation and provided a guideline regarding detailed assessment of neurovascular injuries in patients presenting with fractures. The staff were also encouraged to revisit trust protocols for specific injuries. Mailed and emailed interventions are known to improve behaviors among doctors regarding prescribing and we aimed to improve their attitude regarding documentation with a similar intervention in our study [10].

Another intervention we decided to adopt was to arrange a consultant-led interdepartmental teaching session inviting both Orthopaedics and Emergency department staff for attendance. During this session, we emphasized the importance of our findings in the first audit cycle and reiterated the significance of complications that can result from improper assessment and documentation. Sessions involving staff from different departments and professions provide unique opportunities for teambuilding. They also provide an opportunity to learn from others' experiences and help to understand skills and limitations of colleagues from differing backgrounds [12,13]. Our session received positive feedback from our colleagues both in our department and from the ED.

As a result of our interventions, a significant improvement was noted in attitudes towards appropriate documentation and assessment of neurovascular injuries in fracture patients. The second loop of our audit showed a picture which was far from ideal. Nevertheless, we noted that both emergency department and Orthopaedics staff made improved their documentation. Our strategy of disseminating information

regarding neurovascular injury was well received. We adopted a close loop audit strategy to document the strides made by both departments. Closed loop audits are deemed invaluable to improvement of service provision. Integration of this system has been shown to enhance efficiency of healthcare systems [14].

5. Limitations

A few potential limitations to our study were that we had collected data worth only of one month in each cycle. Time given for affective change to take place was only of 2 months. Our search was only limited to our own fracture wards and not on patients sent home from the emergency department. Our chosen sample size had more of lower limb neurovascular examination compared to upper limb documentation.

6. Conclusion

In fracture patients, preoperative documentation of neurovascular condition was lacking. The details of the neurovascular evaluation were poorly documented. The introduction of instructions, prompts, and training supported increased recording of neurovascular assessments and enhanced emergency department evaluation of patients presenting with upper and lower limb injuries.

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Nil.

Ethical approval

Retrospective study looking at patient notes so no ethical approval needed.

Consent

All data anonymised.

Author contribution

Mr Ahmad Faraz: lead author idea and write up. Miss Ammal Qurshah: write up and corrections. Mr Mohammad Noah H Khan: data collection and write up. Mr Bakht Yawar: data analysis. Dr Mariam Saghir: proof reading and corrections of statistics. Dr Misbah Malik: data collection and analysis. Mr Yasir Tarar: data collection. Mr Ghulam Dastagir Faisal: data analysis.

Registration of research studies

Name of the registry:

Unique Identifying number or registration ID:

Hyperlink to your specific registration (must be publicly accessible and will be checked):

Provenance and peer review

Not commissioned, externally peer-reviewed.

Declaration of competing interest

Nil.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.amsu.2022.103935>.

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