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WRIST & HAND

The management of suspected scaphoid fractures in the UK: a national cross-sectional study

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Aims

Current National Institute for Health and Clinical Excellence (NICE) guidance advises that MRI direct from the emergency department (ED) should be considered for suspected scaphoid fractures. This study reports the current management of suspected scaphoid fractures in the UK and assesses adherence with NICE guidance.

Methods

This national cross-sectional study was carried out at 87 NHS centres in the UK involving 122 EDs and 184 minor injuries units (MIUs). The primary outcome was availability of MRI imaging direct from the ED. We also report the specifics of patient management pathways for suspected scaphoid fractures in EDs, MIUs, and orthopaedic services. Overall, 62 of 87 centres (71%) had a guideline for the management of suspected scaphoid fractures.

Results

A total of 11 of 87 centres (13%) had MRI directly available from the ED. Overall, 14 centres (17%) used cross-sectional imaging direct from the ED: MRI in 11 (13%), CT in three (3%), and a mixture of MRI/CT in one (1%). Four centres (6%) used cross-sectional imaging direct from the MIU: MRI in three (4%) and CT in two (2%). Of 87 centres' orthopaedic specialist services, 74 (85%) obtained repeat radiographs, while the most common form of definitive imaging used was MRI in 55 (63%), CT in 16 (19%), mixture of MRI/CT in three (3%), and radiographs in 11 (13%).

Conclusion

Only a small minority of centres currently offer MRI directly from the ED for patients with a suspected scaphoid fracture. Further research is needed to investigate the facilitators and barriers to the implementation of NICE guidance.

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Introduction

Wrist trauma represents a large clinical and economic burden for both patients and healthcare services.[1] A significant proportion of patients with wrist trauma have clinical signs consistent with a potential scaphoid fracture but normal radiographs,[2] the so-called 'suspected scaphoid fracture'. Only a minority of these patients will have a scaphoid injury that necessitates immobilization, but given the high chance of developing post-traumatic arthritis in an untreated acute scaphoid fracture,[3] and the notable difficulty and expense of treating a scaphoid nonunion and any associated arthritis, the accurate identification of fractures at the time of acute presentation is imperative to enable prompt appropriate treatment.

In the UK, National Institute for Health and Clinical Excellence (NICE) guidance currently advises that MRI is considered the first line imaging for people with suspected scaphoid fractures following a thorough clinical examination;[4] the guidance is based upon some detailed health economic modelling which compared three clinical pathways (radiographs alone vs radiographs + CT vs radiographs + MRI), which indicated that MRI was the most cost-effective option.[5] There are also other potential advantages of early

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MRI, including achieving a prompt diagnosis in order to enable safe early mobilization and a return to activities.[6] The COVID-19 pandemic is likely to have had a significant impact upon practice, with an emphasis on reducing the number of face-to-face contacts with patients.

Our primary objective was to assess the availability of MRI imaging direct from the emergency department (ED). Our secondary objectives were to assess the availability of MRI imaging direct from minor injuries units (MIUs), the specifics of patient management pathways for suspected scaphoid fracture in EDs, MIUs, and orthopaedic services (OSs), and the estimated incidence of scaphoid fractures at each centre.

Methods

We carried out a multicentre, survey-based cross-sectional study in 87 UK centres over six months from November 2020 to April 2021. REC approval was not required, as per National Research Ethics Service (NRES) guidance, as it involved clinician surveys only.

Participating centres and clinicians. The SUSPECT working group, involving collaborators from multiple stakeholder groups, including EDs, orthopaedics, and radiology, was assembled. Participating centres were recruited using clinician contacts from previous collaborative projects and advertising on social media.[7] Any centre which regularly treated patients with acute wrist trauma was eligible to participate. Each centre had to serve at least one ED and involve a distinct specialist surgical department. The set of surveys will consist of a surgeon-lead survey, an ED-lead survey, and an MIU-lead survey, when an MIU was present. These surveys had been created by the study group and previously piloted at four centres. The clinician surveys were completed remotely in electronic format by the representatives from surgical services, as well as the ED and MIU where applicable, for each centre for each centre. If any questions were unclear, then these were addressed by email or telephone communication. Local clinical guidance was gathered when possible, and responses cross-referenced with local guidance to ensure accuracy of responses.

Outcomes. The primary outcome measure was availability of MRI direct from the ED. The secondary outcomes included the availability of MRI imaging direct from MIUs, the specifics of patient management pathways for scaphoid fractures in EDs, MIUs, and OSs, and the estimated incidence of scaphoid fractures at each centre.

Statistical analysis. The study was done according to a previous template for survey-based studies.[8] Statistical analysis was carried out using IBM SPSS Statistics for Windows (version 27.0; IBM, USA). Unless otherwise stated in the characteristics description, numbers represent n (percent) for categorical variables, and median (interquartile range (IQR)) for continuous variables.

Table I. Centre characteristics.

Variable	Data, n = 87, n (%)
Major trauma centre	20 (23)
Catchment population, median (IQR)	500 (350 to 612)
Country	
England	75 (86)
Scotland	7 (8)
Wales	4 (5)
Northern Ireland	1 (1)
Number of emergency departments	
1	60 (69)
2	22 (25)
> 2	5 (6)
Local clinical guideline for the management of suspected scaphoid injuries?	
Yes	62 (71)
No	25 (2)
Number of minor injuries units	
0	6 (7)
1	36 (41)
2	22 (25)
> 2	23 (26)
Management of suspected scaphoid injuries in minor injuries unit?	
Yes	59 (72)
No	23 (28)

IQR, interquartile range.

Results

Centres. In total, 87 UK centres participated (see Table I for characteristics), of which 17 (23%) were designated major trauma centres, and a majority of 75 (86%) were from England. The sum of the centres' catchment populations was 49 million (approximately 65% of the UK's population). Using the frequency of suspected scaphoid fractures estimated by EDs and MIUs, as shown in Tables II and III, a conservative estimate for the number of the suspected scaphoid fractures in the UK per annum is 70,000, assuming each centre sees ten scaphoid fractures per week. In all, 62 of 87 EDs (71%) had a guideline for the management of suspected scaphoid fractures, while 59 of 82 centres (72%) with an MIU had a guideline.

Primary outcome: NICE guidance adherence. In total, 11 of 87 centres (13%) had MRI directly available from ED in adherence with NICE guidance. This is demonstrated in Table II and Figure 1.

Secondary outcomes

ED based pathways. These pathways are summarized in Table II and Figure 1. The most common frequency of scaphoid fracture patients per week were five to < ten (30 centres; 34%) and ten to < 20 (30 centres; 34%). All centres routinely used radiographs which were variable in nature, while most used splint immobilization initially (82 centres; 92%). The most common clinical criteria for further investigation were anatomical snuffbox (ASB) or

Table II. Emergency department survey results.

Variable	Data, n = 87, n (%)
What is your role?	
Consultant ED	65 (75)
Specialist trainee ED	4 (5)
Advanced nurse practitioner	5 (6)
Advanced physiotherapist	4 (5)
Staff grade or GP	9 (10)
< 5	16 (18)
5 to < 10	30 (34)
10 to < 20	30 (34)
20 to < 30	8 (9)
30 or >	3 (4)
Which type of radiographs do you routinely obtain?	
Posteroanterior/lateral wrist	4 (5)
PA/lateral wrist and scaphoid views	40 (46)
Scaphoid views	44 (51)
How are patients typically immobilized?	
Splint without thumb	35 (40)
Splint with thumb	45 (52)
Backslab/temporary cast	7 (8)
What are the clinical signs for further investigation?	
All with history, irrespective of signs	33 (38)
ASB tenderness	6 (7)
ASB and/or tubercle tenderness	39 (45)
ASB or tubercle tenderness or axial loading	5 (6)
Other	4 (4)
Do you provide further investigation direct from ED?	
No	72 (83)
Yes, MRI	11 (13)
Yes, CT	3 (3)
Yes, other (MRI and CT mix)	1 (1)
Subgroups	
For those centres with imaging direct from ED, how are patients followed-up? (n = 15)	
ED	5 (33)
Specialist	6 (40)
Mixture of ED and specialist	4 (27)
For those centres without direct imaging, where are patients followed-up? (n = 72)	
ED for radiographs and then onward specialist referral	1 (1)
ED for CT	2 (3)
ED for MRI	3 (4)
Specialist services	66 (92)

ASB, anatomical snuffbox; ED, emergency department; GP, general practioner.

Table III. Minor injuries unit survey results.

Variable	Data, n = 82, n (%)
What is your role?	
Consultant ED	8 (10)
Specialist trainee ED	1 (1)
Advanced nurse practitioner	60 (73)
Advanced physiotherapist	6 (7)
Other	7 (9)
How many patients are seen in your unit per week?	
< 5	16 (20)
5 to < 10	35 (43)
10 to < 20	25 (30)
20 to < 30	6 (7)
30 or >	0 (0)
Which type of radiographs do you routinely obtain?	
Posteroanterior/lateral wrist	36 (44)
Posteroanterior/lateral wrist + scaphoid views	0 (0)
Scaphoid views	46 (56)
How are patients typically immobilized?	
Splint without thumb	28 (34)
Splint with thumb	48 (59)
Backslab/temporary cast	6 (7)
What are the clinical criteria for further investigation?	
All with history, irrespective of signs	37 (45)
ASB tenderness	1 (1)
ASB and/or tubercle tenderness	38 (46)
ASB or tubercle tenderness or axial loading	2 (2)
Other	4 (5)
Do you provide further investigation direct from MIU?	
No	77 (94)
Yes, MRI	3 (4)
Yes, CT	2 (2)
Subgroups	
For those centres with imaging direct from MIU, how are patients followed-up? (n = 5)	
MIU/ED	1 (20)
Specialist	3 (60)
Mixture of MIU/ED and specialist	1 (20)
For those centres without direct imaging, where are patients followed-up? (n = 77)	
MIU/ED	10 (13)
ED/specialist mixture	3 (4)
Specialist	64 (83)
For those centres with MIU/ED follow-up, how are patients next managed? (n = 10)	
Repeat scaphoid view radiographs and specialist referral	3 (30)
Repeat scaphoid view radiographs and MRI	4 (40)
Repeat scaphoid view radiographs and CT	1 (1)
MRI	2 (2)

ASB, anatomical snuffbox; ED, emergency department; MIU, minor injuries unit.

scaphoid tubercle tenderness (39 centres; 45%), and a suspicious history irrelevant of clinical examination (33 centres; 38%). In all, 72 centres (83%) did not offer cross-sectional imaging direct from ED, and in these centres follow-up was by OSs in 66 (76%) and ED in six (7%). Of these 72 centres (83%), 44 (51%) used MRI directly, 13 (15%) used CT, two (2%) used a CT/MRI mix, and 13 (15%) used radiographs alone. Follow-up after direct ED imaging was mixed in terms of ED and specialist input.

MIU based pathways. These pathways are summarized in Table III and Figure 2. The most common frequency of scaphoid fracture patients per week were five to < ten (35 centres; 43%) and ten to < 20 (25 centres, 30%). All centres routinely used radiographs which were variable

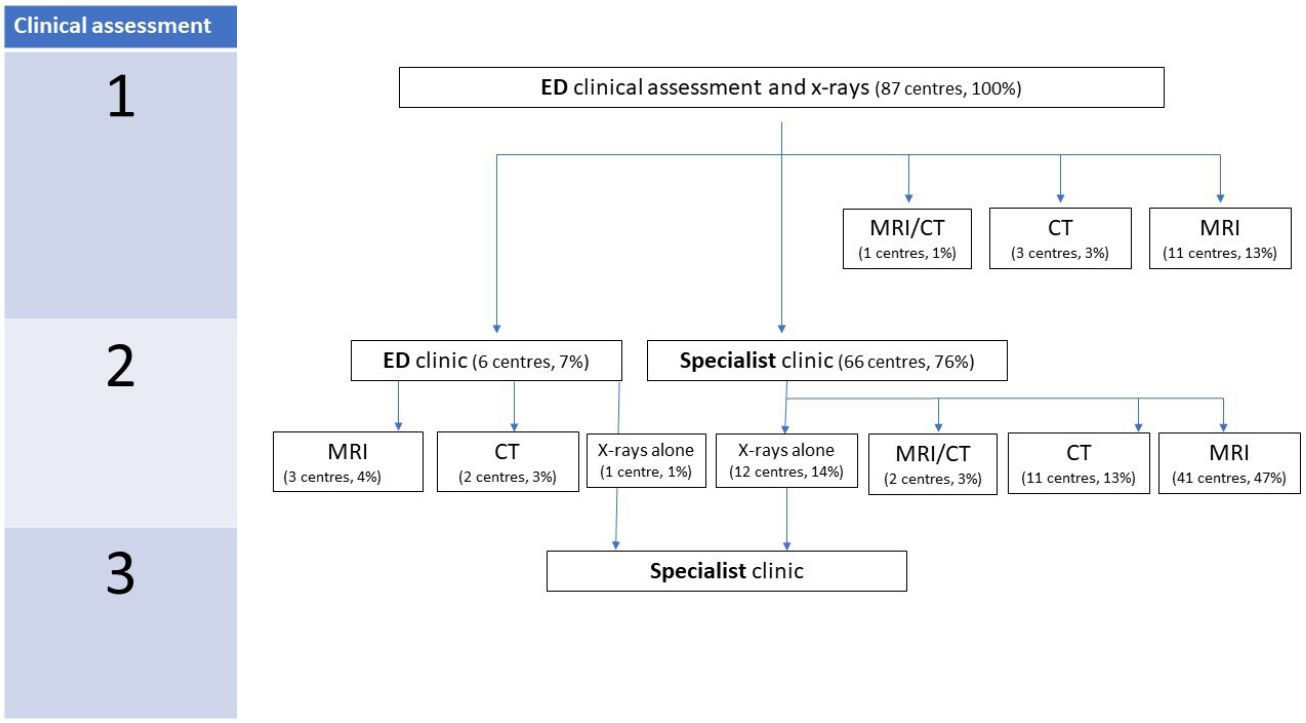

Fig. 1
A summary of pathways from the emergency department.

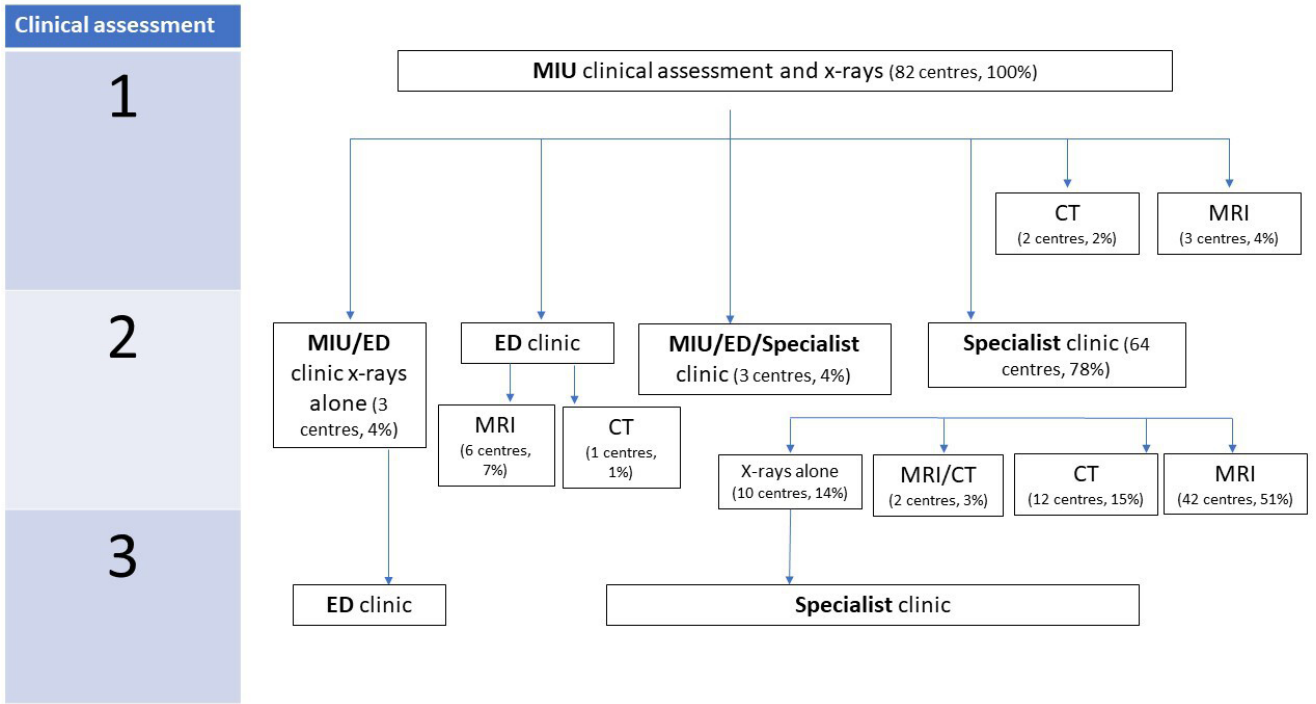

Fig. 2
A summary of pathways from minor injury units.

in nature, while most centres used splint immobilization initially (76 centres; 93%). The most common clinical criteria for further investigation were anatomical snuffbox (ASB) or scaphoid tubercle tenderness (38 centres; 46%), and a suspicious history irrelevant of clinical examination (37 centres; 45%).

Table IV. Surgeon survey results.

Variable	Data, n (%)
What is your role?	
Consultant orthopaedic surgeon	87 (100)
What are the clinical signs for further investigation?	
All with history, irrespective of signs	28 (32)
ASB tenderness and axial loading	3 (3)
ASB and/or tubercle tenderness	49 (56)
Other	7 (8)
Which type of radiographs do you routinely obtain?	
None	13 (15)
Scaphoid views	74 (85)
How are patients typically next managed?	
Splint/cast and MRI	55 (63)
Splint/cast and CT	16 (19)
Mixture of MRI and CT	3 (3)
Splint and return for x-rays	7 (8)
Cast and return for x-rays	4 (5)
Other	2 (2)
For those who use MRI, do you routinely use CT to assess for fracture displacement? (n = 58)	
Yes	8 (14)
For radiograph positive scaphoid fractures, do you routinely use further imaging to assess for displacement?	
No	55 (63)
Yes, CT	29 (33)
Yes, MRI	3 (3)
How do you manage scaphoid fractures non-surgically?	
Below elbow cast with thumb	8 (9)
Below elbow cast without thumb	79 (91)
How long do you immobilize scaphoid fractures (weeks)?	
4 to 5	3 (3)
6	59 (68)
7	1 (1)
8	24 (28)
How do you assess for union routinely?	
CT routinely	22 (25)
Radiographs initially ± CT if judged necessary	64 (74)
No imaging	1(1)

ASB, anatomical snuffbox.

Four centres (6%) used cross-sectional imaging direct from the MIU: this was MRI in three (4%) and CT in two (2%). Overall, 77 centres (94%) did not offer cross-sectional imaging direct from MIU, and of these, follow-up was in OSs in 64 (78%), an ED/MIU clinic in ten (12%), and a mixture of ED/OSs in three (4%).

Specialist surgery pathways. These pathways are summarized in Table IV. All respondents were Orthopaedic surgeons. Of 87 centres OSs, 74 (85%) obtained repeat radiographs, while the most common form of definitive imaging used was MRI (55; 63%), then CT (16; 19%), a mixture of MRI/CT (three; 3%), and radiographs (11; 13%). The most common clinical criteria for further investigation were anatomical snuffbox (ASB) or scaphoid tubercle tenderness (49 centres; 56%), and a suspicious history irrelevant of clinical examination (28 centres; 32%). Overall, 74 centres routinely obtained scaphoid series radiographs (74 centres; 85%) while the remainder did not do any radiographs (13 centres; 15%).

A small minority of centres (eight; 14%) routinely obtained a CT scan to assess for displacement in patients with an MRI detected scaphoid fracture. Over half of centres (55; 63%) did not routinely use further imaging to assess for displacement in radiograph detected scaphoid fractures, while 29 (33%) used CT for this purpose. All centres used a below elbow cast for the non-surgical management of scaphoid fractures; this did not involve the thumb in 79 centres (91%) and did involve the thumb in the remainder (eight centres; 9%). The most common period of cast immobilization was six weeks (59 centres; 68%), followed by eight weeks (24 centres; 28%). CT was used a routine first line imaging for scaphoid union in 24 centres (28%).

Discussion

The results of this study demonstrate that only a small minority (11 centres; 13%) of centres are adherent with NICE guidance in terms of being able to offer MRI direct from the ED for scaphoid fractures, while only 4% (three centres) were able to offer MRI directly from the MIU. Given the evidence demonstrating both the economic and clinical gains of early MRI, there remains a case for better implementing the NICE guidance and for future work to support the bridging of this implementation gap.

The great strength of our study is that by spanning specialist services, EDs, and MIUs, we have been able to unpick the overall pathways with greater clarity than previous studies. A limitation to our study is the sample size of 87 centres, although this is larger than previous studies, and sampling bias may have influenced our results. While a further limitation is that our study relies on the assumption that the results of surveys accurately represent what is happening to real patients on the clinical frontline, this may not always be the case.

The most recent study on UK pathways for scaphoid fractures was carried out over two years ago in January 2019, with responses from 66 EDs demonstrating only 3% of centres offered imaging beyond radiographs directly from the first ED attendance.[9] Our findings have shown that this has improved to 17%; however, it cannot be ruled out that this change may be due to sampling bias. The study by Snaith et al[9] was limited by its smaller sample size of 66 EDs and its reliance on data solely from EDs; no data was gathered from OSs or MIUs. Chunara et al[10] carried out a survey-based study in 2017, and reported that 38 of 74 responding NHS trusts offered MRI as a 'first-line investigation'. Notably, the question posed to entirely radiologists, 'Do you offer MRI as a first line investigation for scaphoid fracture where plain radiographs are normal?', would likely

have resulted in MRI used after repeat radiographs in an orthopaedic clinic being deceptively counted as MRI being used as a 'first-line investigation'.

The costs associated with repeated clinical attendances and repeat radiographs have been well described previously, with a short sequence wrist MRI costing around £72 and an initial fracture clinic appointment, without radiographs, costing £165 alone.[5,11] The Scaphoid Magnetic Resonance Imaging in Trauma (SMaRT) trial was a single-centre, randomized controlled trial involving 132 patients, which compared a novel pathway involving early MRI direct from the ED with a conventional pathway involving clinic attendance with radiographs, followed by a CT scan if clinically indicated, and then further radiographs after four to eight weeks.[6] It was shown that early MRI resulted in cost savings of £174 per patient at three months, and £266 per patient at six months.[6] Not only did early MRI have this clear cost advantage, it also benefits diagnostic accuracy and patient satisfaction.[6] The accurate early diagnosis also enables the immobilization of scaphoid fractures, which will arguably minimize the costs of litigation and early mobilization, without the need for further clinic attendances in a large proportion of patients.[12]

The reasons underlying the failure to implement the NICE guidance are likely complex and multifactorial. The capacity for MRI may be a factor; however, Chunara et al[10] found no strong relationship between the MRI usage and the number of MRI scanners available. One key issue is potentially a lack of awareness of the NICE guidance and the evidence, which supports the use of early MRI; it may be that the better communication and dissemination of information is influential. The care for patients with scaphoid fractures involves many staff from multiple departments, including the ED, MIUs, radiology, orthopaedic surgery, and, perhaps most importantly, management. Improving cross-departmental communication and breaking down artificial clinical silos may also be necessary to implement change. Certainly, there is a strong justification for future research to explore the barriers and facilitators to change.

In conclusion, only a small minority of centres currently offer MRI directly from the ED for patients with a suspected scaphoid fracture. Further research is needed to investigate the facilitators and barriers to the implementation of NICE guidance.

Take home message

- Only a small minority of centres in the UK offer MRI directly from the emergency department for patients with suspected scaphoid fractures.
- Further research is needed to investigate the facilitators and barriers to the implementation of National Institute for Health and Clinical Excellence (NICE) guidance.

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