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The success of virtual clinics during COVID-19: A closed loop audit of the British orthopaedic association (BOAST) guidelines of outpatient orthopaedic fracture management

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ARTICLE INFO

Article history:
Accepted 15 September 2020

Keywords:
COVID-19
Coronavirus
Virtual
Clinic
Telemedicine
BOAST

ABSTRACT

COVID-19 has had profound management implications for orthopaedic management due to balancing patient outcomes with clinical safety and limited resources. The BOAST guidelines on outpatient orthopaedic fracture management took a pragmatic approach. At Great Western Hospital, Swindon, a closed loop audit was performed looking at a selection of these guidelines, to assess if our initial changes were sufficient and what could be improved.

Method: An audit was designed around fracture immobilisation, type of initial fracture clinic assessment, default virtual follow up clinic and late imaging. Interventions were implemented and re-audited.

Results: Initially 223 patients were identified over 4 weeks. Of these, 100% had removable casts and 99% did not have late imaging. 96% of patients were initially assessed virtually or had initial orthopaedic approval to be seen in face to face clinic. 97% had virtual follow up or had documented reasons why not. The 26 patients who were initially seen face to face were put through a simulated virtual fracture clinic. 22 appointments and 13 Xray attendances could have been avoided.

We implemented a change of requiring all patients to be assessed at consultant level before having a face to face appointment. The re-audit showed over 99% achievement in all areas.

Conclusion: Virtual fracture clinics, both triaging new patients and follow-up clinics have dramatically changed our outpatient management, helping the most appropriate patients to be seen face to face. Despite their limitations, they have been well tolerated by patients and improved patient safety and treatment.

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Introduction

COVID-19 has had a huge impact on society, individuals as well as the whole of the NHS. Orthopaedic surgeons have been required to balance optimal, evidence-based fracture management against clinical safety and limited resources. Operative capacity has been reduced due to the redeployment of ventilators, anaesthetic staff and decontamination procedures. Patient contact has been limited to reduce disease transmission and staffing levels have been decreased due to isolation, infection and redeployment.

The British Orthopaedic Association (BOAST) produced guidelines on the 'Management of patients with urgent orthopaedic conditions and trauma during the coronavirus pandemic' on March 22nd 2020, updated on 20th April 2020 [1]. This reflected and sup-

ported the British Orthopaedic Association's view on the pragmatic approach to fracture management. This required a rapid paradigm shift in the organisation and decision-making processes within outpatient fracture management. The emphasis was required to shift to non-operative management and reducing hospital attendances. An 11 point plan was described with a further 5 points for specific injuries.

This audit site was Great Western Hospital, Swindon. This is a large, 480 bedded district general hospital catering for presentations with general orthopaedic, spinal, paediatric and hand specialist access. This paper describes the changes that occurred due to COVID-19 in the Great Western Hospital. The authors then designed an audit based on the new COVID-19 BOAST guidelines, implemented changes and then re-audited to compare the results.

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Initial COVID-19 adaptations

Fracture management at GWH has routinely been managed through direct referral to the on-call orthopaedic team or referral to Virtual Fracture Clinic (VFC). GWH was an early adopter of the VFC which has been working as an excellent triaging service, utilising the most senior and experienced surgeon to minimise unnecessary follow up and improve efficiency [2,3]. VFC is usually completed by the consultant on call and trauma nurse team, who then phone patients with management plans. Face to face fracture clinic occurs every day with referrals from VFC, the on-call team and a small number of GP referrals.

Considerable restructuring occurred due to COVID-19 within the department. The on-call team remained constant and the VFC continued but was done remotely using Microsoft Teams and telephone calls. This was now run every day by the same consultant and registrar simultaneously. Both were shielding doctors working from home. Virtual Fracture Follow-up clinics were then created using a combination of telephone and video calls using the Fleming 'accrux' system and run by the same consultant and registrar team. Follow up fracture clinics also occurred within the hospital in a much-reduced capacity.

Audit

The audit was designed to assess how the initial changes implemented within the department had affected outpatient fracture management. This was important because there had been considerable changes in management decisions and both patients and staff were potentially at harm from increased face to face attendances. We wanted to assess if we were meeting the new standards set by BOAST and if any adaptations could be made. The four most relevant and useful standards were identified as below:

7. Use of removable casts or splints should be maximised to reduce follow-up requirements.
8. Patient-initiated follow-up should be the default, with booked appointments only where this is unavoidable. Junior doctors should not arrange follow-up without senior agreement.
9. Follow-up appointments should be delivered by telephone or video call if at all possible. Existing appointments should be cancelled, postponed or conducted remotely.
10. Follow-up imaging should only be performed when there is likely to be a significant change in management. There is no role for imaging to check for fracture union in most injuries.'

These were the bases of our audit standards.

Method

The initial audit was completed over 4 weeks from 1st April 2020 to 28th April 2020 inclusive. This allowed a 2-week settling in period from the guideline production and departmental restructuring. During this time the country was in 'lockdown'. Information for the audit information was gained prospectively through review of the online notes system 'Medway', Xray request system 'ICE' and Xray viewing platform 'Medview'. An excel spreadsheet was created with anonymised data and shared on the secure hospital system by the four investigators.

Inclusion criteria: All patients who had fractures, suspected fracture or dislocations were included within the date range that were referred to VFC or face to face new patient fracture clinic.

Exclusion criteria: Patients with soft tissue injuries, infections or complications from elective surgery were excluded.

Table 1
Immobilisation type.

Immobilisation type	Number of patients	Percentage
Backslab	60	26.9
Splint	49	22.0
Sling	34	15.2
Walking boot	33	14.8
Buddy strap	21	9.4
Collar and cuff	13	5.8
Footwear advice	7	3.1
Nothing required	4	1.8
Bandage	2	0.9
Total	223	100.0

Initial results

There were 223 patients with fractures, suspected fractures or dislocations that were seen in VFC or face to face during our four-week period.

Standard 1

BOA guideline: Use of removable casts or splints should be maximised to reduce follow-up requirements

Our audit standard: Forms of immobilisation should span removable casts or splints in 100% cases. **Exceptions:** documented clinical indication

Results: 100% of our patients had removable casts applied in the emergency department or minor injuries units. There were no full casts applied with documented reason. Five patients however (2.2%) had immobilisation that was thought to be inappropriate. Three patients had a backslab that was too short, one would have been more appropriately treated in a backslab and one patient had no documentation that a sling (which would have been appropriate) was given to them.

A variety of immobilisation types were used (Table 1).

Standard 2

BOA guideline: Patient-initiated follow-up should be the default, with booked appointments only where this is unavoidable. Junior doctors should not arrange follow-up without senior agreement.

Our audit standard: Index appointments in fracture clinic should be 100% virtually screened.

Exceptions: documented clinical indication or patient initiated
Results: 96% of patients were either virtual or had been initially reviewed by the T&O team (Table 3). Of the 223 patients, 197 (88%) were seen in virtual fracture clinic, 18 (8%) were seen face to face with prior approval and 8 (4%) were seen face to face with no approval.

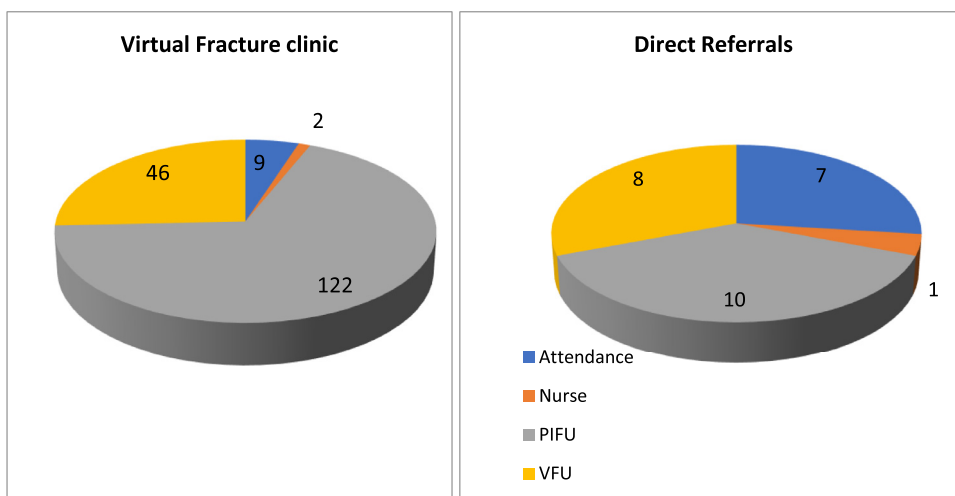
Standard 3

BOA guideline: Follow-up appointments should be delivered by telephone or video call if at all possible. Existing appointments should be cancelled, postponed or conducted remotely.

Our audit standard: Follow-up appointments should be conducted by phone or video in 100% cases **Exceptions:** documented clinical indication or patient initiated.

Results: 97% of patients were either virtually assessed or had documented reasons for attendance (Table 2).

Of the 16 patients who attended face to face clinics there were a variety of reasons. Seven needed clinical examination, two required plaster intervention one was patient initiated and six had



Graph 1. Outcome of appointment comparing the location of initial assessment.

Table 2
Outcome of initial fracture assessment.

Follow up	Number of patients	Percentage
Operative intervention	18	8
Attendance for face to face clinic	16	7
Nurse led clinic	3	1
Patient Initiate Follow Up	132	59
Virtual Follow Up	54	24
Total	223	100

Table 3
Number of appointments saved if the patients had been assessed in Virtual Fracture Clinic initially, rather than directly in a face to face assessment.

Type of appointment	Number of appointments saved
Face to face appointments	30
Virtual appointments	0
Xray attendances	13
Nurse led clinic	-1
Total	22

no documented reason why they could not have been assessed virtually.

Therefore 6 out of 223 (2.7%) have no documented reason why they could not have a virtual follow up.

The follow-up outcomes were compared between the patients who were initially reviews in virtual fracture clinic compared to those who were initially seen in face to face clinic (see Graph 1).

This shows that a far greater proportion of patients attending face to face clinic initially were reviewed a further time, and a higher proportion were also seen in face to face clinic.

Standard 4

BOA guideline: Follow-up imaging should only be performed when there is likely to be a significant change in management. There is no role for imaging to check for fracture union in most injuries.

Our audit standard: Follow-up radiographs to screen for fracture union should be performed in 0% cases.

Exceptions: documented clinical indication.

Results: 0.4% of patients had inappropriate radiographs for union.

There were 3 patients had follow-up X-rays for union at 6 weeks; 2 were high risk ankle fractures for non-union with a documented acknowledgement of clinical indication but one was a proximal humeral fracture with no risk factors.

Initial discussion

In general, the re-organisation and restructuring of the department had a very positive outcome on fracture management. All the audit standards were above 90% with the first and fourth standard being very nearly 100%.

The emergency department had understood our clear message that all immobilisation should be removable. There were only a handful of discrepancies and backslab skills were improving throughout the audit.

The message from BOAST around avoiding radiographs until union had been taken on board and adhered to by the whole department after a relatively short period of time.

The biggest discrepancy in management that was identified, was between patients that were seen initially in face to face clinic compared to those through virtual clinic. These patients were reviewed by the registrar and sometimes, but not always, discussed with the consultant. The decision of where to hold the follow up was not always made by the most senior person. In fact, it was the more senior trainees who were making independent decisions and not discussing with the consultant, that were more likely to bring patients back, and bring them to a face to face clinic.

We felt it was unfair to directly compare the patients who were seen face to face with those reviewed virtually, because their injuries were more likely to be more complex due to the on-call team being initially involved. We therefore set up a simulated virtual clinic. The senior consultant normally doing VFC was blinded and all the 26 patients were presented as if they have been presented virtually initially. The senior consultant made a decision about management which was recorded. The number of appointments for these patients was then compared (Table 3).

If all the patients had been assessed in virtual clinic initially, 22 hospital appointments and 13 Xray attendances would have been saved. This is due to the more senior initial decision making which underlies the principles of have the most senior surgeon in a triaging position.

A copy of the audit was sent to the orthopaedic department. At this time there were two team alternating teams running with no possibility for a formal audit meeting. The departmental doctors

were reminded via email to use virtual clinics as much as possible to reduce patient attendance in hospital.

The decision was made that all patients attending face to face clinic should have a senior opinion during the COVID situation, either from formal discussion at the trauma meeting, documented discussion with the consultant on call or by being referred to virtual fracture clinic first. This would adhere to the BOAST principle of an initial senior decision-making process in order to streamline orthopaedic care.

This was implemented from 11th of May.

Re-audit

The same methodology was used for a re-audit which occurred between the 18th and 29th of May. This was decided to be two weeks for ease of data analysis and because the part of the COVID-19 temporary restructuring was being altered. This was not affecting the virtual clinics however.

Results

Over these two weeks 145 patients met our inclusion criteria, an increase of 50%. Some aspects of lockdown had been relaxed and it was noticeable that there were more patients with slightly higher energy injuries.

Standard 1

Our audit standard: Forms of immobilisation should span removable casts or splints in 100% cases. Exceptions: documented clinical indication

Results: 100% had removable casts or splints. There was little significant change in the distribution of what was used.

Standard 2

Our audit standard: Index appointments in fracture clinic should be 100% virtually screened.

Results: 99% of patients were either virtually assessed or had been initially reviewed by a T&O Consultant. Of the 145 patients, 130 (90%) were reviewed in virtual clinic, 14 (10%) had approval for face to face approval and only one patient (1%) was seen face to face with no approval.

The one patient inappropriately triaged was a GP referral, which was not a pathway previously considered. Because of this, GP and outside hospital referrals are now discussed with the virtual fracture clinic team before an attendance appointment is made. This was a generally a useful improvement.

Standard 3

Our audit standard: Follow-up appointments should be conducted by phone or video in 100% cases

Results: 100% of patients were either virtually assessed or had documented reasons for attendance (see [Table 4](#))

There were slightly more virtual follow up appointments, slightly reduced PIFU rates but no change in attendance appointments.

The patients were again compared by index appointment type ([Graph 2](#))

There was still a much higher rate of attendance follow up appointments from the patients initially seen face to face, however a large number were related to plaster reasons. There were a higher proportion of patients requiring manipulations and moulded full casts who needed to come back to plaster room for their cast to be taken off. The number of virtual fracture clinic appointment follow

Table 4

Re-audit results of reasons for face to face attendance.

Follow up	No of patients	Percentage
Operative	0	0
Attendance for clinical reasons	10	7
Attendance for plaster reasons	6	4
Nurse led clinic	2	1
Patient Initiated Follow Up (PIFU)	83	57
Virtual Follow Up	44	30
Total	145	100

ups was again small, but these were all clinically documented as to why they needed a face to face review.

Standard 4

Our audit standard: Follow-up radiographs to screen for fracture union should be performed in 0% cases.

Results: 0.7% of patients had inappropriate radiographs for union

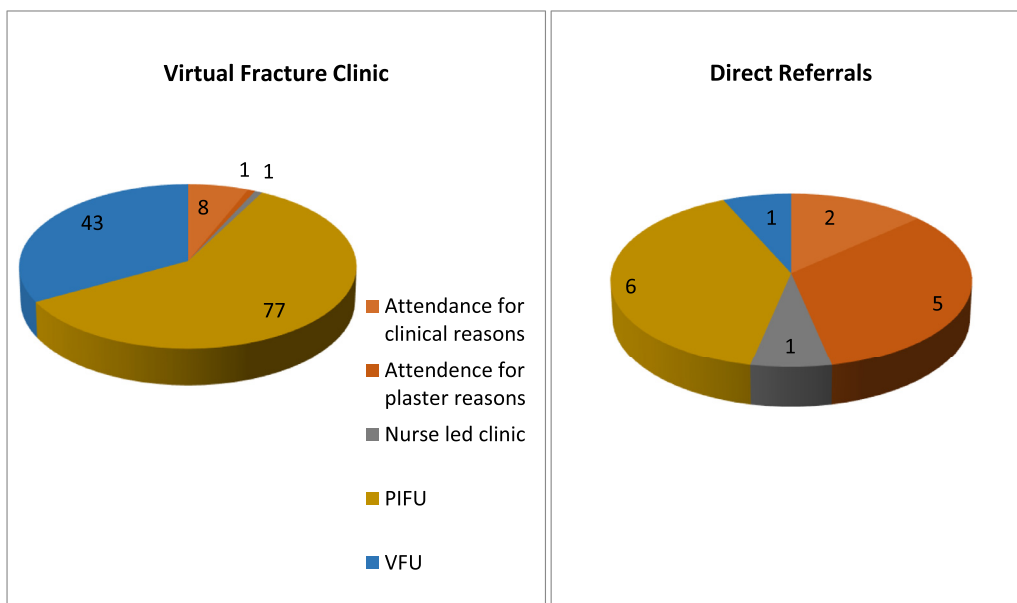
There were two patients who had radiographs for union. The first had a documented reason for increased risk of non-union with change of management. The second was a patient seen by a new locum consultant who had recently started in the department.

Discussion

With a simple intervention of having a senior consultant making the initial management decision primarily from virtual fracture clinic, all the BOAST standards were met 99% of the time for all four standards. We felt that the department now carefully balanced the optimal patient care with clinical safety and resources.

The increased use of virtual clinics has been described in the literature as an excellent use of resources and time [4,5]. The new patient clinic is now reaching capacity and expansion will need the consideration of extending the trauma nurse team. The ability for this to happen remotely has enabled the utilisation of shielding staff. Looking forward, it also has the potential to expand to include other learners or participants, overcoming geographical restraints. Teaching and supervision are adequately built into the model and this platform provides an excellent opportunity for discussion and assessments. They have been widely adopted in other specialties [6]. Virtual fracture clinic could easily be built into job plans and has the potential to create flexibility in the departmental re-organisation after COVID.

Virtual follow up clinics with patient telephone and video calls have only begun in our department with the necessity of COVID-19. They are being widely adopted [7,8]. The expansion of technological infrastructure to home working required minimal hardware and was easily accomplished by the IT department. Telephone consultations are reliant on any telephone device however video consultations require a mobile phone, adequate data reception and a level of technological agility. Virtual telemedicine has limitations particularly with reduced communicative ability due to lack of visual cues particularly in those with hearing impairments or where English is not fluent. The inability to touch the patient has significant implications where clinical assessment is crucial. There are also potential security issues around identity and coercion. However, they have huge advantages. For the clinician they can be done remotely, take less time are cost efficient due to lack of clinical space and nurse support, provide flexibility and could potentially be done out of hours to fit around the needs of the clinician, allow flexibility in timings and allows triaging to specialist clinics. For patients they are less disruptive, quicker, save travel time and costs and provided quicker appointments. Working forward we are



Graph 2. Reaudit of outcomes of appointment comparing initial assessment type.

planning on utilising the skills learnt and streamlining virtual clinics for appropriate patients.

Conclusion

Great Western Hospital adapted quickly and effectively to the COVID-19 situation in the care of orthopaedic fracture patients. Initial measures ensured that the majority of patients were given appropriate, removable immobilisation, were reviewed remotely if clinically relevant and were not followed up until union. After the initial audit we concluded that by having a consultant opinion before every face to face clinic would reduce clinic appointments rationing resources and clinical safety. Our re-audit showed that this increased our compliance to the BOAST COVID-19 guidelines. The patients we had not caught in our intervention were the outside and GP referrals which have now been addressed.

Adhering to the COVID-19 BOAST guidelines has streamlined our orthopaedic service. As the risk of disease transmission decreases and the operative capacity increases, we hope to utilise the lessons learnt by the success of certain groups of patients being managed by virtual follow up clinics. We also hope to increase our utilisation of consultant screened decisions to reduce pressure on our face to face clinics, giving time and space to patients that need this intervention and increasing our efficiency. Our plan going forward it to decide which subgroups of patients are best managed through virtual telephone clinics and how to integrate out lessons learnt into our departmental organisation.

Declarations of Competing Interest

None.

Funding

No funding was received or required as part of this paper.

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