POINT: A multi-centre randomised trial of surgery versus non-surgical splint treatment for proximal phalanx shaft finger fractures in adults

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SYNOPSIS

Title	A multi-centre randomised trial of surgery versus non-surgical splint treatment for proximal phalanx shaft finger fractures in adults
Acronym	POINT
Short title	Surgery versus non-surgical splint treatment for proximal phalanx shaft finger fractures
Chief Investigator	Dr Alexia Karantana
Objectives	To determine the clinical and cost-effectiveness of surgery compared to non-surgical splint treatment for Proximal Phalanx Shaft (PPS) finger fractures in adults. **Primary Objective** To compare participant-reported hand function between surgical and non-surgical splint treatment for PPS finger fractures at 6 months post randomisation, using the Hand Health Profile of the Patient Evaluation Measure (PEM) **Secondary Objectives** a) To compare participant-reported hand function and hand health between surgical and splint treatment at 6 weeks, 3 months and 12 months using the Hand Health Profile of the PEM. b) To compare participant-reported assessment of location-specific health (the hand) using the Single Assessment Numeric Evaluation (SANE) tool at 6 weeks, 3 months, 6 months and 12 months. c) To compare participant-reported assessment of upper extremity function, using the Patient-Reported Outcomes Measurement Information System (PROMIS), at 6 weeks, 3 months, 6 months and 12 months. d) To compare participant-rated appearance of the hand as per item 10 of the Hand Health Profile of the PEM at 6 weeks, 3 months, 6 months and 12 months. e) To compare investigator-assessed active range of motion of affected digit(s), grip and pinch strength of the affected hand at 3 months. f) To determine the complication rate, including need for further surgery within 12 months. g) To compare health-related quality of life, health resource use and cost-effectiveness between surgical and splint treatment at 12 months.
Trial Configuration	Pragmatic, multi-centre, parallel two-arm, superiority randomised trial.
Setting	Acute Care NHS Trusts that provide hand surgery and hand therapy services, throughout the UK.

Sample size estimate	The estimated sample size to detect a between group difference of 3 points in the primary outcome measure (PEM) using a standard deviation of 8.5, with 90% power, two-tailed significance of 5%, and 1:1 allocation, is 340. To allow for a 15% loss to follow-up, we plan to recruit 400 participants (200 per arm) over a period of 24 months.
Number of participants	400 participants
Eligibility criteria	**Inclusion criteria:** • Patients with one or more PPS finger fracture • Patients aged 16 years or older • The treating specialist believes the fracture(s) is/are suitable for either surgery or non-surgical splint treatment • Willing and able to give fully informed consent **Exclusion criteria:** • Injury more than 14 days old at anticipated time of treatment • Basal metaphyseal fracture • Phalangeal neck fracture • Open fracture • Fracture pattern extending into the joint surface • Patients who would not be able to adhere to trial procedures or complete the study questionnaires Patients with concomitant injuries will be included; information on additional injuries will be recorded at baseline and the analysis adjusted as necessary.
Description of interventions	**Surgery** Any mode of surgical intervention used in routine care, involving the use of surgical fixation as considered appropriate by the treating specialist. Surgery will be performed in an operating theatre, using an anaesthetic technique appropriate for the patient. **Non-Surgical Splint Treatment** Any mode of technique and material used in routine care, which may involve the manipulation of the fracture with or without analgesia or local anaesthetic, and subsequent bracing through an externally applied support, performed in a clinic or therapy room environment.
Duration of study	Total duration of the study is anticipated to be approximately 48 months. Each participant will participate in the trial for 12 months. The recruitment phase of the trial will be 24 months.
Randomisation and blinding	Participants will be individually allocated on a 1:1 ratio, minimised by centre, gender, fracture pattern and displacement, to surgical or non-surgical splint treatment arms. This is an unblinded study, where participants and clinicians are aware of group allocation. Clinical measurements at the 3 month clinic visit will be performed by trained research associates, independent of the treating health professionals, who will not take part in any post-intervention outcome assessment of study participants.

Outcome measures	**Primary Outcome:** Participant-reported assessment of hand function, using the Hand Health Profile of the Patient Evaluation Measure (PEM) questionnaire at 6 months post randomisation. **Secondary Outcomes:** • Participant reported assessment of hand function and appearance, using the Hand Health Profile of the PEM questionnaire at 6 weeks, 3 months, and 12 months. • Participant-reported assessment of location-specific health (the hand) using the Single Assessment Numeric Evaluation (SANE) tool at 6 weeks, 3 months, 6 months and 12 months. • Participant-reported quality of life assessment, using the EQ-5D-5L questionnaire, at 6 weeks, 3 months, 6 months and 12 months. • Participant-reported assessment of upper extremity function, using the Patient-Reported Outcomes Measurement Information System (PROMIS) computerised adaptive test, at 6 weeks, 3 months, 6 months and 12 months. • Participant-rated appearance of the hand as per item 10 of the Hand Health Profile of the PEM. • Investigator assessed active range of motion of affected digit(s), using a finger goniometer at 3 months (where visit takes place face-to-face). • Investigator assessed palmar grip and pinch strength of the affected hand, using a hydraulic dynamometer and pinch meter at 3 months. • Resource use and costs, assessed by a health economic analysis of health & social services costs (primary analysis) and effects on families and society (secondary analysis). **Safety Outcome:** • Participant and investigator reported complications, including need for further surgery, recorded in the Case Report Form and participant questionnaire responses.
Statistical methods	Analysis of the primary outcome measure (PEM at 6 months) will be performed using a mixed effects model to examine the between group difference with gender, fracture pattern, fracture displacement and baseline PEM score (contemporary) included as fixed effects and recruiting centre as a random effect. The mixed effects model will use all available longitudinal outcome data and include a treatment-by-time interaction to estimate the between group difference at each follow-up time-point with 6 months being the primary treatment comparison. Participants will be analysed according to randomised group regardless of treatment actually received. Sensitivity analyses will investigate potential effects of compliance with allocated treatment and missing data.

ABBREVIATIONS

AE	Adverse Event
A&E	Accident and Emergency Department
BAHT	British Association of Hand Therapists
BSSH	British Society for Surgery of the Hand
CAT	Computerised Adaptive Test
CEACs	Cost Effectiveness Acceptability Curves
CI	Chief Investigator
CRF	Case Report Form
DIP(J)	Distal Interphalangeal (Joint)
DMC	Data Monitoring Committee
GCP	Good Clinical Practice
HTA	Health Technology Assessment
ICF	Informed Consent Form
IFSSH	International Federation of Societies for Surgery of the Hand
ICEF	Incremental Cost Effectiveness Ratio
MCP(J)	Metacarpophalangeal (Joint)
NCTU	Nottingham Clinical Trials Unit
NHS	National Health Service
NIHR	National Institute of Health Research
PEM	Patient Evaluation Measure
PI	Principal Investigator at a local centre
PIP(J)	Proximal Interphalangeal (Joint)
PIS	Participant Information Sheet
PPI	Patient and Public Involvement
PPS	Proximal Phalanx Shaft
PROM	Patient Reported Outcome Measure
PROMIS-UE	Patient Reported Outcome Measurement Information System - Upper Extremity
REC	Research Ethics Committee
R&D	Research and Development
RCT	Randomised Controlled Trial
RoM	Range of Motion
SAE	Serious Adverse Event
SAP	Statistical Analysis Plan
SANE	Single Assessment Numeric Evaluation (Patient Reported)
TAM	Total Active Motion
TMG	Trial Management Group
TSC	Trial Steering Committee
QALY	Quality Adjusted Life Year

TABLE OF CONTENTS

TRIAL PERSONNEL AND CONTACT DETAILS **2**

SYNOPSIS **5**

PRIMARY OBJECTIVE 5
SECONDARY OBJECTIVES 5

ABBREVIATIONS **8**

TRIAL BACKGROUND INFORMATION AND RATIONALE **11**

TRIAL PURPOSE, AIM AND OBJECTIVES **11**

PURPOSE 11
PRIMARY OBJECTIVE 12
SECONDARY OBJECTIVES 12

TRIAL DESIGN **12**

TRIAL CONFIGURATION 12
Primary outcome measure 12
Secondary outcome measures 13
Safety outcome measures 13
Stopping rules and discontinuation 13
ENROLMENT, RANDOMISATION AND BLINDING 14
Maintenance of randomisation codes and procedures for breaking code 14
TRIAL MANAGEMENT 15
DURATION OF THE TRIAL AND PARTICIPANT INVOLVEMENT 15
End of the Trial 15
SELECTION AND WITHDRAWAL OF PARTICIPANTS 15
Recruitment 15
Eligibility Criteria 16
Expected duration of participant participation 16
Participant withdrawal 16
Informed Consent 16

TRIAL TREATMENT AND REGIME **17**

Criteria for terminating trial 22

STATISTICAL CONSIDERATIONS **22**

Sample size and justification 22
Analysis of Outcome Measures 22
Health Economic Analysis 23
Procedures for missing, unused and spurious data 24
Definition of populations analysed 24

ADVERSE EVENTS **25**

Procedures for reporting of adverse events 27
TRIAL TREATMENT / INTERVENTION RELATED SAES 27
Participant removal due to adverse events 28

ETHICAL AND REGULATORY ASPECTS **28**

ETHICS COMMITTEE AND REGULATORY APPROVALS 28
INFORMED CONSENT AND PARTICIPANT INFORMATION 28
RECORDS 29
(electronic) Case Report Forms 29
Source documents 29
Direct access to source data / documents 29
DATA PROTECTION 30
QUALITY ASSURANCE & AUDIT 30
INSURANCE AND INDEMNITY 30
TRIAL CONDUCT 30
TRIAL DATA 30
RECORD RETENTION AND ARCHIVING 30
DISCONTINUATION OF THE TRIAL BY THE SPONSOR 31
STATEMENT OF CONFIDENTIALITY 31
PUBLICATION AND DISSEMINATION POLICY 31
USER AND PUBLIC INVOLVEMENT 31
STUDY FINANCES 32
Funding source 32
Participant stipends and payments 32
SIGNATURE PAGES 33
REFERENCES 35

TRIAL BACKGROUND INFORMATION AND RATIONALE

Proximal phalanx shaft (PPS) finger fractures are common in adults. They occur due to falls, direct blows or twisting forces to the finger(s). Patients initially present to the Accident and Emergency Department (A&E), where they receive analgesia and finger supports, with definitive treatment usually provided in a fracture/hand clinic by specialists.

The aim of treatment is to restore normal function. This requires fracture healing in a good position and prevention of scar tissue formation, as scar hinders tendon gliding and joint movement. Failure to achieve this can result in a stiff finger with limited movement or a bent or rotated finger, which may cross over the adjacent one. These are serious complications potentially necessitating complex surgical treatment (e.g. tenolysis, corrective osteotomy) (1-3).

There is no consensus on whether PPS finger fractures are best treated by surgery or non-surgically. For both modalities, the fracture has to be held in good alignment. In surgery, this is achieved by inserting metalwork into the bone (such as wires, screws or plates). In non-surgical treatment, a hard or soft splint is applied to the finger to hold or support the fracture; this is done in clinic, with or without manipulation under local anaesthetic and/or analgesia.

There is a lack of evidence to support decision making in the context of PPS finger fractures. Current decision-making is determined largely by the treating hand specialist's training, personal experience and belief. Both treatment options require specialist resources, multiple hospital visits and a period of rehabilitation of weeks to months, during which, use of the hand is restricted.

A recent systematic review, combining treatment interventions for extra-articular proximal and middle phalangeal fractures, found no studies comparing surgical to non-surgical treatment (4). The review comprised a narrative synthesis of 16 low-quality studies, mostly retrospective cohorts or case-series of either surgical or non-surgical treatments. Study heterogeneity and low quality made it impossible to compare treatments and demonstrate superiority of any one treatment. The recommendation was for appropriate level-1 studies. There are no published or ongoing RCTs or cohort studies comparing surgical and non-surgical treatment for this injury.

Surgical fixation can result in a better fracture position and earlier movement, but is invasive and carries surgical risks such as infection, surgical scar tissue-induced stiffness, metalwork related and anaesthetic problems. Non-surgical splint treatment avoids surgical risks and may result in less scar tissue formation; however, the fracture position can be harder to maintain (1, 3, 5, 6). Splints are also bulky, inconvenient, restrict hand function and often have to be worn for 3-4 weeks.

Whilst surgery represents an initial high resource outlay, the expense of repeated clinic visits often associated with splinting represents a potentially considerable and ongoing resource cost in terms of staff time. Economic evidence is not available to determine which of these pathways represents a greater resource cost to the NHS. Alongside the unknowns of long-term comparative outcome for patients and speed of recovery, it is not known which treatment pathway represents better value for money. In addition, the two pathways may have different patient and societal costs.

This trial will aim to improve care by helping clinicians and patients make informed choices in the treatment of PPS finger fractures. It will determine which treatment results in a better outcome for patients and which represents value for money for patients and the NHS.

TRIAL PURPOSE, AIM AND OBJECTIVES

Purpose

The purpose of this trial is to help improve care by helping clinicians and patients make informed choices in the treatment of PPS finger fractures.

The aim is to determine the clinical and cost-effectiveness of surgical treatment for PPS finger fractures in adults, compared to non-surgical splint treatment.

Primary Objective

To compare participant-reported hand function between surgical and non-surgical splint treatment for PPS finger fractures at 6 months post randomisation, using the Hand Health Profile of the Patient Evaluation Measure (PEM).

Secondary Objectives

a) To compare participant-reported hand function and hand health between surgical and splint treatment at 6 weeks, 3 months and 12 months using the Hand Health Profile of the PEM.

b) To compare participant-reported assessment of location-specific health (the hand) using the Single Assessment Numeric Evaluation (SANE) tool at 6 weeks, 3 months, 6 months and 12 months.

c) To compare participant-reported assessment of upper extremity function, using the Patient-Reported Outcomes Measurement Information System (PROMIS), at 6 weeks, 3 months, 6 months and 12 months.

d) To compare participant-rated appearance of the hand as per item 10 of the Hand Health Profile of the PEM at 6 weeks, 3 months, 6 months and a year.

e) To compare investigator-assessed active range of motion of affected digit(s), grip and pinch strength of the affected hand at 3 months (where visit takes place face-to-face).

f) To determine the complication rate, including need for further surgery within 12 months.

g) To compare health-related quality of life, health resource use and cost-effectiveness between surgical and splint treatment at 12 months.

TRIAL DESIGN

Trial Configuration

The trial is a pragmatic multi-centre, parallel two-arm superiority randomised trial of surgery versus non-surgical splinting for the treatment of PPS finger fractures in adults, with an internal pilot phase to review expected rate of recruitment at 10 months and a second review at 14 months to assess primary outcome follow-up at 6 months.

Participants will be randomised to one of two treatment groups:

Group A: Surgery – any mode used in routine care involving the use of surgical fixation (metalwork inserted into the bone), performed in an operating theatre, using an anaesthetic technique appropriate for the patient.

Group B: Non-surgical splint treatment (Splinting) – any mode of technique and material used in routine care, which may involve the manipulation of the fracture with or without analgesia or local anaesthetic, and subsequent bracing through an externally applied support, performed in a clinic or therapy room environment.

Primary outcome measure

Participant-reported hand function, as defined by the Hand Health Profile of the Patient Evaluation Measure (PEM) patient-reported questionnaire at 6 months post randomisation.

Secondary outcome measures

- Participant reported assessment of hand function and appearance, using the Hand Health Profile of the PEM
- Participant-reported Single Assessment Numeric Evaluation (SANE) (7)
- EuroQol-5D-5L, self-rated health utility and quality of life (8)
- Patient-reported outcome measure information system (PROMIS) Upper Extremity (9)
- Participant-rated appearance of the hand as per item 10 of the Hand Health Profile of the PEM (10, 11)
- Active range of motion of the affected digit(s)
- Grip and pinch strength of the affected hand
- Resource use, including return to work

Safety outcome measures

- Participant and investigator reported complications, including need for further surgery, recorded in medical notes, electronic case report form ((e)CRF) and participant questionnaires.

Timelines associated with collection of the above secondary outcomes are detailed in Table 1, summary of assessments by time point.

There is no Core Outcome Set (COS) for studies of hand surgery conditions or hand trauma. A COS for hand fractures and joint injuries is currently under development (12).

Stopping rules and discontinuation

There is no planned interim analysis of treatment effectiveness. Recruitment and retention will be assessed following the internal pilot phase to determine the feasibility of recruitment and retention to follow-up according to agreed progression criteria.

Recruitment will be assessed at month 10 from day of first participant randomised against the overall recruitment target. A further formal review of retention will be conducted at month 14 from first participant randomised to assess the proportion of participants completing the 6 month follow-up. The Trial Steering Committee (TSC) will convene after each assessment point, at which time the committee will review data on recruitment and retention.

<u>Decision to proceed or stop the trial</u>

The Data Monitoring Committee (DMC) will review the data on recruitment and retention from the internal pilot and make recommendations to the TSC in respect of re-evaluating and adjusting methods for recruitment and retention optimisation for the remaining timeline.

The following criteria will aid decision making about progression of the trial, although final agreement on stop/go criteria will take place after discussion with the HTA.

Progression guidance	Recruitment	Retention
Continue: No action required	>85%	>85%
Continue: Action required	50-85%	40-85%
Stop Trial	<50%	<40%

- Recruitment: If recruitment at 10 months is amber (50%-85% of target) we will implement a recruitment recovery strategy as agreed by the Trial Management Group (TMG) and TSC with recommendations from the DMC. Further formal review to monitor the impact of the recovery strategy would be agreed by the TSC, TMG and HTA.
- Retention: If retention at 14 months is AMBER (40%-85%), a review will be undertaken by the TMG/TSC with recommendations from the DMC and a recovery strategy implemented. Further formal review to monitor the impact of the recovery strategy would be agreed by the TSC, TMG and HTA.

The Sponsor reserves the right to discontinue this study at any time for failure to meet expected enrolment goals, for safety or any other administrative reasons. The Sponsor shall take advice from the Trial Steering Committee and the funder (NIHR HTA) as appropriate in making this decision.

ENROLMENT, RANDOMISATION AND BLINDING

Enrolment

Adult patients presenting to a hand/fracture clinic with PPS finger fractures will be screened for eligibility. Throughout the study, screening logs will be kept at each site to determine the number of patients assessed for eligibility and reasons for non-participation or exclusion.

Eligible patients will be identified by their treating hand specialist or the research team for recruitment to the study. Participant eligibility will be confirmed by completion and signature of an eligibility checklist by the Principal Investigator or appropriate delegate.

After informed consent is taken, baseline data will be collected by a member of the site research team and will include*:* demographic information, fracture characteristics, hand function (PEM, SANE and PROMIS) and Health-related Quality of Life (EQ-5D-5L) questionnaires. Participants will be asked to complete the PEM and EQ-5D-5L questionnaires twice to indicate both their contemporary (injured) and typical (pre-injury) status.

The participant's contact details for receiving reminders and follow-up questionnaires will also be recorded with consent. Following baseline data collection and confirmation of eligibility an authorised member of the site research team will log into the secure randomisation system and randomise the participant.

Randomisation

For patients who agree to take part in the trial, randomisation will occur at the first hand/fracture clinic appointment, so that treatment can occur as per standard care for each study arm.

Participants will be allocated at the individual level to one of the treatment groups (surgical fixation or splinting) on a 1:1 ratio using minimisation algorithm with a probabilistic element. The minimisation variables will comprise of recruiting centre, gender, fracture pattern and fracture displacement. The allocation will be concealed using a secure web-based system developed and maintained by the Nottingham Clinical Trials Unit (NCTU). Access to the system will be granted by the NCTU in accordance with the roles delegated by the Principal Investigator on the Delegation Log.

Maintenance of randomisation codes and procedures for breaking code

Participants, investigators and outcome assessors cannot be blinded to the treatment allocation.

Treating health professionals will have no role in outcome assessment. Clinical assessments at the 3 month clinic visit will be performed by trained research associates who are independent of the treating clinical team. Blinded assessment of clinical outcomes was considered, but not deemed feasible due to the following:

- the widely differing nature of the patient pathway and potential for treatment-specific complications and
- any attempt to cover scars in the affected digit (i.e. via latex gloves) can impact on the clinical outcome measurements performed.

The trial statisticians and TSC members will be blinded to participant group allocations. An unblinded independent NCTU statistician will produce closed reports for the DMC. This is an unblinded trial, so no emergency unblinding processes are necessary.

TRIAL MANAGEMENT

The Trial Steering Committee (TSC) will meet at least once a year or as required and will provide independent oversight of the trial on behalf of the trial sponsor.

The Data Monitoring Committee (DMC) will meet at least once a year or as required to assess safety, effectiveness and futility of the study and will report to the TSC.

The Trial Management Group (TMG) will meet more frequently, at least every two months, and will be responsible for the day-to-day management of the trial.

DURATION OF THE TRIAL AND PARTICIPANT INVOLVEMENT

Study Duration: the total duration of the trial will be 48 months and the recruitment period for the trial is anticipated to be 24 months. Participant follow-up will continue for a maximum of 12 months following the end of recruitment. However, recruitment progress and timelines will be monitored against projected recruitment and timelines will be adjusted if necessary.

Participant Duration: Individuals will participate in the trial for up to 12 months from randomisation to final follow-up.

End of the Trial

The end of trial will be final database lock.

SELECTION AND WITHDRAWAL OF PARTICIPANTS

Recruitment

This trial will be conducted at Acute Care NHS Trusts, which provide hand surgery and hand therapy services. These centres will be geographically dispersed throughout the United Kingdom and thus are likely to be socio-demographically representative of services provided, enabling nationally generalisable findings.

Recruitment will occur in secondary care fracture clinics at these centres, to which patients are directly referred from the A&E. Information about the trial will be on display in the relevant clinical areas and brief information leaflets signposting to the study will be readily available to patients with finger fractures in A&E and fracture clinic. The initial approach will be from a member of the patient's usual care team (which may include the Principal Investigator).

The Principal Investigator or appropriate delegate, e.g. from the research team or a member of the participant's usual care team, will then inform the participant of all aspects pertaining to participation in the study. It will be explained to the potential participant that entry into the trial is entirely voluntary and that their treatment and care will not be affected by their decision. It will also be explained that

they can withdraw at any time. In the event of their withdrawal, it will be made clear that their data collected prior to withdrawal will be retained and used in the analysis.

Sites will be opened at an expected rate of 1-2 per month to allow time for approvals and Site Initiation Visits (SIVs) and training to take place.

Eligibility Criteria

Inclusion criteria:

- Patients with one or more PPS finger fracture(s)
- Patients aged 16 years or older
- The treating specialist believes the fracture(s) is/are suitable for either surgery or non-surgical splint treatment
- Willing and able to give fully informed consent

Exclusion criteria:

- Injury more than 14 days old at anticipated time of treatment
- Open fractures
- Basal metaphyseal fractures
- Phalangeal neck fractures
- Fracture patterns that extend into the joint surface
- Patients who would not be able to adhere to trial procedures or complete the study questionnaires

Patients with concomitant injuries will be included; information of additional injuries will be recorded at baseline and the analysis adjusted as necessary. Fingers pertain to the index, middle, ring and little.

Expected duration of participant participation

Study participants will be participating in the study for 12 months.

Participant withdrawal

Participants may withdraw from the trial at their own request at any time and be made aware that this will not affect their future care. Participants will also be made aware (via the information sheet and consent form) that should they withdraw from the trial the data collected to date cannot be erased and may still be used in the final analysis.

Participants can opt to withdraw from the allocated intervention, receive an alternative treatment and continue in the trial for follow-up measures. A record of participants who do not receive allocated treatment along with actual treatment received and reasons for this will be kept on the trail database.

Informed Consent

All participants will provide written informed consent. The Informed Consent Form will be signed and dated by the participant before they enter the trial. The Principal Investigator, or delegate, will explain the details of the trial and provide a Participant Information Sheet (PIS), ensuring that the participant has sufficient time to consider participating or not, before they are presented with the consent form. The Principal Investigator, or delegate will answer any questions that the participant has concerning study participation.

Study consent and timing of the interventions

Consent for study participation and randomisation will by sought at the first hand/fracture clinic appointment. Consenting and randomisation in the hand fracture clinic means that, in most cases, treatment would likely be administered on the same day for non-surgical splint treatment and within 2-3 days for surgery, as per standard care. Therefore there will be no cooling-off period for the non-surgical study arm, as this would result in a delay to treatment in this arm, compared to standard care. This was discussed at length with patients with PPS injuries during focus group meetings; they proposed this was appropriate and acceptable. Indeed they felt strongly that they would not want to be directly approached by the research team earlier i.e. when first presenting to A&E with an acutely painful injury. They suggested instead that information signposting to the study in the form of a brief introductory leaflet could be readily available to patients with finger fractures in A&E and other relevant clinical areas, which is what has been implemented.

Informed consent will be collected from each participant before they undergo any interventions (including questionnaire completion) related to the study. One copy of this will be kept by the participant, one will be kept securely by the recruiting centre, and a third will be retained in the patient's hospital records. A copy will also be provided to Nottingham Clinical Trials Unit. Should there be any subsequent amendment to the final protocol, which might affect a participant's participation in the trial, continuing consent will be obtained using an updated consent form which will be signed by the participant.

TRIAL TREATMENT AND REGIME

Both proposed surgical and non-surgical treatments represent current practice and are provided as usual care by hand specialists in the NHS. This study aims to interfere as little as possible with current care for the treatment modalities under comparison.

A colour-coded participant pathway flowchart illustrates details on current care and schedule of research assessments (Figure 1). A summary of research assessments is also provided in Table 1.

Description of trial interventions

Surgery

Any mode of surgical intervention involving the use of surgical fixation (metalwork inserted into the bone), as considered appropriate by the treating specialist. Surgery will be performed in an operating theatre, using an anaesthetic technique appropriate for the patient.

The range of fixation options and techniques employed by specialists in each case is varied, and could involve metalwork inserted through the skin using limited incisions (percutaneous) or via open reduction and internal fixation (ORIF) of the bone under direct vision. Fixation could consist of any suitable combination of screws (i.e. lag or positional screws), plates (i.e. standard, locking) or wires.

Non-surgical splint treatment

Any mode of non-surgical intervention involving splinting of the fracture, as considered appropriate by the treating specialist. This may require manipulation of the fracture, performed with or without local anaesthetic. Splinting will be performed in a clinic or therapy room environment and not in an operating theatre suite.

The range of splinting techniques and materials employed by specialists vary and can include custom-made or 'off the shelf' splints; static or dynamic; volar, dorsal or circumferential and made from rigid or soft (yielding) materials. Irrespective of the choice of splint design or material used the splint aims to maintain fracture alignment and/or support the healing fracture site.

Common to both randomisation arms

Treatment modality in each case and the grade of staff providing them, will be recorded. Acceptability of the fracture position will be determined by the treating clinical team, as per standard care. Timing of the intervention and clinical follow-up will be as per standard care and will be recorded.

Post Treatment Rehabilitation (hand therapy)

1. All participants will be provided with a standardised written advice sheet informing them of initial rehabilitation, i.e. instructing them on how to elevate the affected limb and keep all non-involved joints mobile.

2. All participants will be offered rehabilitation by a specialist hand therapist through formal referral after the treatment intervention, to ensure participants in both study arms have equal access to hand therapy tailored to their individual needs.

3. Written best practice guidance will be provided to therapists in all study centres on the pros of early active movement as soon as fracture stability and treatment method allow. Management of any concomitant presenting problems (e.g. oedema, stiffness, scarring) will be carried out as per local standard care and recorded.

Initiation of active movement of the metacarpophalangeal (MCP), proximal interphalangeal (PIP) and distal interphalangeal (DIP) finger joints in the injured finger as soon as possible is considered best practice to avoid stiffness. However, optimal timing of this can vary depending on the individual injury/fracture, mode of treatment and other patient factors. Thus, initiation of active movement in the injured finger and the frequency, duration and content of hand therapy sessions will be at the discretion of the treating clinician, and will be recorded.

Follow-up

We will offer and use all methods of delivery and collection of questionnaires and reminders including use of research teams for time points associated with hospital visits, postal mail, e-mail, web-based, telephone and SMS text for participant follow-up.

<u>6 week remote follow-up</u>

Participants will be sent a questionnaire containing the PEM, PROMIS, SANE, EQ-5D-5L and a patient-reported resource use pro-forma. Data collection will also include patient-reported information on treatment and rehabilitation received, as well as information gathering on any treatment complications or adverse events.

<u>3 month research clinic visit</u>

Participants will attend a research clinic visit at 3 months post randomisation. Data collection is repeated, as for week 6, in addition to hand clinical measurements taken by the study research associates. Participant medical notes will also be checked for evidence of complications. If the participant is not able to attend this visit in person this data will be collected remotely (via telephone or video consultation, in line with existing NHS procedures for remote clinics).

<u>6 and 12 month remote follow-up</u>

Participants will be sent a questionnaire at 6 months and 12 months post randomisation to repeat the data collection, done at 6 weeks, and capture longer-term treatment effects.

At any time during follow-up, trial participants will be able to contact the trial management team at the coordinating centre for assistance with the questionnaires (technical support or clarification). The trial management team will send reminders (via telephone, text message, letter or email) to participants that questionnaires are ready for completion and will follow-up (via telephone, text message, letter or email) outstanding questionnaires to achieve maximum completion.

A study within a trial (SWAT) may be embedded within the trial to investigate the impact of collecting data via text messaging to enhance retention. This will be managed by the trial management team and a separate research protocol will be developed and submitted as an amendment for approval to the main trial before this is implemented.

Assessments

The primary outcome measure for this study is the Hand Health Profile of the Patient Evaluation Measure (PEM) at 6 months post randomisation. The PEM is a questionnaire that is self-reported (filled out by the patient). It consists of eleven items relating to hand function and appearance, each scored from 1 to 7 from best/normal to worst (10, 11).

The secondary outcome measures in this trial are:

- Patient-reported Single Assessment Numeric Evaluation (SANE): The SANE (7) is a simple and easy to use numeric scale of location specific health. A normal hand is scored as 100 per cent, while a completely useless hand is scored as zero per cent.
- EQ-5D-5L: The EQ-5D-5L (8) is a validated, generalised, health related quality of life questionnaire consisting of five domains related to daily activities with five levels within each domain. The health utility index is derived by applying the country specific valuation tariff.
- The Patient-Reported Outcomes Measurement Information System Upper Extremity (PROMIS): is deployed as a computerised adaptive test designed to minimise patient burden when collecting outcome data and theorised to measure latent traits more precisely than existing PROMs. The adaptive nature and international adoption of this tool ensures that outcomes are directly comparable across nationalities and will continue to be valid in the future (13). For participants who do not engage with electronic means, a paper-based short form alternative version is available.
- Active Range of Motion (RoM) of affected digit(s) will be assessed with a finger goniometer using a standardised protocol. A single Total Active Motion (TAM) score will be derived by adding MCP flexion, PIP flexion and DIP flexion and subtracting any MCP, PIP or DIP extension deficit. Hyperextension of joints will be recorded as zero. TAM of the affected digit will be divided by the TAM of the contralateral unaffected digit to derive a percentage (%) TAM for analysis.
- Grip strength and pinch strength of the injured hand: Palmar grip and pinch strength will be assessed using a hydraulic dynamometer and pinch meter (Jamar) following a standardised protocol for administration (14). A maximum of three attempts will be recorded for the affected and unaffected hands. For analysis, percentage grip strength and pinch strength will be derived by dividing measurements in the affected hand by the unaffected hand.
- Resource use: A purposely-designed patient proforma will be used to collect patient resource level information. This will cover relevant items outlined in the case report forms (CRF) and will be focused and designed for the trial patient group with input from the study patient advisory group. It will follow good practice approaches used by the health economics DiRUM (Database of instruments for Resource Use Measurement) group to estimate costs and be submitted for inclusion in this database.

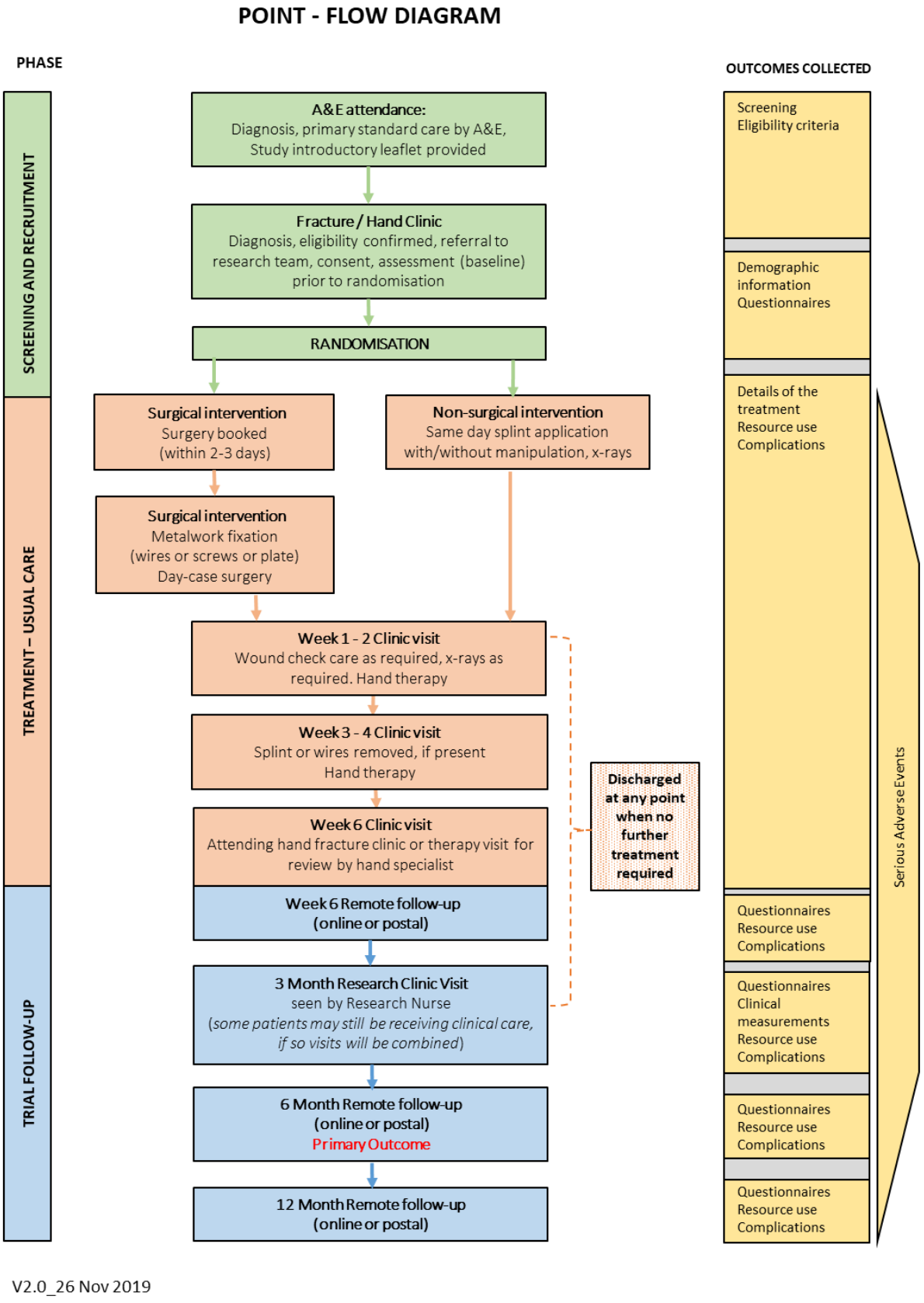
Content and frequency of rehabilitation: hand therapists will log appointments and complete a simple standardised treatment log at each therapy session. Such hand therapy treatment logs have been successfully implemented in a previous pragmatic trial of post-surgery hand therapy (SCORD trial) with excellent completion rates (15).

Table 1: Summary of assessments by time point

Assessments	Randomisation / Baseline Visit	Intervention / treatment	6 week remote follow-up	3 month clinic visit	6 month remote follow-up (Primary Outcome)	12 month remote follow-up
Eligibility assessment	✓					
Consent	✓					
Demographics	✓					
PEM (pre-injury)	✓					
PEM	✓		✓	✓*	✓	✓
SANE	✓		✓	✓*	✓	✓
PROMIS	✓		✓	✓*	✓	✓
EQ-5D (pre-injury)	✓					
EQ-5D	✓		✓	✓*	✓	✓
Complications				✓*	✓	✓
SAEs			✓	✓*	✓	✓
Treatment record		✓				
Grip				✓		
Pinch				✓		
Range of Motion (RoM)				✓		
Post-treatment hand therapy log				✓*		✓
Patient Resource Use questionnaire			✓	✓*	✓	✓

If the participant is not able to attend the 3 month visit in person this data* will be collected remotely, via telephone or video consultation, in line with existing NHS procedures for remote clinics.

Figure 1: Participant Flow Chart



V2.0_26 Nov 2019

Criteria for terminating trial

The HTA (in collaboration with the TMG, DMC and TSC and the sponsor) may stop the trial at any time, or terminate one centre if new information becomes available causing major safety concerns, or if there are issues with trial conduct, or lack of recruitment.

Statistical Considerations

Sample size and justification

The primary outcome measure for this study is the Hand Health Profile of the Patient Evaluation Measure (PEM) at 6 months post treatment. Using prospectively collected data from a directly comparable population (N=30) with PPS finger fractures treated surgically or non-surgically from the Cardiff Hand Trauma database, we obtained a standard deviation (SD) of 7.5 points for the PEM at an average 112 days post treatment. To avoid possible under-powering from potential imprecision in the variance estimate from sample data, we used the upper one-sided 80% confidence limit of SD=8.5. A minimum important difference for PEM has been reported from a previous study to be 3 points (16). Using a SD of 8.5, the estimated sample size to detect a between group difference of 3 points in PEM with 90% power, two-tailed significance of 5%, and 1:1 allocation, is 340. To allow for a 15% loss to follow-up, we plan to recruit a minimum of 400 participants (200 per arm) over a period of 24 months, from a minimum of 15 sites. We expect there to be many treating clinicians in both arms at each site with each clinician treating only a small number of study participants, and therefore we assume any treatment-related clustering to be ignorable, hence the sample size has not been inflated to adjust for the clinician effect.

Analysis of Outcome Measures

The analysis and reporting of the trial will be in accordance with CONSORT guidelines, with the primary comparative analyses being conducted according to randomised allocation. A full Statistical Analysis Plan (SAP) will be developed prior to completion of data collection, and agreed with the DMC and TSC before database lock.

Appropriate descriptive statistics (mean, standard deviation, median, lower and upper quartiles, minimum, maximum or frequencies and percentages) for the demographic and clinical outcome measures at baseline, will be used to assess balance between the randomised arms at baseline, but no formal statistical comparisons will be performed. Baseline characteristics will also be descriptively compared between those randomised and those analysed to see if the attrition has introduced any imbalances. Descriptive statistics appropriate for the outcome will also be presented for all outcomes at all collected time points by treatment arm.

The primary analysis will use all the available longitudinal outcome data, with participants analysed as randomised regardless of treatment actually received. A mixed effect model, which gives valid inferences when data are assumed missing at random, will be used. The model will include the fixed effects of allocated treatment, gender, fracture pattern, fracture displacement and baseline PEM score (contemporary) and random effects for the recruiting centre. The model will also include allocated treatment-by-time interaction to estimate the between group difference at each follow-up time-point, as well as an interaction between each covariate and time to get a different adjustment for each covariate at each time point. The estimated between group effect will be presented using the difference in means, with a 95% confidence interval. The primary treatment comparisons will be the contrast between allocated treatment at 6 months.

Sensitivity analyses for the primary outcome will include:

- Complete case analysis based on observed outcome data
- Use of multiple imputation with auxiliary variables not included in the primary analysis also included in the imputation model.

- Adjustment for any other baseline variable with marked imbalance between the two treatment groups

Secondary analysis for the primary outcome will involve:

- Use of complier average causal effect (CACE) analysis to estimate the effect of the intervention among the participants who would comply with their allocated intervention
- Adjustment for concomitant injuries if necessary.

Between-group comparison of secondary outcomes will also be based on mixed effect model adjusted for the minimisation variables (gender, fracture pattern and fracture displacement as fixed effects and recruiting centre as random effect) and baseline outcome measure if available and accounting for clustering for finger-specific outcomes if necessary. For PEM, SANE and PROMIS, we will also compare the overall average between-group effects across time using all repeated measures data. Complications (patient and investigator reported) and adverse events will be presented descriptively.

Subgroup analyses for the primary outcome will be performed according to fracture pattern and fracture displacement by including appropriate interaction terms in the mixed effect model. Between-group treatment effects and 95% CI will be provided for each subgroup, but interpretation of any subgroup effects will be based on the treatment-subgroup interaction and their corresponding 95% confidence interval, estimated by fitting an appropriate interaction term in the regression model. The trial is not powered to detect any interactions hence the subgroup analyses will be treated as exploratory.

Health Economic Analysis

The primary economics analysis will take an NHS and personal social services cost perspective in accordance with NICE guidance. Secondary analysis will take a wider societal perspective to capture the broader effects of PPS finger fracture, such as time lost from paid employment, out of pocket expenses and potential effect on families and friends. This will enable a broader societal perspective to be reported alongside a health service perspective.

Data from a purposively designed patient resource proforma will collect patient-level resource information using patient self-completion. This measure will collect data on all aspects of patient treatment and follow-up, including medication, inpatient and outpatient hospital visits, rehabilitation and primary and community care use. The measure will be designed with input from the study patient advisory group and seek to capture all relevant resource drivers yet minimise patient burden. The purposely designed health economic resource proforma (to be lodged in the UK health economists DiRUM database) will ensure the key resource implications for PSS finger fracture treatment (surgical or non-surgical splint treatment) are captured.

The proforma will be used to collect data at 6 weeks, 3 months, 6 months and 12 months from all participants. Where data is collected remotely, reminders including but not limited to phone calls, emails and text messages will be implemented to maximise retention. This resource data will then form the units on which cost data, using sources such as the Unit Cost of Health and Social Care, Personal Social Services Research Unit (PSSRU) of the British National Formulary (BNF), and national reference costs can be attached.

It is important to accurately identify and quantify all resource inputs of the two interventions notably the health service costs of delivering the treatments. As such, complications will be costed accordingly per arm, but importantly the true cost of delivering surgery versus splint treatment for the health service will be quantified. The nature of NHS contracting and the service delivery variation between surgery and splinting of proximal phalanx shaft finger fractures is such that a

routine health service cost does not exist for all interventions in the trial. As such it will be important to establish a cost profile which can be applied for both interventions. The work will establish these profiles by undertaking within trial data collection and if necessary a subgroup micro-costing exercise in the surgery and splinting groups. This costing is complex, as there is no one single surgical or splinting method used and costs can differ within randomisation group depending on the geographic site, specific treatment technique used and cadre of staff undertaking the procedure.

Specific treatment technique and staff cadre and grade will be recorded routinely throughout the study. Recording all consumables used in surgery or splinting would be untenable – as such, an average resource profile will be determined by using a purposive sample of staff and interventions. Should sufficient data not be collected within trial a small number of representative procedures and sites will be chosen to record the health service resources involved with delivering a range of the surgery and splinting techniques. The key resources will fall into capital, staff, consumables, and duration. The CRF will record location, staff delivering the intervention, grade of staff, and duration. Care will be taken to establish and record a representative consumable resource profile for surgery and splinting such as type of splint, materials, staff and duration. This will produce a probabilistic range of costs for surgery and splinting. As such, it is hoped an average or point estimate can be achieved for surgical and splint techniques to yield a direct treatment cost and a range of possible costs. The range of costs in the surgical and non-surgical groups will be employed in sensitivity analysis. The outcome measure for the economic evaluation will be the number of QALYs based on a 12 month time horizon with no discounting for costs or outcomes as they accrue within a 12 month period.

An incremental analysis will be used between the two groups: surgery and non-surgical splint treatment. Where appropriate, an Incremental Cost Effectiveness Ratio (ICER) will be reported. We will use the net monetary benefit framework and implement a net benefit regression to estimate the extent to which, and the probability that, surgery for PPS finger fractures or splinting represents the most cost-effective intervention. Cost Effectiveness Acceptability Curves (CEACs) showing the probability of effectiveness versus willingness to pay at the NICE threshold of 20-30k per QALY will be constructed. Key cost drivers will be examined using probabilistic sensitivity analysis.

Procedures for missing, unused and spurious data

Missing baseline data

We anticipate missing baseline data to be minimal. For baseline scores which will be adjusted for as covariates, any missing data will be imputed using the mean score at each centre.

Missing outcome data

Two principled maximum-likelihood based methods will be employed to deal with missing data, both assuming that the probability that a response is missing depends on the observed data, but not on the unobserved data i.e. the missing data is missing at random (MAR).

i) Mixed-effect model as the primary analysis

ii) Multiple imputation as a sensitivity analysis: Multivariate imputation by chained equations (MICE) will be used to generate at least 15 multiply-imputed datasets of each missing outcome.

Definition of populations analysed

For the primary analysis, participants will be analysed according to allocated treatment group regardless of adherence to the allocated intervention. Primary analysis will be for participants with

outcome data collected at any time point (i.e. using all the available data). Sensitivity analyses for the primary outcome will include:

- Analysing data from participants with complete data at 6 months
- Multiple imputation

Secondary analysis for the primary outcome will include the participants who would comply with their allocated intervention.

For the secondary outcomes, participants will be analysed according to allocated treatment group regardless of adherence to the allocated intervention, but CACE analyses may additionally be performed on certain key outcomes and this will be specified in the SAP. Main analysis for each outcome will be for participants with outcome data collected (i.e. without imputation for missing data).

For the safety outcomes, data will be presented according to:

- Participants analysed according to allocated treatment group regardless of adherence to the allocated intervention.
- Participants analysed according to intervention received.

ADVERSE EVENTS

The interventions being evaluated in this study are treatments that are widely available within the NHS and used in standard care. Adverse events that could be due to these treatments are therefore safety outcomes for this study (complications) and will be collected as such, rather than reported as adverse events.

Reporting and follow-up of participant and investigator-reported complications associated with the intervention delivery will be recorded in trial CRFs in a structured format and do not need to be reported to REC. Complications specific to this trial are listed in Table 2.

Table 2: POINT complications

1. Infection of the injured finger and/or hand a. requiring oral antibiotics b. requiring intravenous antibiotics c. requiring surgical washout in an operating theatre d. requiring surgical washout in an operating theatre and associated removal of metalwork
2. Complex Regional Pain Syndrome
3. Nerve injury
4. Tendon injury
5. Arterial injury
6. Local areas of soft tissue pressure (i.e. from splints, plasters, bandage) a. requiring a change of splint/plaster/ bandage b. requiring a change in treatment modality from splint to surgery
7. Loss of fracture position (after initial successful baseline treatment) leading to further intervention within 6 weeks of randomisation a. Participants treated with splint: leading to (further) manipulation b. Participants treated with splint: leading to surgery c. Participants treated with surgery: loss of fracture position and/or implant-related complication leading to splint treatment d. Participants treated with surgery: loss of fracture position and/or implant-related complication leading to secondary surgery
8. Malunion leading to corrective osteotomy after six weeks from randomisation
9. Malunion not leading to corrective osteotomy after six weeks from randomisation
10. Stiffness of the injured finger requiring surgery
11. Generalised stiffness of the hand at 3 months
12. Scar related complication (including hypertrophy)
13. Diagnosis of non-union requiring surgery within 12 months

Serious Adverse Events (SAEs)

A Serious Adverse Event (SAE) is any adverse event occurring following study mandated procedures, having received the treatment or intervention that results in any of the following outcomes:

- Death
- A life-threatening adverse event
- Inpatient hospitalisation or prolongation of existing hospitalisation
- A disability / incapacity
- A congenital anomaly or birth defect

Important medical events that may not result in death, be life-threatening, or require hospitalisation may be considered a serious adverse event when, based upon appropriate medical judgment, they may jeopardize the patient or participant and may require medical or surgical intervention to prevent one of the outcomes listed in this definition.

For the purpose of this study, the following SAEs will be considered reportable:

- Death
- Amputation of part of injured hand
- Any unexpected and serious event that is potentially related to the intervention

For the purposes of this trial, the following are not considered a SAE and need not be reported:

- Hospitalisations for treatment on an emergency, outpatient basis for an event not fulfilling any of the definitions of serious as given above.
- Hospitalisation for a pre-existing condition that has not worsened
- Hospitalisation for treatment which was elective or pre-planned, for a pre-existing condition not associated with any deterioration in condition e.g. pre-planned hip replacement operation which does not lead to further complications.

Procedures for reporting of adverse events

Participants will be asked to contact the study site immediately in the event of any serious adverse event.

The Medical Monitor/Chief investigator shall be informed within 24 hours of any serious adverse events and shall determine seriousness and causality in conjunction with any treating medical practitioners.
All treatment related serious adverse events will be recorded and reported to the REC as part of the annual reports. Unexpected serious adverse events will be reported within the timeframes to the REC and sponsor as stated below.

Trial Treatment / Intervention Related SAEs

A serious adverse event that is unexpected in its severity and seriousness *and* deemed directly related to or suspected to be related to the trial treatment or intervention shall be reported to the ethics committee that gave a favourable opinion as stated below.

The event shall be reported immediately of knowledge of its occurrence to the Medical Monitor/Chief investigator.

The Medical Monitor/Chief investigator will:

- Assess the event for seriousness, expectedness and relatedness to the trial treatment or intervention.

- Take appropriate medical action, which may include halting the trial and inform the Sponsor of such action.
- If the event is deemed related to the trial treatment or intervention shall inform the REC using the reporting form found on the HRA web page within 7 days of knowledge of the event.
- Shall, within a further eight days send any follow-up information and reports to the REC.
- Make any amendments as required to the study protocol and inform the REC as required

Participant removal due to adverse events

As the interventions in this trial are treatments are widely available within the NHS and one-off interventions, we do not anticipate a situation where a participant would need to be removed from the study. Follow-up will be conducted for all participants regardless whether they receive the allocated intervention.

ETHICAL AND REGULATORY ASPECTS

Ethics Committee and Regulatory Approvals

The trial will not be initiated before the protocol, informed consent forms and participant and GP information sheets have received approval / favourable opinion from the Research Ethics Committee (REC), the respective National Health Service (NHS) or other healthcare provider's Research & Development (R&D) department, and the Health Research Authority (HRA) if required. Should a protocol amendment be made that requires REC approval, the changes in the protocol will not be instigated until the amendment and revised informed consent forms and participant and GP information sheets (if appropriate) have been reviewed and received approval / favourable opinion from the REC and R&D departments. A protocol amendment intended to eliminate an apparent immediate hazard to participants may be implemented immediately providing that the REC are notified as soon as possible and an approval is requested. Minor protocol amendments only for logistical or administrative changes may be implemented immediately; and the REC will be informed.

The trial will be conducted in accordance with the ethical principles that have their origin in the Declaration of Helsinki, 1964; the principles of Good Clinical Practice, and the UK Policy Framework for Health and Social Care Research, 2018.

Informed Consent and Participant Information

The process for obtaining participant informed consent will be in accordance with the REC guidance, and Good Clinical Practice (GCP). The Principal Investigator (or authorised delegate) and the participant will both sign and date the Informed Consent Form before the person can participate in the study.

The participant will receive a copy of the signed and dated consent form and a copy of the Patient Information Sheet (PIS). The original consent form will be retained in the Trial Master File and a second copy will be filed in the participant's medical notes.

The decision regarding participation in the trial is entirely voluntary. The Principal Investigator or appropriate delegate will emphasise that consent regarding trial participation may be withdrawn at any time without reason or affecting the quality of their future medical care. No trial-specific interventions will be done before informed consent has been obtained.

The investigator will inform the participant of any relevant information that becomes available during the course of the study, and will discuss with them, whether they wish to continue with the study. If applicable they will be asked to sign revised consent forms.

If the Informed Consent Form is amended during the study, the principal investigator, or delegate will follow all applicable regulatory requirements pertaining to approval of the amended Informed Consent Form by the REC and use of the amended form (including for ongoing participants).

RECORDS

(electronic) Case Report Forms

Each participant will be assigned a unique trial identification number allocated at enrolment, for use on eCRFs, other trial documents and the electronic database. The documents and database will also use this unique trial identification number and the participants initials (of first and last names separated by a hyphen or a middle name initial when available).

Baseline demographics and participant contact details will be logged on a separate secure system from the eCRF, to ensure participant data is not identifiable. Participant contact details may also be used by the trial team in order to send out study related questionnaires, correspondence and follow-ups, limited to the duration of the participant's participation in the trial. Participants may also optionally consent to their contact details being retained beyond the duration of their participation in the trial, in order to be updated about the outcomes of the research, or informed of future research.

The database will have in-built validation to ensure that the identifiers used all match with the allocated participant ID number. CRFs will be treated as confidential documents and held securely in accordance with regulations. (e)CRFs will be restricted to those personnel approved by the Chief or local Principal Investigator and recorded on the Trial Delegation Log. Errors will be corrected using standard GCP correction methods (errors will be struck through, initialled and dated). The Chief or local Principal Investigator (or their designee) will sign a declaration ensuring accuracy of data recorded in the (e)CRF.

The (e)CRF will only collect the minimum required information for the purposes of the trial. (e)CRFs will be held securely, in a locked room, or locked cupboard or cabinet. Access to the information will be limited to the trial staff and investigators and relevant regulatory authorities (see above). Electronic data including the trial database will be held securely and password protected.

Source documents

Source documents shall be filed at the investigator's site and may include but are not limited to, consent forms, current medical records, laboratory results and records. An (e)CRF may also completely serve as its own source data. Only trial staff as listed on the Delegation Log shall have access to trial documentation other than the regulatory requirements listed below.

Direct access to source data / documents

The (e)CRF and all source documents, including progress notes and copies of laboratory and medical test results shall made be available at all times for review by the Chief Investigator, Sponsor's representatives (e.g. for monitoring and auditing purposes) and inspection by relevant regulatory authorities (e.g. Department of Health, Human Tissue Authority).

Data Protection

All trial staff and investigators will endeavour to protect the rights of the trial's participants to privacy and informed consent, and will adhere to the Data Protection Act, 2018. All data will be stored on a secure dedicated web server. Access will be restricted by user identifiers and passwords (encrypted using a one way encryption method). We anticipate that anonymised trial data may be shared with other researchers to enable international prospective meta-analyses.

Information about the trial in the participant's medical records/hospital notes will be treated confidentially in the same way as all other confidential medical information. Electronic data will be backed up every 24 hours to both local and remote media in encrypted format.

Participant data will be kept securely and access will be restricted to member of the trial team.

QUALITY ASSURANCE & AUDIT

Insurance and Indemnity

Insurance and indemnity for trial participants and trial staff is covered within the NHS Indemnity Arrangements for clinical negligence claims in the NHS, issued under cover of HSG (96)48. There are no special compensation arrangements, but trial participants may have recourse through the NHS complaints procedures.

The University of Nottingham as research Sponsor indemnifies its staff, research participants and research protocols with both public liability insurance and clinical trials insurance. These policies include provision for indemnity in the event of a successful litigious claim for proven non-negligent harm.

Trial Conduct

Trial conduct may be subject to audits of the Trial Master File for inclusion of essential documents; permissions to conduct the trial; Trial Delegation Log; CVs of trial staff and training received; local document control procedures; consent procedures and recruitment logs; adherence to procedures defined in the protocol (e.g. inclusion / exclusion criteria, correct randomisation, timeliness of visits); adverse event recording and reporting; accountability of trial materials and equipment calibration logs.

Trial Data

Monitoring of trial data and conduct will be in accordance with the study specific monitoring plan, to be finalised prior to the commencement of recruitment.

Record Retention and Archiving

In compliance with the ICH/GCP guidelines, regulations and in accordance with the University of Nottingham Research Code of Conduct and Research Ethics, the Chief or local Principal Investigator will maintain all records and documents regarding the conduct of the study. These will be retained for at least 7 years or for longer if required. If the responsible investigator is no longer able to maintain the study records, a second person will be nominated to take over this responsibility.

The Trial Master File and trial documents held by the Chief Investigator and the Nottingham Clinical Trials Unit on behalf of the Sponsor shall be finally archived at secure archive facilities at the University of Nottingham. This archive shall include all trial databases and associated meta-data encryption codes.

Discontinuation of the Trial by the Sponsor

The Sponsor reserves the right to discontinue this trial at any time for failure to meet expected enrolment goals, for safety or any other administrative reasons. The Sponsor shall take advice from the Trial Steering Committee and Data Monitoring Committee as appropriate in making this decision.

Statement of Confidentiality

Individual participant medical information obtained as a result of this study are considered confidential and disclosure to third parties is prohibited with the exceptions noted above.
Participant confidentiality will be further ensured by utilising identification code numbers to correspond to treatment data in the computer files.

Such medical information may be given to the participant's medical team and all appropriate medical personnel responsible for the participant's welfare. If information is disclosed during the study that could pose a risk of harm to the participant or others, the researcher will discuss this with the CI and where appropriate report accordingly.

Data generated as a result of this trial will be available for inspection on request by the participating physicians, the University of Nottingham representatives, the REC, local R&D Departments and the regulatory authorities.

Anonymised participant data may be shared with researchers external to the trial research team in accordance with the NCTU's data sharing procedure. All requests for data should be sent to the Nottingham Clinical Trials Unit.

PUBLICATION AND DISSEMINATION POLICY

Research findings will be disseminated via a HTA monograph in the NIHR Journals library, scientific papers, conference presentations, and communicated to groups involved in guideline development and commissioning decisions. They will also be available from or signposted via the British Society for Surgery of the Hand (BSSH) British Association of Hand Therapists (BAHT), British Orthopaedic Association (BOA), British Association of Plastic Surgeons (BAPRAS), Federation of European Societies for Surgery of the Hand (FESSH) and International Federation of Societies for Surgery of the Hand (IFSSH) websites and/or newsletters, a podcast and social media, alongside plain English summaries.

The BSSH, BAHT, FESSH and IFSSH clinician networks and social media will be used to publicise findings. The patient representatives will lead on dissemination to patients and the public, via lay summary report and information hosted on appropriate websites and social media.

Trial publications and conference presentations will be submitted to the NIHR HTA for approval prior to submission to the event organisers or the editors. All publications will acknowledge the support of the HTA in funding this trial. All participants will receive a copy of the trial results (unless they have stated they do not wish to receive this). Neutral or negative results will not constitute a reasonable justification to delay publication.

USER AND PUBLIC INVOLVEMENT

The research question was prioritised by the 2017 James Lind Alliance Priority Setting Partnership on Common Conditions Affecting the Hand and Wrist. This was a nationwide process involving 231 patients, which prioritised the surgical versus non-surgical treatment of hand injuries as a top ten research priority (17).

Patients with PPS finger fractures were actively involved in developing this proposal through:

- A national consensus workshop where NHS clinicians, patients and researchers came together to develop the PICO framework for the current proposal (18). Patients with PPS injuries, supported by an independent PPI and engagement facilitator, shared their experiences of the injury, treatment and recovery, informing discussions as part of the working groups.
- Two patient consultation events (focus groups) were hosted in different centres (Nottingham and Cardiff) to ensure a balanced representation of treatment experiences in varying NHS settings. Participants had experienced no treatment (an initially neglected fracture), splint treatments and surgical fixations. Furthermore, there was a range of age groups represented including students, working adults and retirees. During the focus groups patients:
    - Reviewed a range of upper limb questionnaires selecting the PEM as primary outcome measure for this study, based on its relevance to PPS fracture recovery and ease of use.
    - Informed the patient pathway including: where and when patients could be approached for recruitment, preferred mode of patient follow-up and means of optimising patient recruitment and retention in the study.
    - Advised on priorities for recovery, informing the choice of secondary outcome measures and specifically fed back on the appropriateness, relevance and ease of use of the PROMIS CAT, SANE and aspects of the resource use questionnaires. In particular they highlighted that multiple questionnaires facilitated capture of maximum relevant information.

The study patient co-applicant, provides experience and understanding from the patient and public perspective, having had a sustained a PPS fracture and experienced treatment in the NHS. They are supported by an independent PPI facilitator employed by the host trust, the trial manager and the CI. The patient co-applicant has been involved in the study design from the onset as a participant in the national consensus workshop, the patient focus group and via direct feedback on patient flow, study burden and the development of the plain English summary.

To support the Trial team and PPI Co-applicant, the study will have a Patient Advisory Group (PAG). Members of the group will support the patient co-applicant through contribution to aspects of the trial including preparation of patient-facing study materials, supporting and advising on aspects of delivery such as recruitment and retention as well as evaluation and dissemination of findings.

In addition, at least two independent patient representatives will sit on the Trial Steering Committee (TSC) to help oversee the study. Their role is to contribute to the group their ideas and opinions on the trial from the perspective of someone who has experienced the condition or service being looked at in the trial. All PPI representatives will be reimbursed with appropriate remuneration and recognition as per guidance from NIHR Involve.

STUDY FINANCES

Funding source

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Participant stipends and payments

Participants will not be paid to participate in the trial. Participants have a total allocation of £50 high-street vouchers with specific amounts given for completion of the following; 3 month research clinic visit/remote data collection (as inconvenience allowance), and for completion and return of 6 and 12 month questionnaire(s), (as a token of appreciation).

SIGNATURE PAGES

Signatories to Protocol

Chief Investigator: (name)_____

Signature:_____

Date: _____

Sponsor: (name) _____

Signature:_____

Date: _____

Trial Statistician: (name)_____

Signature:_____

Date: _____

Version Control Table

Version number and date	Section of protocol	Details of change
V1.2 04 May 2020	Contact details	PPI personal details removed
	Stopping rules and discontinuation	Time point clarification added
	Secondary Objectives, Follow-up (3 months), Summary of assessments by time point, Participant stipends and payments	Added details to allow for remote data collection at 3 months via telephone or video consultation
	Health Economic Analysis	Clarification added about where data is collected i.e. CRF
	Table 2 Complications	Defined definition of 'early' loss of fracture position
	Funding Source	Full funding source details added

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