Supplementary 1: Observation topic guide

Topic	Field notes
Members	Who attends, what are their roles and how do they contribute?
Organisation of meeting	Who chairs the meeting and what is their role, are attendees introduced, who makes introductions?
Agenda	What are the main items for discussion, what are the goals, priorities for discussion, how much time is spent on each item for discussion? Are there presentations, documents or handouts?
Content of discussion	What is discussed? What information is provided and by whom? Are training requirements discussed? Are strategies and recommendations for the TRC or research discussed and by whom?
Group interactions and decision-making	Who contributes to discussion, who asks questions and who responds? What roles do members adopt during discussion, is there an expert, who adopts this role? Who dominates the group discussions and who is quiet of silent? What is the general atmosphere, is it rushed, tense, relaxed?

Supplementary 2: Interview topic guide

Topic	Discussion content
Participant background	Clinical, research, methodological, clinical, stage of training, current post, any TRC and trials experience.
Current TRC and research experience	Set up and running of TRCs and trials including any barriers and facilitators.
Understanding and awareness of trials	Training and knowledge and where obtained.
Current trial(s) involvement	Any current involvement with information about the trial(s)
Trial conduct and trainee involvement	Set up of the trial, roles and activities for trainees in trial(s), any barriers and facilitators, strategies for addressing issues.
Motivation and challenges to trainee engagement with trials	Why trainees engage and don't engage with trials
Stakeholder, organisation involvement and support	What the roles of these groups are and what their involvement is and what support provide, e.g. CTUs, university, research networks.
Training requirements	Any training requirements needed for trainees to engage with trials?

Supplementary 3: Coding framework

01. Why do trainees get involved in research
    - Altruism
    - Advancement of field
    - Contribution to the evidence base
    - Patient benefit
    - Personal Development
    - Being naturally inquisitive
    - Enjoyment
    - Knowledge and skills development
    - Ownership and responsibility
02. Why trainees don't get involved in research
    - Challenges to trainees' engagement in trials
    - Overcoming challenges to the engagement of trainees
    - Streamlining
    - Clinical vs. academic or research work
    - Feeling intimidated
    - Pushback from others
    - Recognition
    - Authorship issues
    - Time and movement
    - Trainee Fatigue
    - Trial resources
03. Overcoming challenges to trainee engagement with trials
    - Access to training research events and meetings
    - Choice and control
    - Consideration of trial design and conduct
    - Ownership and responsibility Co PI or CI role for trainees
    - Strategies for engagement of trainees
    - Working with others
04. Roles of key people
    - Academics
    - Clinical Trials Unit Staff
    - Models or strategies for CTUs working with trainees
    - Surgical Trials Unit
    - Working with trainees from perspective of CTU
    - Consultant
    - Key people
    - Research Nurses
    - Working with trainees from the perspective of Research Nurses
    - Roles of trainees in research
    - Trainee Network Chair
05. Characteristics of Trainee Collaboratives
    - Aims and objectives of collaborative
    - Collaborative meetings
    - Collaborative resources
    - Collaborative studies and trials
    - Selecting studies or trials
    - Setting up collaborative
    - Structure of collaboratives and sustainability

- 06. Benefits of working with trainees
  - Access to clinical skills
  - Increased people power and reach
  - Using vs. working with
- 07. Benefits of collaborative working
  - Bringing together the Pieces of the puzzle
  - Interdisciplinary working
  - Investment in future surgical trial leaders
  - Mentorship
- 08. Engagement with Collaboratives
  - Challenges to engagement with collaboratives
  - Cross Collaboration working
  - Facilitators to engagement with collaboratives
  - Collective momentum or critical mass
  - What doesn't work and why
  - What works well or why it works
- 09. Authorship
- 10. Challenges in surgical trials
  - Overcoming challenges in surgical trials
  - Role of trials in surgery
- 11. Funding and resources for conducting trials
- 12. Interviewee advice to trainees
- 13. Interviewee Background
  - Research experience
  - Role in collaborative
- 14. Trainee knowledge and training in trials
  - Formal training and knowledge
  - Informal training and knowledge
  - Recommendations for training from interviewees

Supplementary 4: Survey questions

Survey - Trainee Views on Surgical Trainee-led Research Collaboratives

Please answer the following questions about yourself and your views on surgical research collaboratives. For most answers, check the box(es) most applicable to you or fill in the blanks.

About You

1. Your Age

……years

2. Your Gender (Select only one)

☐ Female
☐ Male

3. Your Grade

☐ CT1
☐ CT2
☐ ST3
☐ ST4
☐ ST5
☐ ST6
☐ ST7
☐ ST8
☐ Trust grade (please specify level)…….
☐ Other (please specify)……

4. Your Speciality (Select all that apply)

☐ Cardiothoracic
☐ General Surgery
☐ Neurosurgery
☐ Oral & Maxillofacial Surgery
☐ Otolaryngology
☐ Paediatric Surgery
☐ Plastics Surgery
☐ Trauma & Orthopaedic Surgery
☐ Urology
☐ Vascular
☐ Undecided
☐ Other

5. To which region do you belong (i.e. deanery affiliation):

☐ Eastern
☐ Kent, Sussex & Surrey
☐ Leicestershire, Northamptonshire & Rutland
☐ London
☐ Mersey
☐ Northern
☐ Northern Ireland
☐ North West
☐ Trent
☐ Oxford
☐ Scotland

☐ Southwestern
☐ South Yorkshire and South Humber
☐ Wales
☐ West Midlands
☐ Wessex
☐ Yorkshire

6. Are you full-time or less than full-time
☐ Full-time
☐ Less than full-time

Have you obtained/are you undertaking a formal research qualification (Select all that apply)
☐ MRes
☐ MPhil
☐ MD
☐ PhD
☐ Other (please specify)…….
☐ No

Are you an Academic Trainee?
☐ Academic Trainee (current)
☐ Academic Trainee (previous)
☐ No

About Your Publications

9. In the following table, please state the number of PubMed citable publications you have at each type of authorship, for either trainee-led research collaborative studies or other research

	(i) Trainee-led collaborative study (please state the Journals for each and if you paid to publish)	**(ii) Other research study (please state the Journals for each and if you paid to publish)**
a. First author		
b. Co-author (named appears on PubMed alongside title and other part of citation)		
c. Corporate authorship (i.e. as part of a larger group with which the study group itself is the named author)		
d. 'Other' (i.e. citable contributor)		

About Surgical Research Collaboratives

10. Are you currently involved in any studies through a surgical research collaborative?
☐ No
☐ Yes

11. Have you previously been involved in any studies through a surgical research collaborative?
☐ No
☐ Yes

12. If you have been involved in surgical research collaborative research projects, what has your contribution been to these projects? Please select the appropriate category(ies) for your contributions and state the number for each.

Contribution	Previously Involved		Currently Involved	
	(i.) Regional (Involves hospitals within one collaborative)	(ii.) National or international (Involves hospitals across two or more collaboratives)	(iii.) Regional (Involves hospitals within one collaborative)	(iv.) National or International (Involves hospitals across two or more collaboratives)
a. Steering Committee (i.e. project development and running of studies)				
b. Writing Group (i.e. contribution to writing manuscript)				
c. Regional Lead (i.e. coordinating project at regional hospital sites)				
d. Local Lead (i.e. coordinating project at local hospital site)				
e. Local Collaborator (i.e. data collection)				
f. Data Validation (i.e. validation of selected patients)				
g. Advisory Group (i.e. mentored a project with expert advice either in design or writing phase)				

13a. For each of the roles listed below please indicate how likely you would be to get involved in a future trainee-led surgical collaborative study?

Steering Committee (i.e. project development and running of studies)	Very Unlikely	Unlikely	Neither Likely or Unlikely	Likely	Very Likely
Writing Group (i.e. contribution to manuscript)	Very Unlikely	Unlikely	Neither Likely or Unlikely	Likely	Very Likely
Regional Lead (i.e. coordinating project at regional hospital sites)	Very Unlikely	Unlikely	Neither Likely or Unlikely	Likely	Very Likely
Local Lead (i.e. local hospital lead)	Very Unlikely	Unlikely	Neither Likely or Unlikely	Likely	Very Likely
Local Collaborator (i.e. data collection)	Very Unlikely	Unlikely	Neither Likely or Unlikely	Likely	Very Likely
Data Validation (i.e. validation of data previously collected for a study)	Very Unlikely	Unlikely	Neither Likely or Unlikely	Likely	Very Likely

Advisory Group (i.e. mentored a project with expert advice either in design or writing phase)	Very Unlikely	Unlikely	Neither Likely or Unlikely	Likely	Very Likely

13b. Please use the free text space below for any comments for your answers to the above questions

……
……

14a. If you have been involved in a surgical collaborative research project, what was/were the reason(s) you got involved? (please select all that apply)

☐ I have an interest in surgical research
☐ I wanted to improve patient care
☐ I wanted to increase my number of publications
☐ For networking
☐ I was encouraged to by programme director
☐ To educate myself about research and governance
☐ To satisfy ARCP requirements
☐ Other……..

14b. What was the <u>main</u> reason you got involved (please select one)

☐ I have an interest in surgical research
☐ I wanted to improve patient care
☐ I wanted to increase my number of publications
☐ For networking
☐ I was encouraged to by programme director
☐ To educate myself about research and governance
☐ To satisfy ARCP requirements
☐ Other……..

14c. Please provide any further details about your answer

……
……

15a. If you have never been involved, or have decided not to participate in further surgical collaborative research projects, what reason(s) prevented you from taking part? (select all that apply)

☐ I am not interested in collaborative research
☐ I do not have time
☐ There is no surgical research collaborative in my region
☐ It is not recognized at CCT (certificate of completion of training)
☐ The location of the meeting is too far away
☐ The time of the meeting means I cannot attend
☐ The projects are not of interest to me
☐ I do not feel welcome at the collaborative
☐ I feel I am too junior to be part of the collaborative
☐ I have issues with authorship of collaborative research
☐ Other (please specify)…….

15b. Please provide any further comments, including any other barriers to your involvement:

……
……
……
16. Do you think trainee-led research collaboratives have a place in surgical training?
☐ Yes – Why……
☐ No – Why not……
17a. How should CCT requirements recognize involvement in trainee-led research collaboratives? (select all that apply)
☐ Number of projects involved with
☐ Number of publications
☐ Number of first author publications
☐ A points based system based on contribution
☐ Merit judgement by the Speciality Advisory Committee (SAC)
☐ Other, please specify:……..
☐ Should not be recognized at CCT (please go to question 18)
17b. What specific aspects of the research process should be recognized? (Select all that apply)
☐ Steering Committee (i.e. project development and running of studies)
☐ Writing Group (i.e. contribution to manuscript)
☐ Regional Lead (i.e. coordinating project at regional hospital sites)
☐ Local Lead (i.e. coordinating project at local hospital site)
☐ Local Collaborator (i.e. data collection)
☐ Data Validation (i.e. validation of selected patients)
☐ Advisory Group (i.e. mentored a project with expert advice either in design or writing phase)
☐ Other, please specify:……..
17c. For publication purposes, how should authorship contribution of trainee-led research collaborative projects be recognised?
☐ Steering committee as named Co-authors with Contributors citable
☐ Single Corporate Authorship – Steering group and all contributors citable together
☐ Other (please specify)…….
18. Do you think involvement in surgical research collaboratives should be recognized by….? (select all that apply)
☐ UK Foundation Programme (UKFPO)
☐ Core Trainee interview process
☐ Higher surgical training interview process
☐ Academic training posts
☐ Certificate of Completion of Training (CCT)
☐ None of the above (Why?)
.....

Supplementary 5: Stakeholder workshop strategy statements

Potential strategies for enhancing trainee engagement in research in full used in the stakeholder workshop

Letters in brackets relate to whom the strategy might be applicable (e.g., who could help take it forward):

CC=Consultant Champions, CI=Chief Investigators, CTU=Clinical Trials Units, F=Funders, RCS=Royal College of Surgeons, RN=Research Nurses, SA=Speciality Associations, TP=Training Programme(s), TRC=Trainee Research Collaboratives, U=Universities

1	**Trainee Research Collaboratives (TRC) organisation and conduct of research**
1.1	A "flagship" study with 'quick wins' to promote the collaborative (TRC)
1.2	Design trial so that trainees only collect key outcome data (that will be published) so their efforts are not wasted (TRC)
1.3	Seek Consultant Champion(s) to support the collaborative (TRC, CC)
1.4	Focus on engaging junior trainees and students (succession planning) (TRC)
1.5	Include several trainees on trial management groups/engage in trial problem-solving (spreads the word, builds skills, enhances ownership) (TRC, CTU, CI)
1.6	Competitions for trainees to generate study ideas (TRC, CC, CTU)
1.7	Piggy-backing TRC meetings to specialty meetings/training (critical mass) (TRC)
1.8	Social media to promote the group and facilitate communications e.g., Twitter, WhatsApp (TRC)
1.9	Help with small costs to facilitate TRC meetings (e.g. refreshments), TRC admin, websites, and projects e.g. software (CTU, CRNs, SA, RCS)
1.10	Dedicated time to conduct research but acknowledged as impossible! (TP, CC)
1.11	Different communication methods (e.g. video conference/Skype) for those further away to join TRC meetings (TRC)
1.12	Small group working for confidence-building in trainees new to the TRC (TRC)
1.13	Encourage simple studies that are more accessible to new trainees (pressure to do large "gold standard" trials can be intimidating) (TRC, CTU)
1.14	Ensure new pathways involving trainees in trials are clarified with research nurses at the outset (TRC, CI, RN)
1.15	Brief initiation with research nurses on new rotation (discuss studies and how to be involved, easier than with consultants) (RN, TRC)
1.16	Study summaries/simple agreements of roles and responsibilities to be drawn up, for information and agreement when moving to new departments or initiating a new study (enhances consultant buy-in) (TRC, CTU, CI, CC)
2	**Wider facilitation of TRCs and trainee-led research**
2.1	CTUs to be (more) open to working with smaller TRC studies (CTU)

2.2	CTUs to have a presence at and support TRC events (CTU)
2.3	More CTU support or posts for trainees to work within CTUs (CTU, F, CC)
2.4	Engagement/better communication with University methodologists (TRC, U)
2.5	Engaging with CTUs to "sell" benefits of working with trainees (TRC, CTU)
2.6	Improve communication of the benefits of TRCs to trainees, training bodies, and specialty associations (TRC)
2.7	Creating a positive research culture within Trusts so research is second nature (All?)
2.8	Facilitate dialogue between sponsors, funders, TRC, and HRA/R&D to support Co-CI/PI applications (CC, others)
3.	**TRC publications and authorship**
3.1	Transparency (e.g. realistic about what's involved, timings, authorship policy) (TRC)
3.2	Memorandum of understanding: what is expected from all parties at the start of a trial e.g. trainee 'moves on' in role or geographically and what they can expect. (TRC, CTU)
3.3	Criteria for corporate authorship to include quality of data collected (TRC)
3.4	Change publication requirements for career progression (TRC, TP)
3.5	Accessible key liaison person at CTU or University for trainees to help with study design and methodological advice (CTU, U, F)
3.6	Work with journals to support/clarify corporate authorship (TRC?)
4	**Trainee research skills development**
4.1	Training for medical students – wider availability of GRANULE course
4.2	GCP integrated into medical training (TP)
4.3	Making NIHR GCP courses more applicable to non-CTIMP trials and people recruiting (TRC, F)
4.4	Methodology Courses (e.g. BOSTIC or others) more widely available so all trainees have a baseline understanding of trials (U, CC, F, CTU?)
4.5	Free access to research methods courses for trainees doing it in their spare time (F, CTU, U, CC?)
4.6	Contribute research training to registrar induction/teaching days, conferences (TRC)
4.7	Rotate trainees on writing committees to develop writing skills (TRC)
4.8	Trainees as co-CIs, co-PIs, and support interested trainees (TRC, CTU, CC)
4.9	Study-specific training (if on rotation so can't attend site initiation visit) (CTU, RN)
4.10	Involve surgeons in adapting generic clinical trial training so the nuances of surgical trials are covered when delivering courses to surgeons. (TRC, CC)
4.11	Incorporate training in research methods within the trial meetings (CTU, CI)

Supplementary 6: Interview and survey participant characteristics

Participant characteristics	Interview participants (n=32)	Survey respondents (n=73)
Role		
Consultant Surgeon	5 (15.6%)	-
Clinical Trial Unit methodologist	7 (21.9%)	-
Research Nurse	3 (9.4%)	-
Trainee Surgeon	17 (53.1%)	73 (100%)
Gender		
Female	15 (46.9%)	29 (60.3%)
Male	17 (53.1%)	44 (39.7%)
Trainee surgeon grade	(n = 17)	
CT1/CT2	2 (11.8%)	22 (30.5%)
ST3/4/5	4 (23.5%)	22 (30.5%)
ST6/7/8	11 (50.0%)	24 (32.9%)
Trust Grade	-	2 (2.7%)
Other	-	3 (4.1%)
Surgical speciality	(n = 22)	
Cardiothoracic	0	1 (1.4%)
Colorectal	4 (18.2%)	0
General Surgery	7 (31.9%)	30 (41.1%)
Neurosurgery	1 (4.5%)	3 (4.1%)
Oral and Maxillofacial	0	1 (1.4%)
Otolaryngology	0	2 (2.7%)
Oncoplastic	2 (9.2%)	0
Paediatric	1 (4.5%)	2 (2.7%)
Plastic	1 (4.5%)	3 (4.1%)
Transplantation	1 (4.5%)	0
Trauma and Orthopaedic	1 (4.5%)	18 (24.7%)
Urology	0	6 (8.2%)
Upper gastro-intestinal	3 (13.7%)	0
Vascular	1 (4.5%)	5 (6.8%)
Undecided	0	2 (2.7%)
Clinician regions		
Eastern	2 (9.1%)	3 (4.1%)
London	2 (9.1%)	3 (4.1%)
Mersey	0	3 (4.1%)
Northern	1 (4.5%)	1 (1.4%)
Northern Ireland	1 (4.5%)	0
Northwest	1 (4.5%)	12 (16.4%)
Oxford	4 (18.2%)	0
Scotland	0	21 (28.8%)
Southwestern	4 (18.2%)	11 (15.1%)
Wales	2 (9.1%)	1 (1.4%)
West Midlands	5 (22.8%)	13 (17.8%)
Wessex	0	23 (2.7%)
Yorkshire	0	3 (4.1%)