SOFTWARE DEVELOPMENT FOR CLINICAL RESEARCH COMPUTER SYSTEMS

SOP Number: BTC-SOP-IT-001

SOP Version: 2.0

Click here to record your training for this SOP

	NAME	TITLE
Authors	David Carmichael Patrick Yeung Jana Kirwan	Research Systems Technical Developer Research Systems Deputy Developer Research Systems Technical Manager
Reviewer	Rachael Heys	Quality Assurance Manager
Authoriser	Melanie Lewcock	Head of BTC Strategy

Release Date:	05/03/2024	**Implementation Date:**	05/04/2024

Review Due:	05/04/2026

Implementation plan

This Standard Operating Procedure (SOP) should be implemented within two weeks from Release Date for studies that are being set up.

For ongoing studies applicable sections of this SOP should be implemented as far as possible immediately after the implementation date, unless impractical for the circumstances, e.g. too close to the end of study.

If unsure, the BTC Director and/or Quality Assurance Manager should advise.

Note to User:

It is your responsibility to ensure that you are using the latest approved version of this SOP. Please note that versions may be superseded before their planned review date.

THIS IS AN UNCONTROLLED VERSION WHEN PRINTED.

If you are reading this document in printed form, please check that the version number and date match the most recent SOP's details. Current versions of all Bristol Trials Centre (BTC) SOPs and accompanying documents are available on the BTC Teams QA channel.

Contents

1. INTRODUCTION AND PURPOSE

As outlined in the International Conference on Harmonisation (ICH) E6 Good Clinical Practice (GCP) 2.10 “All clinical trial information should be recorded, handled, and stored in a way that allows its accurate reporting, interpretation and verification.”

GCP regulates specific requirements for computerised systems, specifically in Section 5.5.3 “when using electronic trial data handling and/or remote electronic trial data systems:

- Ensure and document that the electronic data processing system(s) conforms to the Sponsor’s established requirements for completeness, accuracy, reliability, and consistent intended performance (i.e. validation).
- Maintain SOPs for using these systems.
- Ensure that the systems are designed to permit data changes in such a way that the data changes are documented, and that there is no deletion of entered data (i.e. maintain an audit trail, data trail, edit trail).
- Maintain a security system that prevents unauthorised access to the data.
- Maintain a list of the individuals who are authorised to make data changes.
- Maintain adequate backup of the data.
- Safeguard the blinding, if any (e.g. maintain the blinding during data entry and processing).”

The purpose of this SOP is to describe the standard procedures for new and ongoing development of Clinical Research Computer Systems by the BTC for capturing, processing, managing and reporting clinical study data to ensure that the development of these systems accords with the ICH GCP guidelines for electronic data collection (ECRIN-TWG, 2008; PIC/S, 2007) and UK Medicines for Human Use (Clinical Trials) Regulations.

2. SCOPE

This SOP describes the processes required in order to produce consistent, available, reliable and secure systems for use within the BTC. It outlines the requisite activities as part of the development life cycle, ranging from initial requirements elicitation through to user acceptance testing and sign-off, detailing the required processes at each stage. It encompasses all systems developed by the BTC for the purposes of collecting, storing and processing clinical study data or related information. This will include any ancillary functionality which supplements the purposes described above.

The Chief Investigator (CI) must be made aware of this SOP and as a minimum, be signposted to the SOP by BTC.

NB: Throughout this document the terms ‘research’, ‘trial’, and ‘study’ will be used interchangeably to denote those projects which fall under the remit of the UK Policy Framework for Health and Social Care Research 2017.

3. DEFINITIONS

For definitions, acronyms and abbreviations relevant to IT please refer to the BTC-RES-IT-001 Definitions and Acronyms (IT) available on the BTC Teams QA channel.

For all other definitions, acronyms and common abbreviations relevant to research projects and general management of research refer to the BTC-RES-TM-001 Definitions and Acronyms, also available on the BTC Teams QA channel.

4. RESPONSIBILITIES

Any delegation of responsibilities should be formally agreed by all parties and clearly documented.

4.1 Sponsor or delegate

It is the responsibility of the Sponsor (or delegate) to ensure that any system commissioned and subsequently developed using the procedures described in this document is fit for the purpose of capturing, processing, managing and reporting clinical study data.

4.2 Chief Investigator (CI) or delegate

It is the responsibility of the CI (or delegate) to provide the final sign-off for any system developed using the procedures described in this document.

4.3 Lead Research Systems Technical Developer or delegate

It is the responsibility of the lead Research Systems Technical Developer (or delegate) to design, implement and arrange tests of any commissioned system using the procedures described in this document.

4.4 Trial Manager/Co-ordinator

It is the responsibility of the trial manager/co-ordinator to:

- Provide all relevant source documentation.
- Ensure all the requirements of the system are fully documented.
- Sign off the functional specification and user acceptance testing.

4.5 Study Statistician

It is the responsibility of the study statistician to:

- Assist the Trial Manager/Co-ordinator with the production of the data specification document.
- Ensure the data produced from the developed system is fit for statistical analysis.

4.6 SOP Author(s) or delegate

It is the responsibility of the SOP author(s) (or an appropriately qualified/trained delegate) to:

- Generate, finalise, and revise the SOP in accordance with the BTC-SOP-QM-001 Development and Management of SOPs.
- Ensure that the SOP remains fit for purpose.
- Provide relevant training and education materials to ensure that staff are aware of their responsibilities in relation to SOP content and management.

4.7 SOP user

It is the responsibility of the SOP user to:

- Ensure compliance with this document.
- Review procedures during use of the SOP and inform the QA manager of any changes required using the Change Request log on the BTC Teams QA channel.
- Undertake training on all aspects of this SOP and record training on the BTC Teams QA channel.

5. SPECIFIC PROCEDURES

The development of systems covered by this SOP may be undertaken using a range of software environments, tools and utilities, depending on the breadth and complexity of functionality required. This will include established off-the-shelf products as well as environments and frameworks developed in-house. All systems covered by this SOP will follow the development route outlined below.

5.1 General Principles

Any system falling under the scope of this document should adhere to the following general principles:

- A system used to capture electronic data should ensure that the data are captured as specified within the protocol.
- A system must ensure electronic data are accurate, legible, contemporaneous, attributable, complete and consistent.
- There should be a formal change control process.
- During the development and subsequent maintenance of in-house software systems the source code and any dependent files must be stored and versioned within a source control system.
- An audit trail should be maintained for the original creation and subsequent modification of all electronic data.
- Electronic data should be protected against unauthorized access.

- The storage of electronic data should provide for their ready retrieval.
- Electronic data should be protected from accidental destruction or corruption.

All developed systems will comply with the guidance outlined the BTC-SOP IT-002 Security and Audit Configuration.

5.2 Commissioning

During this initial stage the BTC Systems Team will be notified that there is a requirement to develop a new (or change an existing) system which falls within the scope of this document. A ticket will be raised on the relevant ticketing system. The ticket will either be raised by the person making the notification, or the BTC Systems Team on behalf of the requester.

The progress of the system development must be tracked and documented in the ticket or equivalent (e.g. suitable project management tool).

The BTC Systemsteam will nominate and assign the lead Research Systems Technical Developer as the principal contact for the project and who will subsequently lead the following stages of development.

5.3 User Requirements elicitation, analysis and definition

During this stage the stakeholders, goals, scope, functionality and constraints of the prospective development will be elicited as a result of careful examination of relevant source documentation and consultation with the study team.

The level of work, additional resources required and initial timescales will be indicated to the trial manager/co-ordinator, dependent on certain factors such as the level and availability of source documentation, lead time to buy in resources etc. Where required a quote will be provided to the study team detailing the estimated costs for the level of resource identified.

Following elicitation, the trial manager will produce a User Requirements document. The Research Systems Technical Developer will perform an analysis of the collected set of user requirements in order to define an overall technical specification for the development. The result of this analysis is a functional specification document which lists all the identified user requirements and describes in detail how the system functionality will meet those requirements. The system functionality will evolve during the development of the study system and the documentation will be updated accordingly.

5.4 Pre-validation process

The stages of system validation (after a new system has been commissioned) are as follows:

- **A pre-validation process** and creation of the Validation Master Plan. This is essentially performing and documenting the decision making process of deciding if a system requires validation, at what level and with what documentation. This step affords the opportunity to risk-assess the system ahead of allocating appropriate resources to validate it.
- **Requirement Gathering** – System Requirements are identified. Requirements are documented.
- **Prototyping** – an initial prototype may be made to flesh out requirements – testing of this need not be documented in detail as its purpose is to elicit more detailed requirements from the system commissioner.

- **Functional specification / system overview document** - reviewed and approved based on the feedback cycle within the prototyping stage.
- **System development** – development of the system based on final functional specification
- **System Testing** – Testing Protocols are written, reviewed, and approved. The protocol is executed to document that the system meets all requirements.
- **System Release** – The Validation Report is written and system is released to the end-users for use.
- **Change Control** – If changes need to be made after validation is complete, Change Control helps ensure that the system changes does not affect the system in unexpected ways (see BTC-SOP-IT-004 Configuration Management).

5.5 Implementation and coding

During this stage the Research Systems Technical Developer will implement the system as defined in the functional specification or equivalent documentation.

At this stage, source documentation should be a set of consistent and stable materials, i.e. not draft or prototype versions, and should not be expected to significantly change during the initial development of the system. Amendments and changes to the source documentation following the initial elicitation phase must be clearly identified and versioned within those source documents, and subsequently communicated to the Research Systems Technical Developer. The process may be iterative as shown in flowchart in Appendix 1.

Depending on the nature of the development, implementation may consist of one or more of the following steps:

- Creating a suitable storage medium for the data, such as a database
- Building data collection mechanisms, such as on-line CRFs
- Writing data validation, cleansing and export routines
- Producing any required study management features and/or other functionality
- Testing of workflow of the study where appropriate – this may be describing and testing how patients move from in screening to in progress to randomised, followed up, etc.
- Put in place a secure deployment plan with accompanying documentation.

5.6 Testing

The system will be tested to ensure it is of suitable quality and meets the user requirements. The testing required will be detailed in the validation plan but may include:

- User acceptance testing;
- Functional testing;
- Transformation testing;
- Performance testing;
- Penetration testing;
- Database specification testing (an alternative would be to validate the code book).

All testing must be documented so that evidence that the system has been validated can be provided if required. Testing procedures are detailed in BTC-SOP-IT-005 Testing Clinical Trials Systems.

5.7 Computerised System Validation and Sign-off

A validation report will be created to ensure all the validation steps defined in the validation plan have been carried out and adequately documented. The validation report will be authored and/or audited by a 2nd member of the BTC Systems Team. The report must be signed off by a role defined in the validation plan. Normally, this would be the Research Systems Technical Developer, a 2nd BTC Systems Team member, the trial manager/co-ordinator and optionally a BTC director and/or Quality Assurance manager. Ideally, the validation report should be signed off before the system is released for general use. In some circumstances this may not be feasible and should be done as soon as possible after the release implementation.

After validation and sign-off the ticket or equivalent can be closed/updated reflecting the status that the system has been released. Any further changes as a result of new requirements being identified, existing requirements amended or software defects being discovered will be subject to the BTC- SOP-IT-004 Configuration Management, in order to ensure the changes are properly recorded and resolved once the system is in use.

6. SUPPORTING DOCUMENTS TO BE USED

Number	Title
BTC-RES-IT-001	Definitions and Acronyms (IT)
BTC-RES-IT-002	Website References – IT SOPs
BTC-RES-TM-001	Definitions, acronyms and abbreviations relevant to research projects and management of research
BTC-SOP-QM-001	Development and Management of SOPs
BTC-SOP-IT-002	Security and Audit Configuration SOP
BTC-SOP-IT-004	Configuration Management SOP
BTC-SOP-IT-005	Testing Clinical Trials Systems SOP
BTC-TEMP-IT-001	Functional Specification Template
BTC-TEMP-IT-006	Validation Report

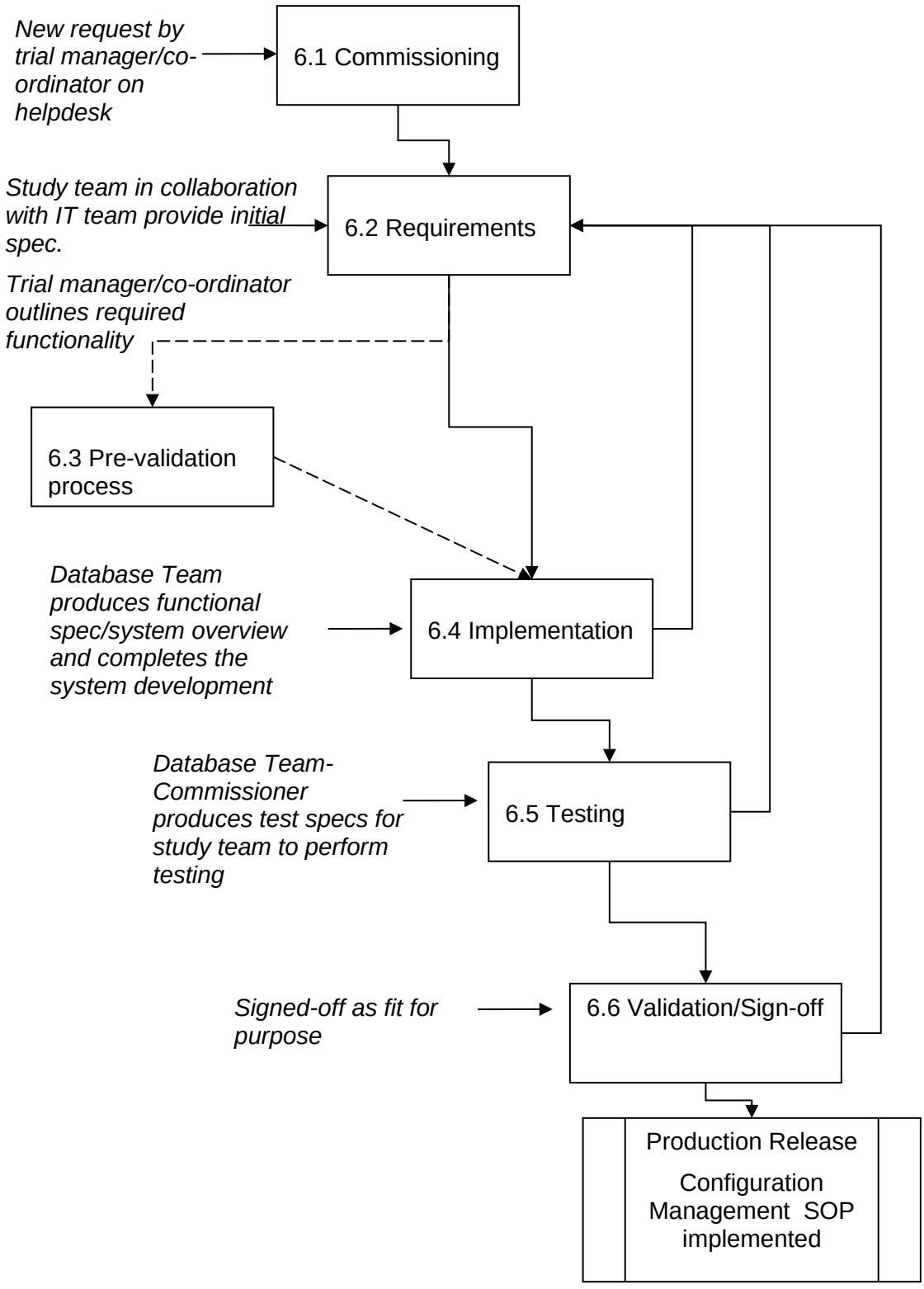
7. CHANGE HISTORY

Previous version and date	New version and date	Summary of review

NIL		New document
V1, 28 Jul 2021	No change	SOP was reviewed and required no change; review date was amended but the SOP version number and date were not changed
V1, 28 Jul 2021	V2, 05 03 2024	Section 5.1: Change control and source control added. Section 5.3: Differentiation between User Requirements document and technical/functional specification. Section 5.5: Deployment plan added. Updated Team name and job titles

8. APPENDICES

8.1 Appendix 1 - Flow Chart of Process



(Dashed lines followed once)