Standard Operating Procedure (SOP)
BRICS System Design Document

Document Information

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Organizations: NINDS DIR ITBP, CIT OIR ISL BIRSS, CNRM

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1. The SOP author sends the SOP SharePoint link to their peers/subject matter experts (SMEs) for review.
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Approved By:

Name	Title	Organization	Approval Date
Yang Fann	IT Director	NINDS DIR ITBP	03/28/19
Matthew McAuliffe	BIRSS Chief	CIT OIR ISL BIRSS	03/28/19
Dominic Nathan	Informatics Core Director	CNRM	03/28/19

Name	Title	Organization	Approval Date
Mark Edwards	IT Manager	NINDS DIR ITBP	03/28/19
Willy Calderon	ISSO	NINDS DIR ITBP	03/28/19

Peer Reviewers

This Standard Operating Procedure was reviewed by the peers (i.e., subject matter experts) listed below. The procedure will be reviewed by the peer reviewers at least annually.

Reviewed By:

Name	Title	Organization	Date
Tsega Gabremichael	Team Lead	CIT OIR ISL BIRSS	03/27/19
Leonie Misquitta	Sr Scientific Advisor	CIT OIR ISL BIRSS	03/27/19
Dominic Nathan	Informatics Core Director	CNRM	03/27/19

Distribution List

This Standard Operating Procedure impacts the individuals on this Distribution List. The SOP author should notify everyone on this list about changes to this SOP *within one week* of NINDS approval.

Distributed To:

Name / Department / Group / Team
Yang Fann
Matthew McAuliffe
Dominic Nathan
Willy Calderon

1. Introduction

1.1 Overview

System Design document describes the system requirements, operating environment, system and subsystem architecture, database design, human-machine interfaces and external interfaces. The intended audience for this procedure includes the groups/individuals listed below:

- NINDS DIR Clinical Informatics Development Team
- CIT OIR ISL BIRSS Development Team
- Business stakeholders and partners

1.2 Purpose

The purpose of this System Design Document is to provide a description for how the new BRICS will be constructed. The System Design Document was created to ensure that the design meets the requirements specificed in the System Requirements Specification (SRS). BRICS is a collaboration and extensible web-based system designed to support the collection of research studies and clinical trials. It consist of modular components including:

- Global Unique Identifier (GUID) tool
- Data Dictionary tool
- Data Repository
- Meta Study
- Protocol and Form Research Management System (ProFoRMS)
- Query Tool
- Account Management

1.3 Scope

This Standard Operating Procedure is applicable to the collection of components that comprise custom software development of the BRICS and its associated systems such as CiSTAR, CASA, and ProFoRMS at NINDS, CIT and CNRM.

1.4 Roles and Responsibilities

The following table defines the System Design roles and responsibilities and also serves as the list of points of contact for issues and concerns relating to the BRICS system design.

Name	Title	Responsibility
Clinical Trial Unit	NINDS DIR CTU	NINDS Governance committee for approvals
Steering Committee	Informatics Core	CNRM Governance committee for approvals
Yang Fann	BRICS Co-Director NINDS IT Director	Authorizing Official to operate Approve requirements
Matthew McAuliffe	BRICS Co-Director CIT BIRSS Chief	Approve requirements
Dominic Nathan	Informatics Core Director	Manage the project
Leonie Misquitta	Sr Scientific Advisor	Provide scientific consulting
Tsega Gebremichael	Sr Software Engineer	Provide technical guidance
Change Control Board	Subject Matter Experts	Manage and approve change requests and system enhancements
Business, Product owner, Instance Program Manager	Key Stakeholders	Review and validate requirements and work products
NINDS/CIT Clinical Informatics Development team	Software Engineer	Responsible for understanding and following the scrum development processes outlined in this document.

1.5 Key Words

The following key terms are used in this SOP.

- BRICS – Biomedical Research Informatics Computing System
- CiSTAR – Clinical Informatics System for Trials and Research
- CASA – Collection Access Sharing Analytics Platform
- CNRM – Center for Neuroscience and Regenerative Medicine
- SRS – System Requirements Specification

1.6 Design Constraints

This section identifies any constraints in the system design, trade-off analyses, conflicts with other systems, or assumptions made by the project team in developing the system design. No design constraints have been identified.

2. System Architecture

This section describes the overall system software and hardware architecture for the BRICS project.

2.1 Software Architecture

The platform architecture comprises three layers as shown in Figure 1 below:

a) Presentation Layer

b) Application Layer

c) Data Layer

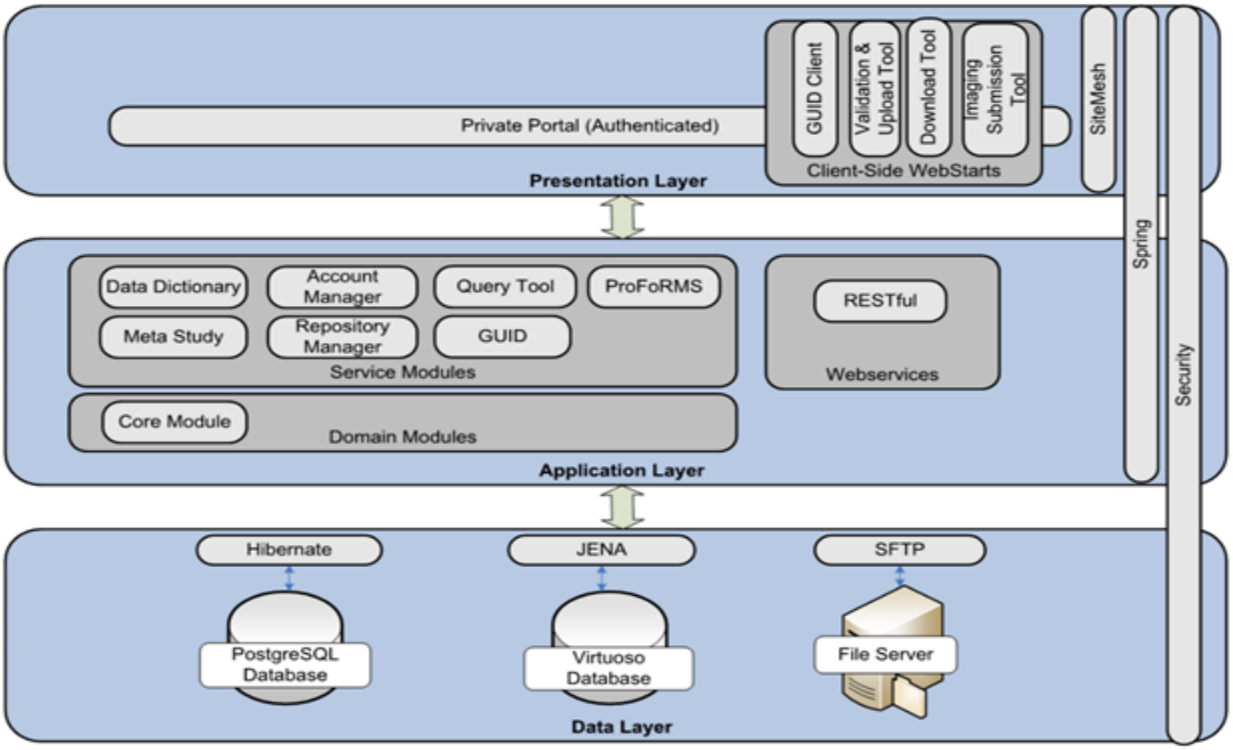


Figure 1. BRICS Platform Architecture

The Presentation Layer serves as the entry point to the BRICS portal, allowing users to securely login by verifying that their credentials are valid, and displaying requested information on the portal web page. The presentation layer uses various open source technologies and libraries, including Java Server Pages (JSP), jQuery, JavaScript libraries (e.g. such as Backbone.js, Asynchronous JavaScript), and XML (AJAX), etc. to make web-pages interactive. This layer also includes WebStart applications: the Global Unique Identifier (GUID) client, Validation and Upload tools, and Download and Image Submission tools, all of which run on users' machines. Although these WebStart tools run on users' machines, they make secure calls to WebServices to obtain data for users. Once the data is returned from the WebServices, it is processed and displayed on the user interface.

The Application Layer processes information received from the Presentation Layer and communicates the requested information back to the Presentation Layer. The Application Layer is responsible for the logic that determines the fundamental capabilities of the BRICS modules and tools. There are seven service modules within the Application Layer that are integrated together to provide a collaborative, extensible web-based data capture, processing, data repository, and access environment(s). The modules (shown in Figure 1) comprise the GUID tool, Data Dictionary (DD), Data Repository, Meta Study, Protocol and Form Research Management System (ProFoRMS), Query Tool, and Account Management.

To communicate and exchange information between the modules, representational state transfer (RESTful) Webservices are used. For example, when submitting data-to-data repository, the data is validated against the Data Dictionary definition. During the process of data validation, the dictionary's Webservice is called to acquire the definition of the given form structure and CDEs, including permissible values.

The Data Layer receives data from the Application Layer. Based on the user's request, the data layer executes queries against a database and returns the results back to the Application Layer. Using the same data validation example, the data layer queries the database to obtain detailed information about the given form structure and sends that information back to the Application Layer. The Data Layer consists of open source databases such as PostgreSQL and Virtuoso databases, and file servers, and data persistence frameworks. The Virtuoso database is used to store the Query Tool and parts of the Data Dictionary data. The Repository module uses the PostgreSQL database to store and retrieve data. Also present are Object-Relational Mapping (ORM) frameworks such as Hibernate and Apache Jena, which are open-source libraries and are used to store and retrieve data from databases.

The three layers intercommunicate with each other, enabling BRICS developers to deploy reusable components for the platform. The layered architecture makes it easier to maintain and allow for scalability. Maintenance is easier because some of the components are shared by different parts of the platform and changes can be applied simultaneously. For example, the same dictionary Webservice is used by the ProFoRMS and Imaging Submission tools. A change to the dictionary Webservice logic only needs to be done once, within the Application Layer, to make it available throughout the system without the need to change code in any other layers. This allows code reuse, minimizes redundancy, and makes maintenance easier.

2.2 Hardware Architecture

BRICS design is based on existing hardware architecture at NIH. The physical infrastructure is located within the NIH Data Center in Bethesda, Maryland, supported by an alternate backup site in Sterling, Virginia. The infrastructure is supported by Storage devices (Dell EqualLogic) and switches (10GbE Cisco) that connect to host servers (Dell R630). A virtualized environment (using VMware Inc. products) is used to host the various applications and services. The operation of various BRICS instances is 24x7 with redundancies and backups done on a nightly schedule.

3. Database Design

Structured data stored in the database will be searchable and sortable in order to meet the reporting requirements. The database field names are consistent with all fields built into specific module and tool. The final design of the DBMS includes the following data dictionary information:

- Refined logical model - normalized table layouts, entity relationship diagrams, and other logical design information.
- A physical description of the DBMS schemas, sub-schemas, records, sets, tables, storage page sizes, etc.
- Access methods (such as indexed, via set, sequential, random access, sorted pointer array, etc.)
- Estimate of the DBMS file size or volume of data within the file, and data pages, including overhead resulting from access methods and free space.
- Definition of the update frequency of the database tables, views, files, areas, records, sets, and data pages, estimate the number of transactions.

The BRICS database will be backed up in accordance with NINDS and CIT Security Plicies and Guidelines and provide a failover capability to revert to in the event of a database corruption or system failure.

Additional technical specifications of the database design can be found in the database management system (DBMS) addendum to the Project Plan.

4. System Security and Integrity Controls

BRICS design incorporates several security and integrity controls to ensure the system and its associated systems are continually protected. This is done through a multi-tiered approach to ensuring data integrity is achieved through only authorized user functions and assignments.

The first design consideration is user authorization and permissions. These users will be unable to perform any transactions outside of their assigned areas. System administrators will grant proper roles and operating boundaries for each of their assigned users.

The next design consideration is to establish control points. Firewalls will be placed to partition the functions each instance is able to perform. The purpose is to reinforce work areas, permissions, and access to prevent any duplication, unintentional changes, or malicious changes of data.

The system design also incorporates the important audit trail capability which will allow administrators to track the history of all users in order to provide history, error identification, and accountability for system users.

Security is a critical component during biomedical informatics platform development. Planning for security must carry out as initial part of design work because maintaining privacy of patient data is essential for meeting various compliance regulations (e.g. HIPPA privacy rule). The BRICS security design is compliant at the Federal Information Security Modernization Act (FISMA) Moderate level. Confidentiality of research subjects is maintained, but data and study protocols are shared to promote scientific collaboration. Appropriate controls and assurance requirements conform to the Federal Information Processing Standards (FIPS) 200 and NIST SP 800-53 Revision 3, and the Department of Health and Human Services policies for information systems.

5. Modular Process Design

Modular design emphasizes separating the functionality of a program into independent module. BRICS platform offers a suite of tools to promote standardization, communication, and collaboration across the research community and a data repository to hold genetic, phenotypic, clinical, and medical imaging data. These plug-and-play

modules can be shared across disease categories or deployed and branded independently.

The platform architecture and the associated functionalities discussed in the system software architecture (section 2.1) provided the basis for implementing a complete Biomedical Research Data Life Cycle Management (BRDLCM) methodology. The essential processes in the BRDLCM are as follows:

- data de-identification
- preparation of submission information packages for data collection
- development of archival information packages for storage within established repositories
- creation of access information packages with tools and techniques for data analysis, sharing and reuse.

5.1 De-identification of Data

BRICS uses the GUID method to support the storage of de-identifying patient/subject research data. The GUID is a Global Unique Identifier for each study participant that allows researchers to aggregate and share a participant's data without exposing personally identifiable information (PII). The GUID is made up of random alpha-numeric characters and is not generated from PII/PHI. The GUID is generated at the researcher's site by using the BRICS GUID generation tool. The PII fields used as part of the hashing process can include complete legal given (first) name of subject at birth, middle name (if available), complete legal family (last) name of subject at birth, day of birth, month of birth, year of birth, name of city/municipality in which subject was born, and country of birth. The PII data is not sent to the server but rather one-way encrypted hash codes are created and returned to the server, allowing the PII to reside only on the researcher's computer. A random number, the GUID, is generated by the server and returned to the researcher. The GUIDs have been designed to be BRICS 'instance' specific, stored within a MongoDB database (illustrated in Figure 2). The GUID is the primary subject identifier.

In addition, the GUID server can be configured to support multiple BRICS instances thereby making the GUID truly more "global". This is especially useful in multi-center clinical trials, and investigations where subjects can be enrolled across studies or repositories.

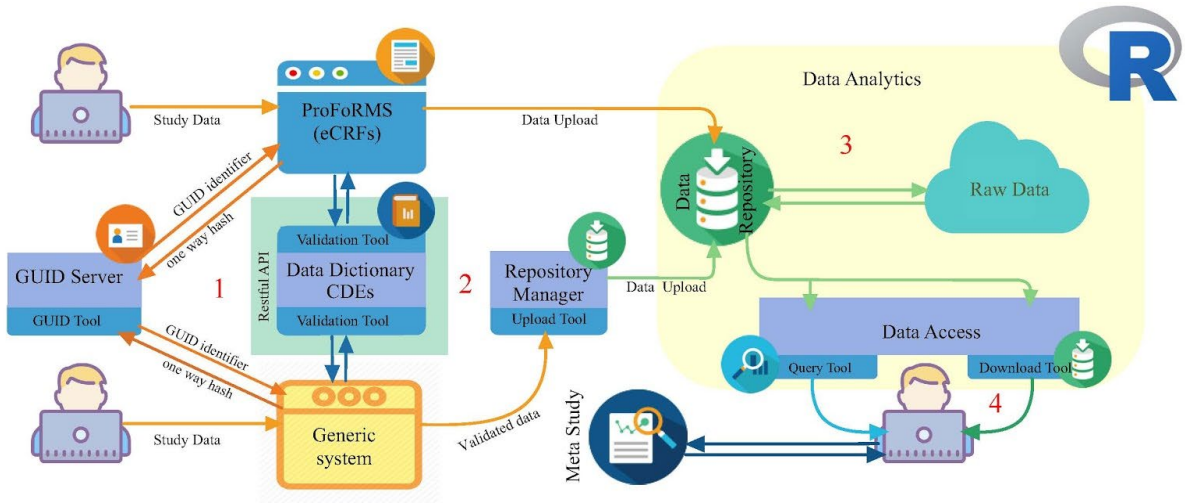


Figure 2 - Schematic representation of making data Findable (F), Accessible (A), Interoperable (I), and Reusable (R) by the deployment of BRICS modules.
Data lifecycle is indicated by 1- preparation of Submission Information Packages (SIPs), 2 - development of Archival Information Packages (AIPs), 3 - storage of AIPs, and 4 - access to Dissemination Information Packages (DIPs).

5.2 Data Submission and Processing

User support is provided for data stewardship activities that include training and assistance to authorized users, for CDE implementation, data validation and submission to the repositories. Access is controlled by a Data Access Committee (DAC) that reviews studies for relevance to a BRICS instance. In addition, access to the system is role based and specific permissions are associated with roles such as PI, data manager, and data submitter.

Researchers are responsible for most of the data submission activities, which includes study FS approval, eForms review, curation, mapping of data elements, and providing associated study documentation. Data curation is carried out by identifying the available standard forms and CDEs in the Data Dictionary. In the event no corresponding CDEs are available, then the user can define the data elements and obtain approval during the submission process.

There are two routes of data submission:

a) One approach uses the ProFoRMS tool (Figure 2, stage 1) for clinical data acquisition that supports scheduling subject visits, collecting data, adding new data, modifying previously collected data entries, and correcting discrepancies that are tracked and maintained in audit logs (in compliance with 21 CFR Part 11).

b) The other data submission mode uses a generic data collection system (e.g. RedCap), where output is uploaded into the repository module (Figure 2, stage 2).

Both routes of data submission validate the submitted data using specific data dictionaries for a BRICS instance.

The Validation Tool supports the data repository and ProFoRMs modules, by using common data elements with defined range and value metrics for data quality checks, to make data reusable **(R)**. Once the data has been validated and uploaded via the submission upload tool, data is stored in its raw form within the repository module in a database that can be accessed by the Query Tool (Figure 2, stage 3).

5.3 Data Storage and Management

The data Repository module for the various BRICS instances serves as a central hub, providing functionality for defining and managing study information and storing the research data associated with each study (Figure 2, stage 3). When an investigator is authorized to submit data to a BRICS instance, they can organize one or many datasets into a single entity called a Study. In general terms, a 'Study' is a container for the data to be submitted, allowing an investigator to describe, in detail, any data collected, and the methods used to collect the data, which makes data accessible **(A)**. In addition, the repository module provides download statistics for specific studies, enabling the investigator to obtain information on their respective data that has been downloaded for other research activities, and overall increase data sharing and collaboration for additional research goals. Depending on the research studies, BRICS based repositories can host high throughput gene expression, RNA-Seq, SNPs, and sequence variation data sets (Figure 2, stage 3).

Through the Repository user interface, researchers can generate Digital Object Identifiers (DOIs) that can be referenced in research articles. BRICS mints its DOIs through the Interagency Data ID Service (IAD), which is operated by the U.S. Department of Energy Office of Scientific and Technical Information (OSTI). The IAD service acts as a bridge to DataCite, which is one of the major registries of DOIs.

5.4 Data Sharing

There are two sharing options – private and shared. By default, the system assigns the sharing preference as 'private' where only users to that specific study can access the data. When the data is in the private state, the PI has the option to share data with specific collaborators (preferential sharing). After a certain period (defined by the data sharing policy for each BRICS instance), the data enters a new 'shared' state, which is accessible **(A)** to the approved users.

Raw data is available for querying within 24 hours of data submission. For the data to be available via the Query Tool module, the raw data is processed through the 'MIRTH' tool (integrated interface engine) and Resource Description Framework (RDF) data

interchange tool (Figure 2, stage 4). Shared data is available to all system users (approved by DAC) to search, filter, and download via the Query Tool functionality. The Query Tool offers three types of functionalities - (a) querying and filtering data, (b) data package downloads based on query, and (c) data package to the Meta Study module.

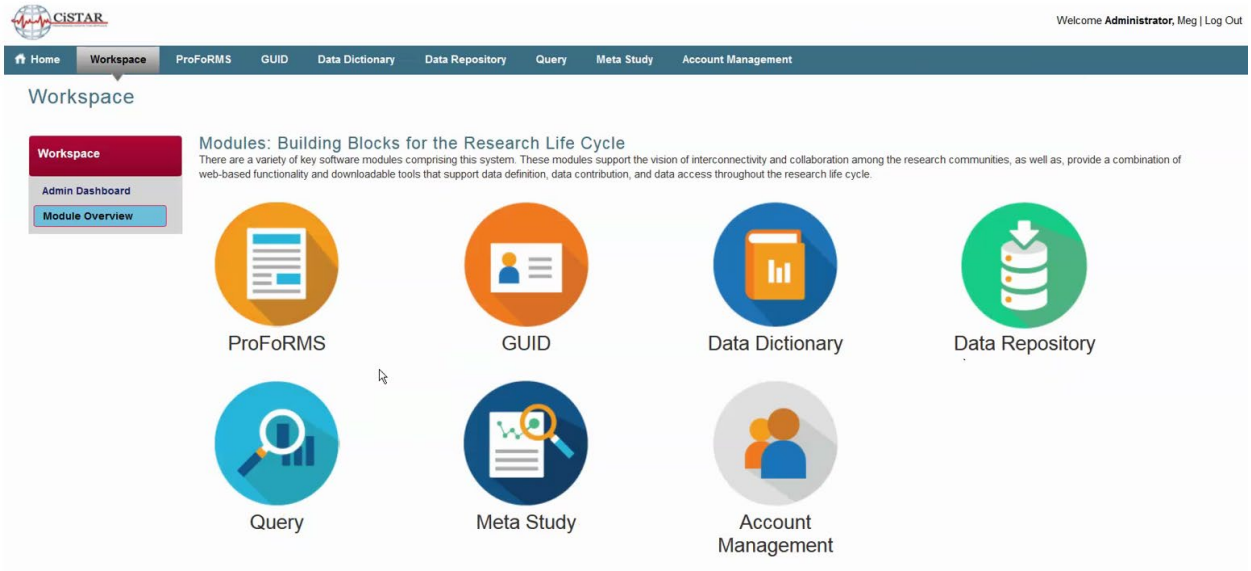
The Meta Study module is used for meta-analysis of the data as well as a collaboration tool between scientific groups. A Meta Study contains findings from studies that can be aggregated by researchers to conduct additional analysis. The Query tool can also support the statistical computing language R as well as structured visualization of data (Figure 2, stage 4).

5.5 Data Access

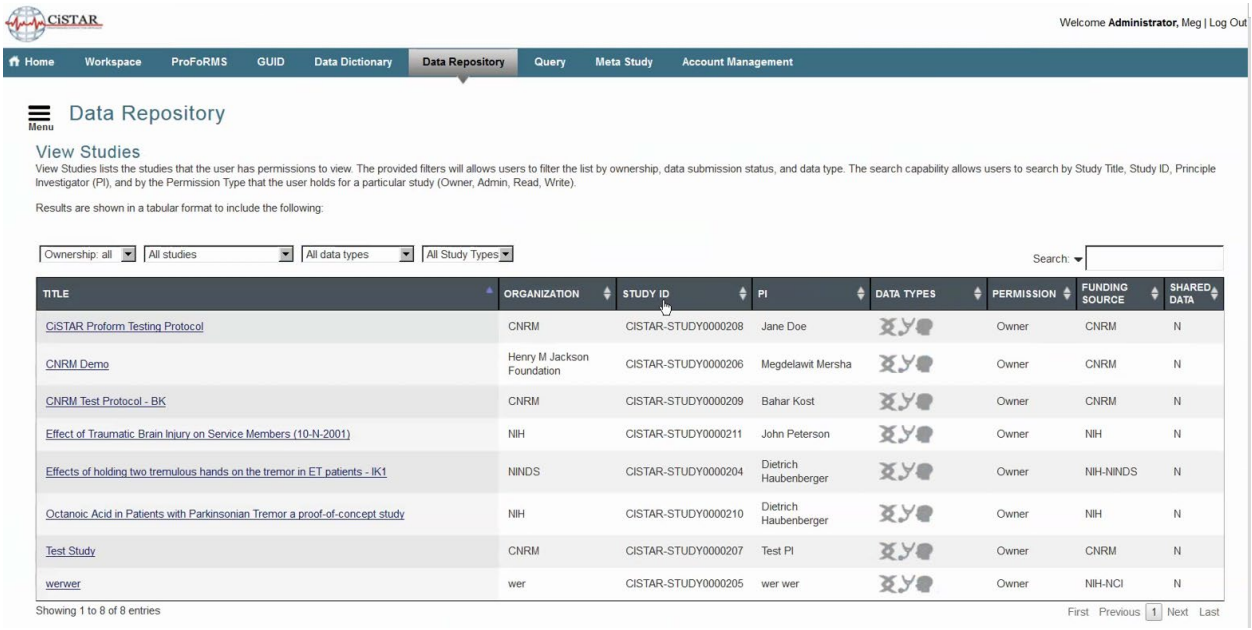
The Query Tool (QT) enables users to browse studies, forms and CDEs, to select clinical data, use filters, and to sort and combine records. Using the GUID and a standard vocabulary via CDEs in forms, the QT provides an efficient means to reuse data by searching through volumes of aggregated research data across studies, find the right datasets to download and perform offline analysis using additional tools (e.g. SAS, SPSS, etc.). The statistical 'R-box' tool, integrated with BRICS, has been incorporated in the QT, to support analysis without having to download data.

6. GUI Interface Design

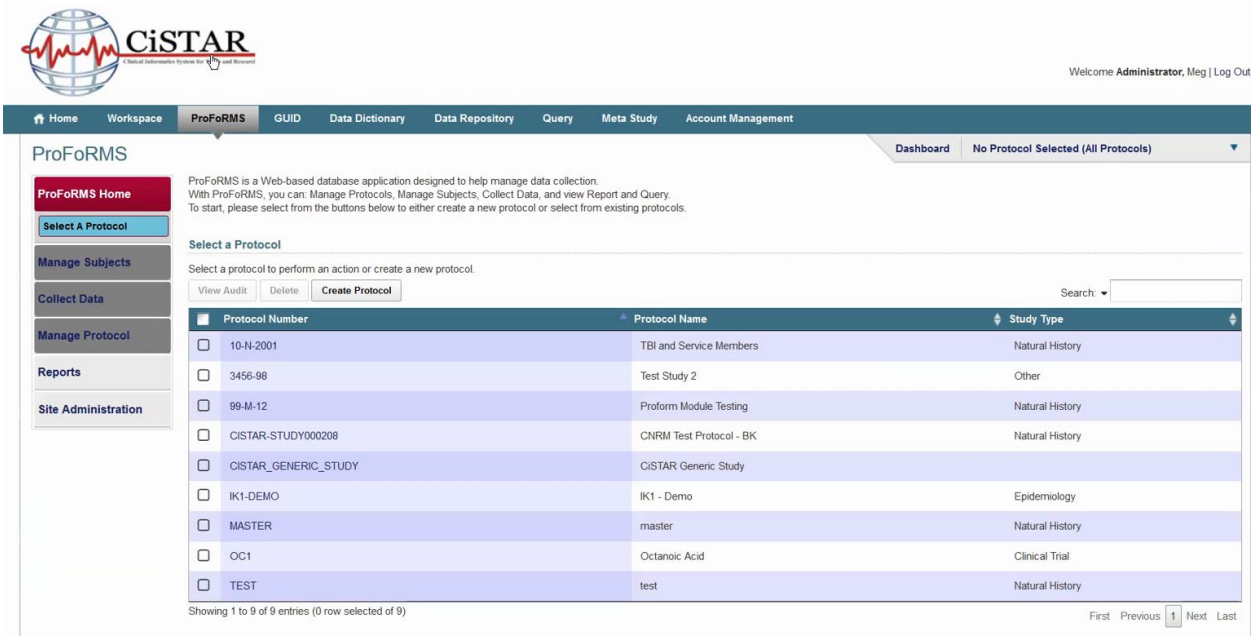
All modules in the BRICS platform will have the similar graphical user interface to prove the users a consistent user experience across different modules of the system. Each user's name will be displayed on the top right corner of the banner after login. All the screen shots or mockups below represent one of the systems.

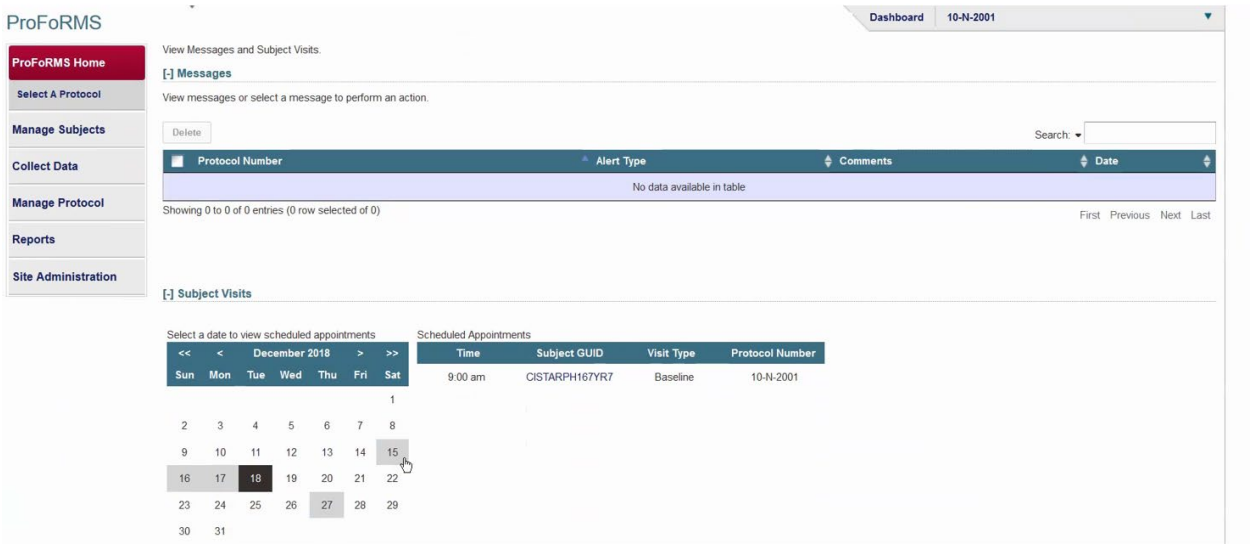


Data Repository is the central hub of the BRICS system, providing functionality for defining and managing study information, and for contributing, uploading, and storing the research data associated with each study.

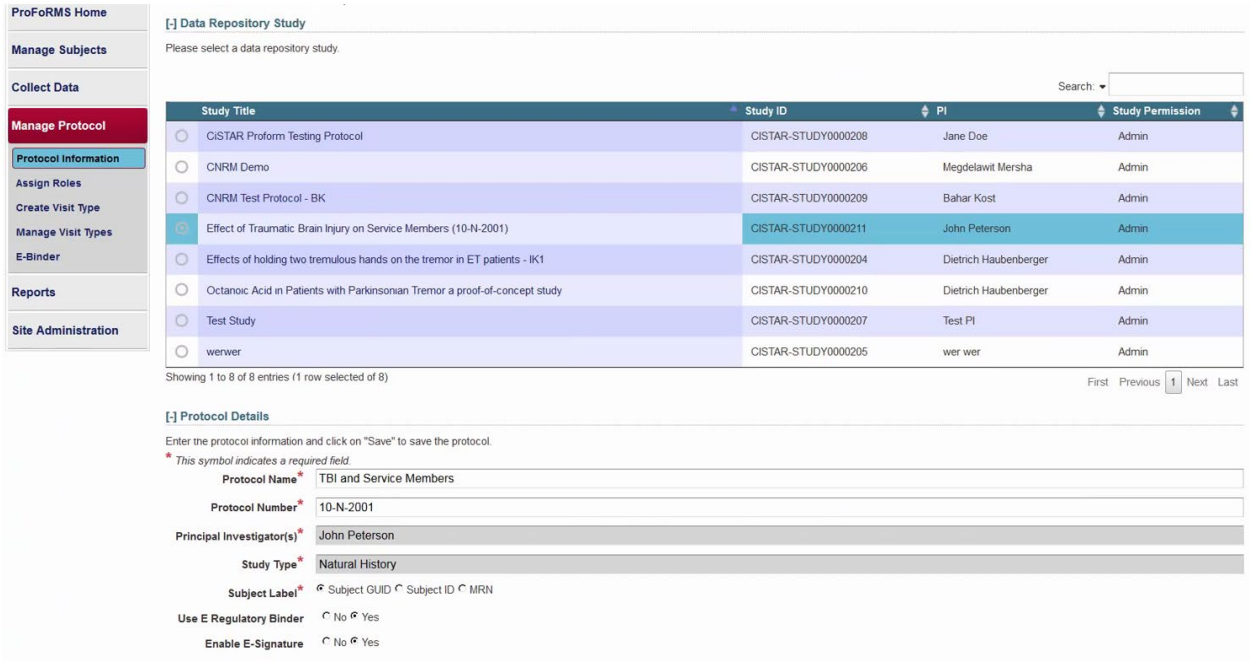


Researchers can define electronic case report forms, schedule and collect clinical data and then export, analyze, and report on the data using the ProFoRMS module.



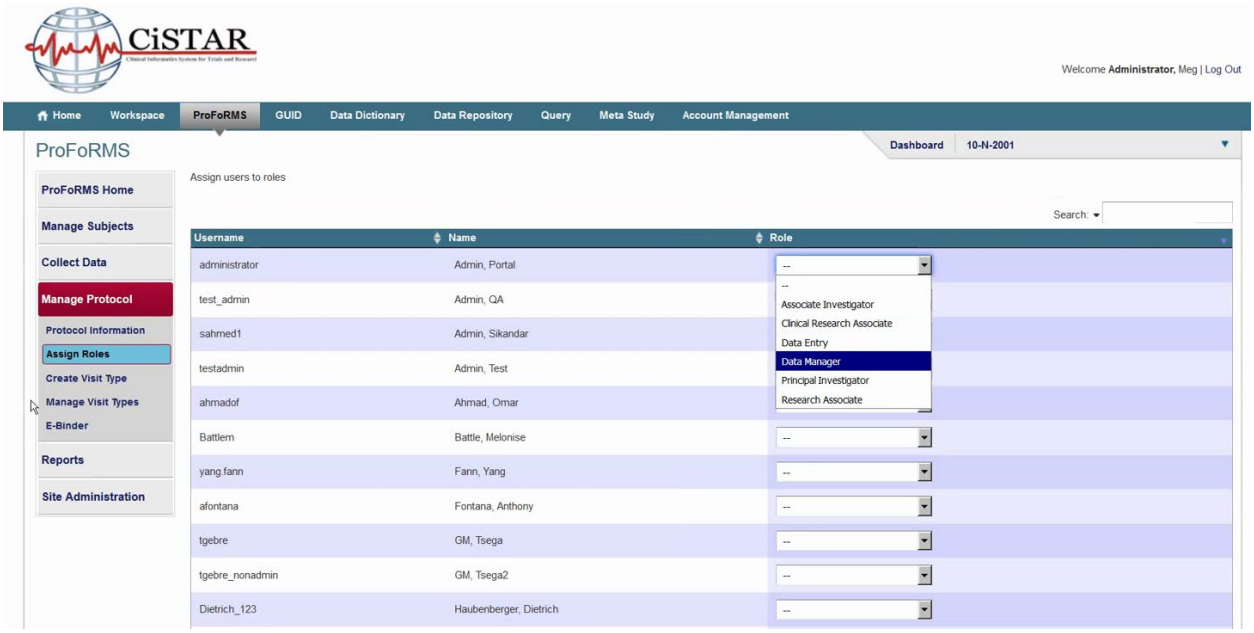


ProFoRMS – Manage Protocol – Protocol Information

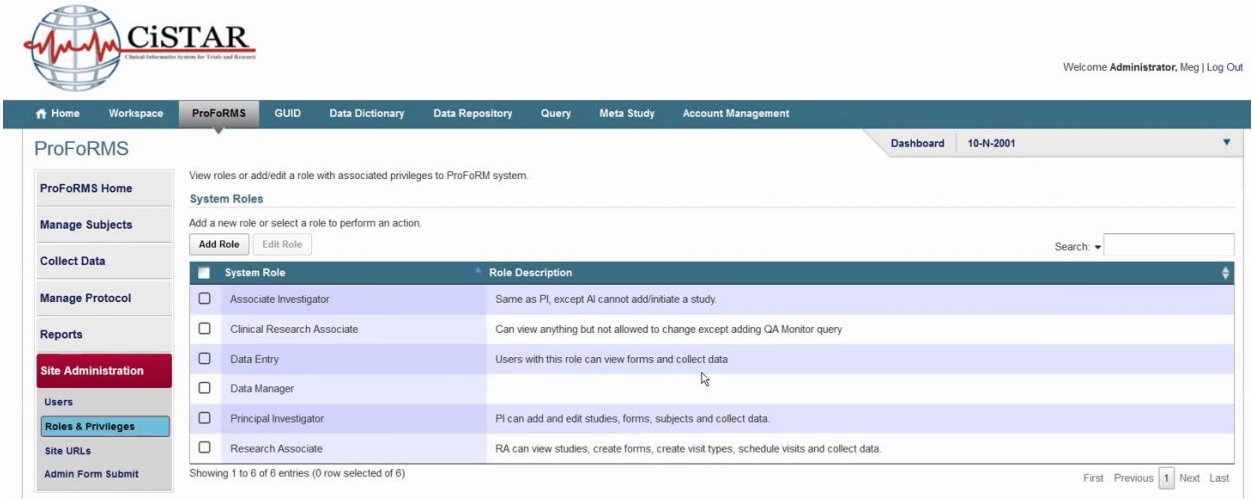


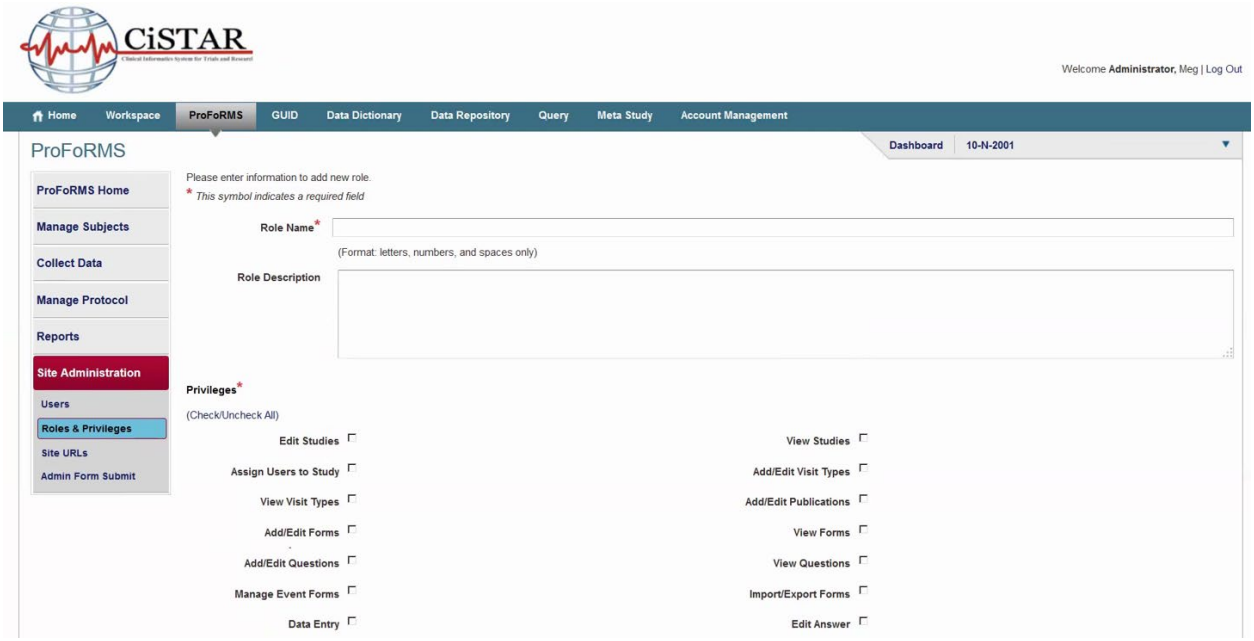
ProFoRMS – Manage Protocol – Assign Roles

The user roles depending on the study setup can be as follows: Principal Investigator, Associate Investigator, Clinical Research Associate, Research Associate, Data Entry, Data Manager, etc.



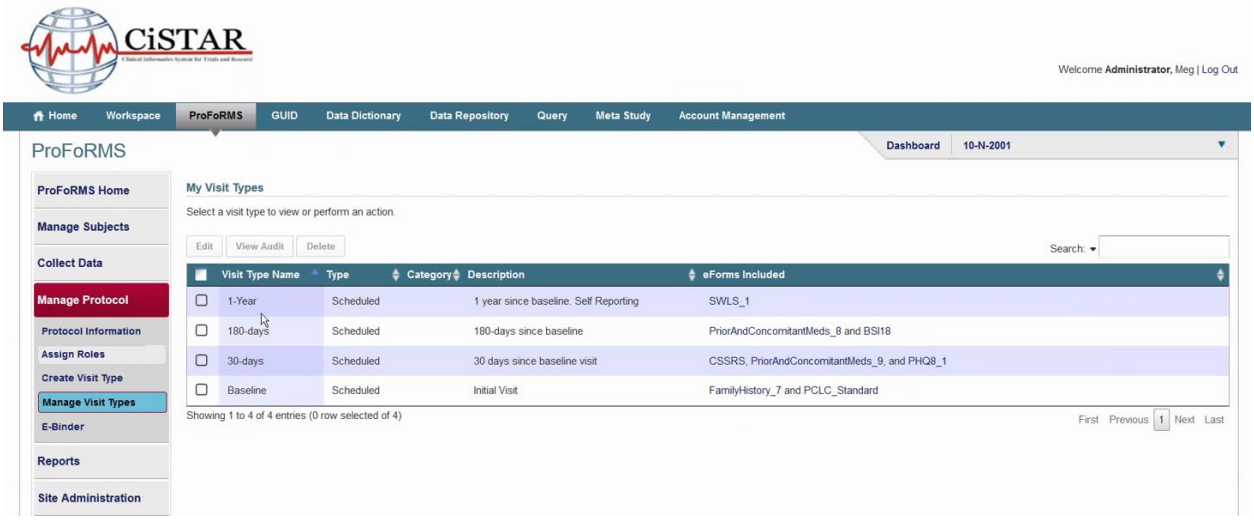
ProFoRMS – Site Administration – Roles & Privileges



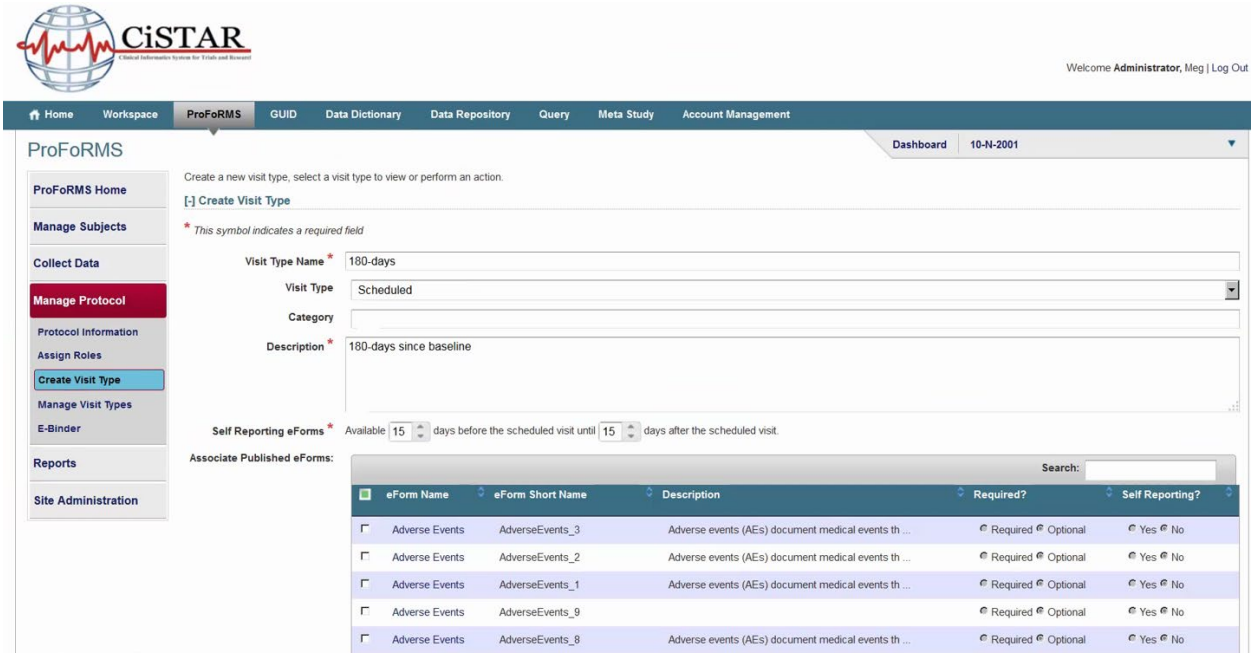


ProFoRMS – Manage Protocol – Manage Visit Types

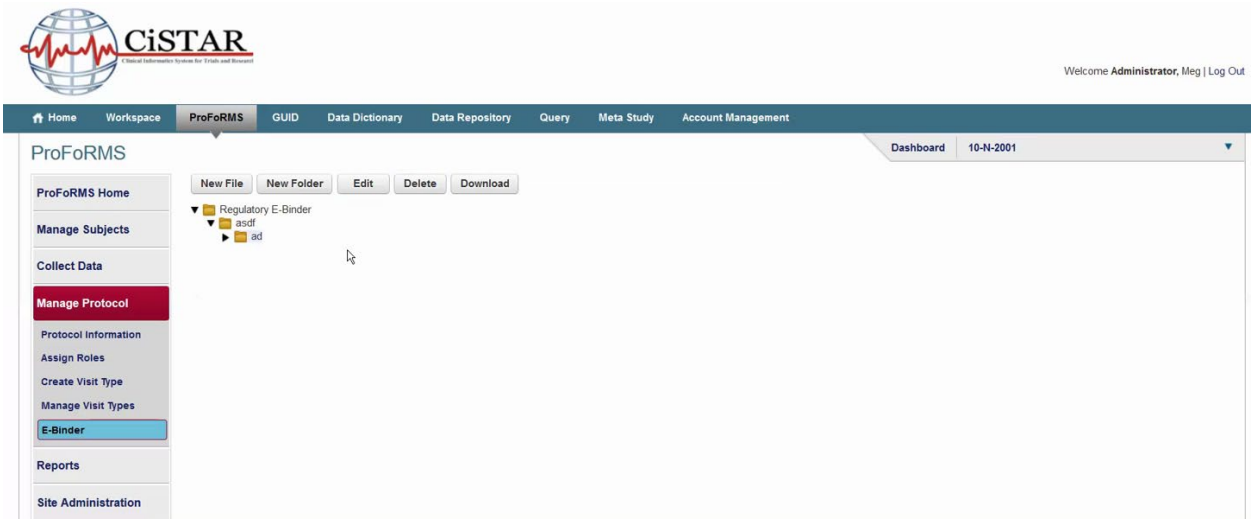
Researchers can add and edit study information, schedule and create study visits, manage visit types for individual subject across multiple studies within the system, and upload subject related documents.



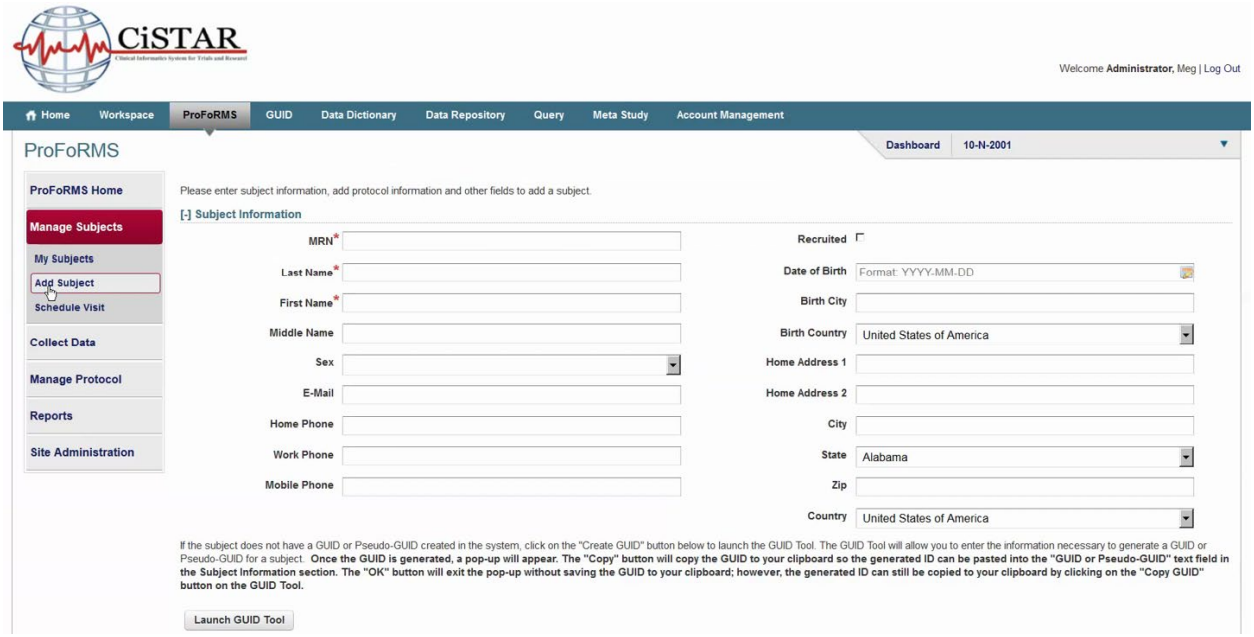
ProFoRMS – Manage Protocol – Create Visit Type

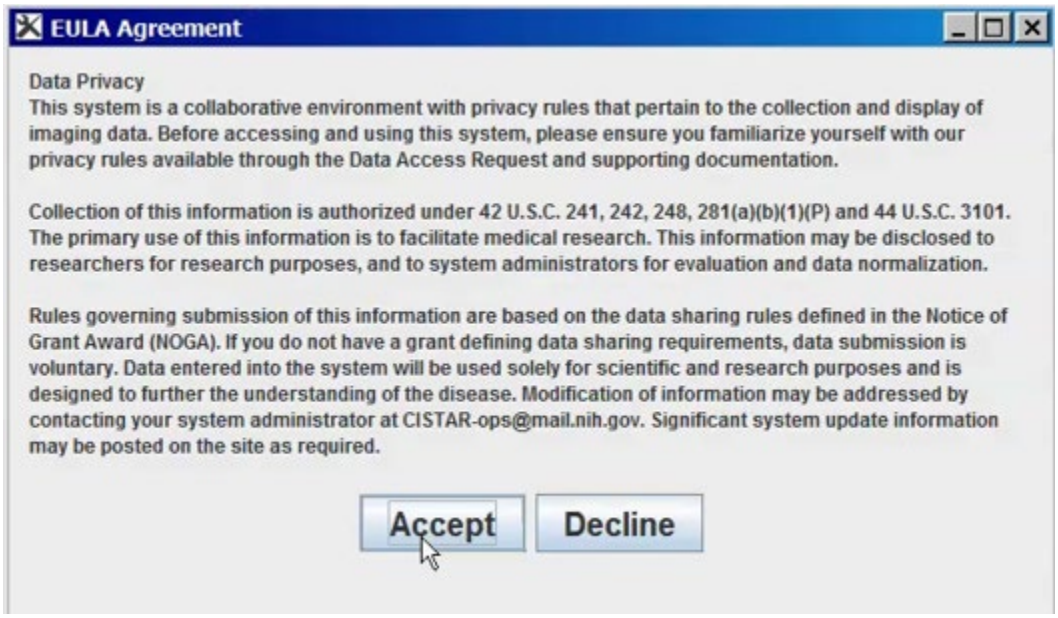


ProFoRMS – Manage Protocol – E-Binder



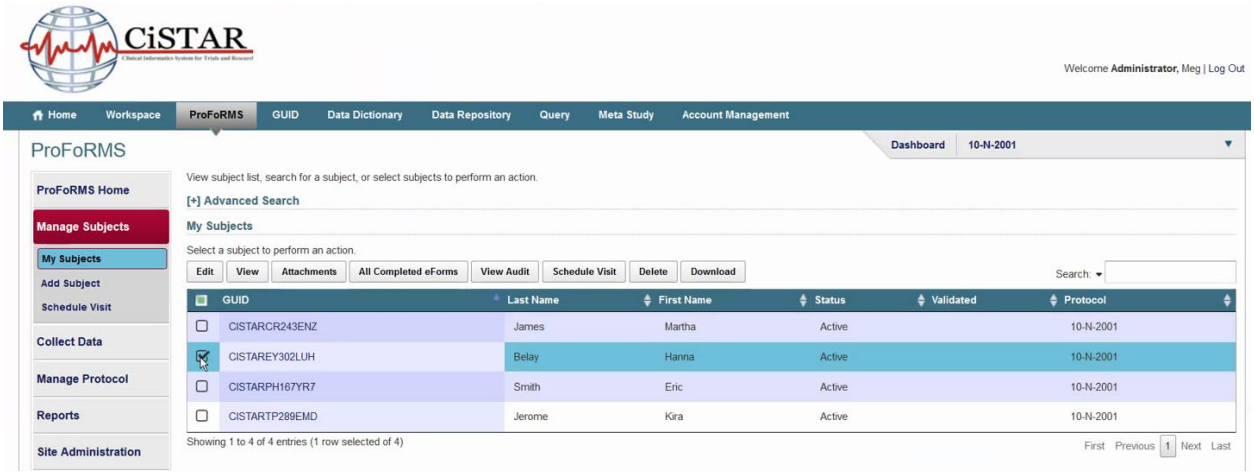
ProFoRMS – Manage Subjects – Add Subject



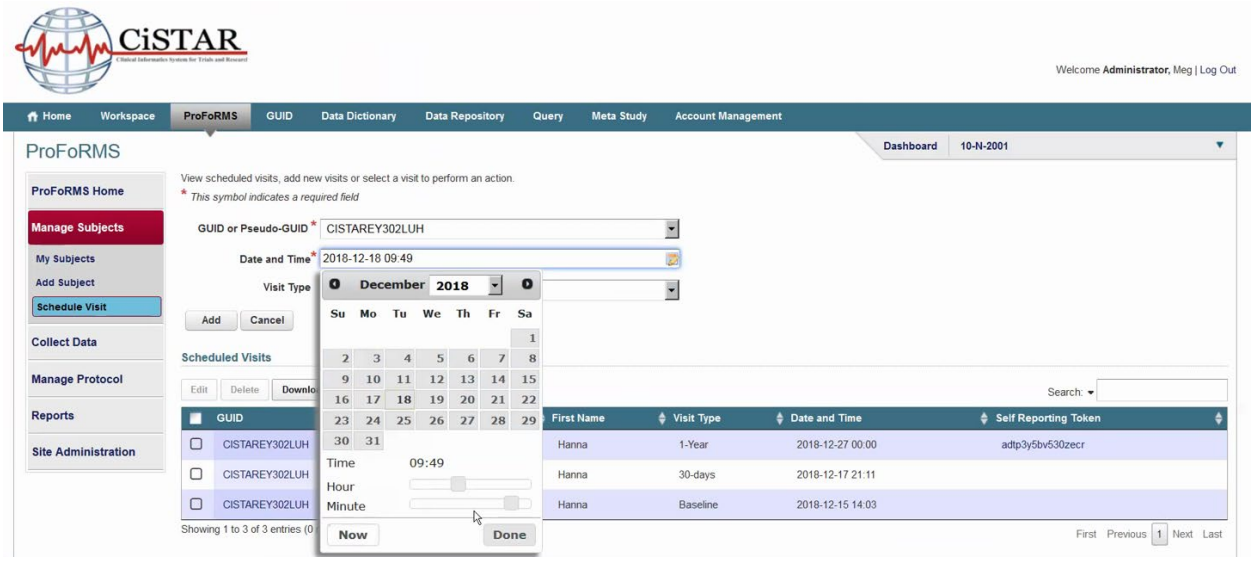


ProFoRMS – Manage Subjects – My Subjects

The My Subjects page lists all subjects currently enrolled into the protocol. The user can sort the list of subjects by GUID, Last/First Name, Status, etc. by clicking on the column heading. This help the researchers to add and edit subject information, schedule subject visits, upload documents, and track across multiple studies.

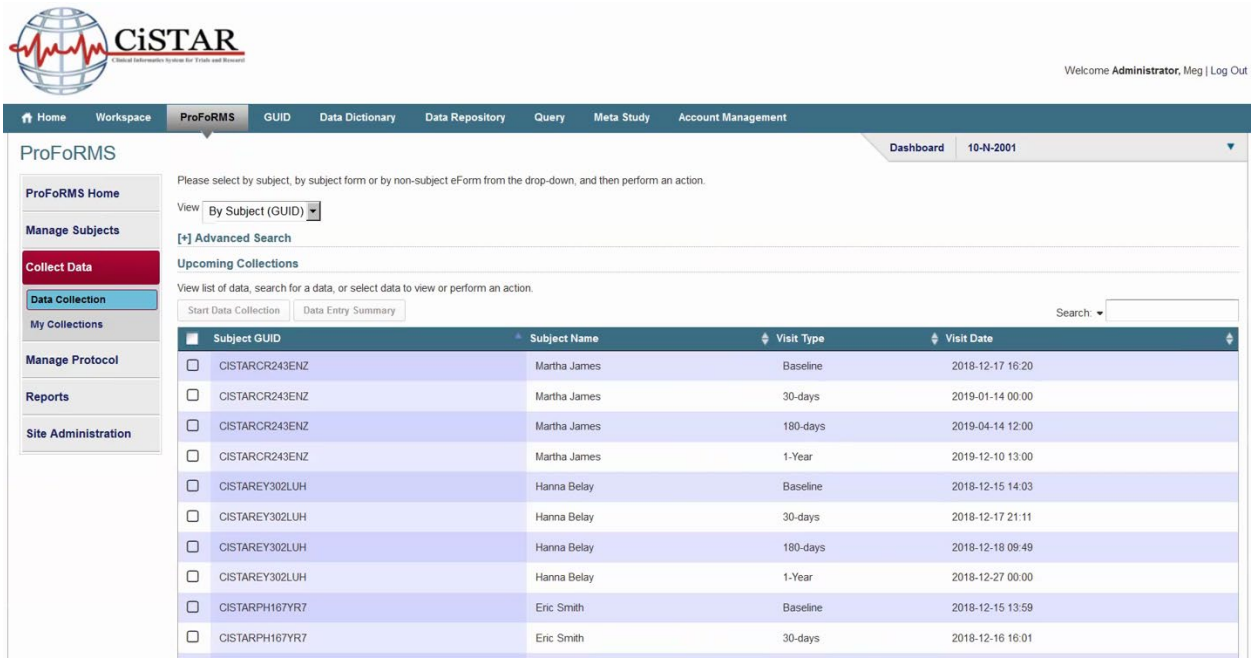


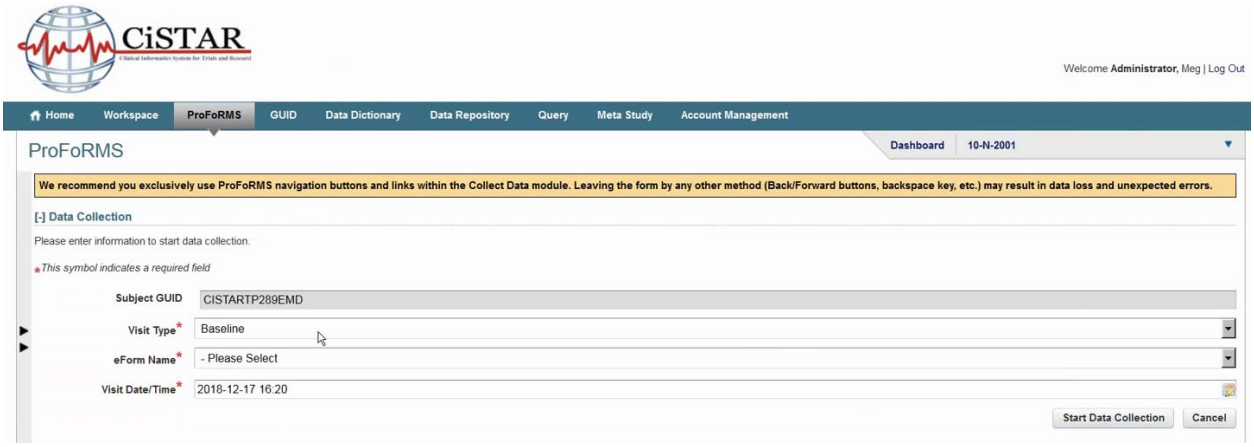
ProFoRMS – Manage Subjects – Schedule Visit



ProFoRMS – Collect Data – Data Collection

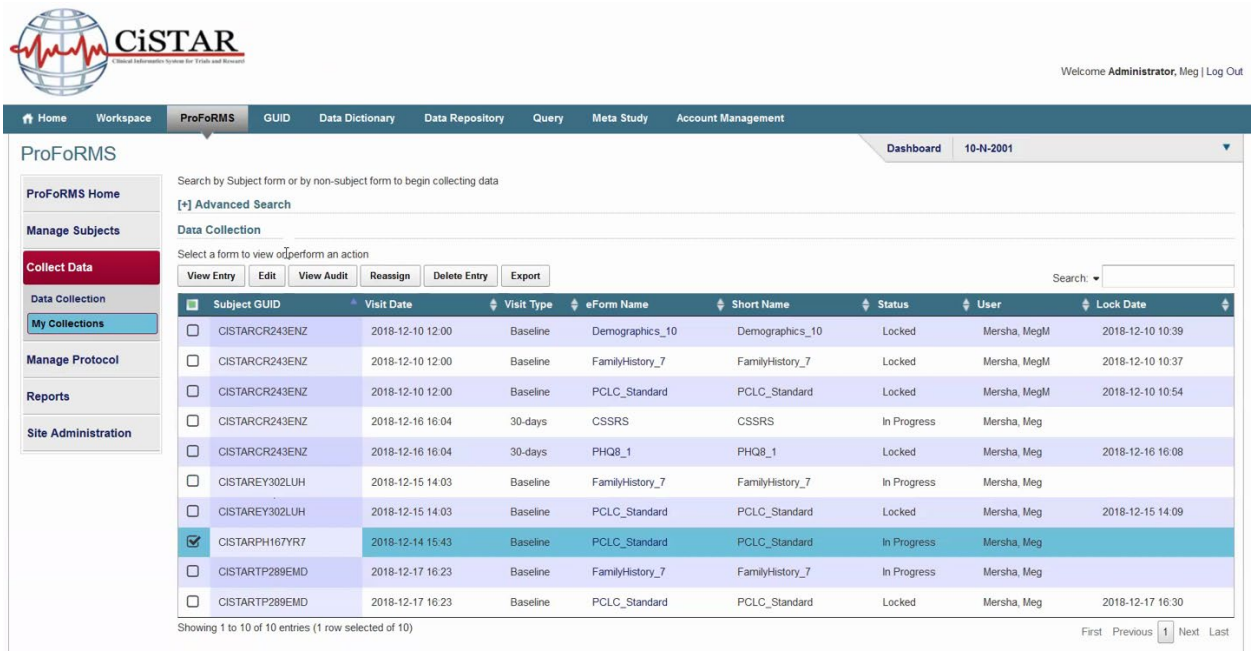
Clinical data may be captured electronically at its source, or in paper form and later transcribed into the system. Researchers can manage protocols, manage subjects, collect data, view Report and Query, perform quality assurance, monitor subject safety, and view audit logs to assure the changes are tracked in the system.

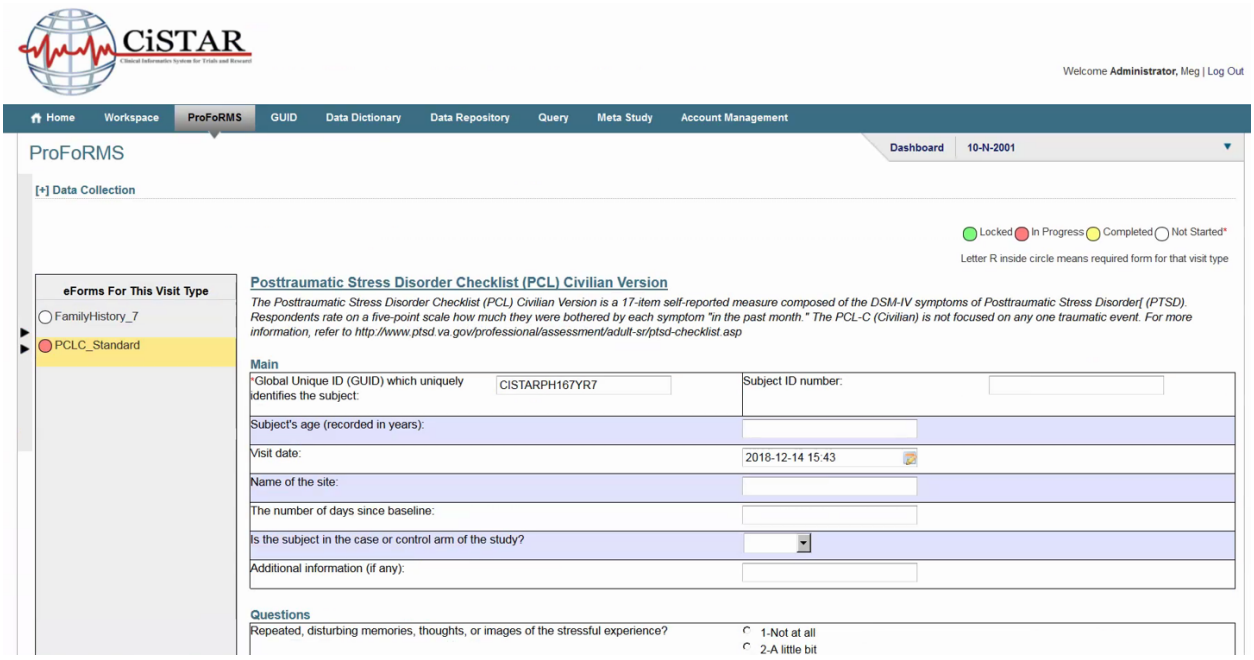




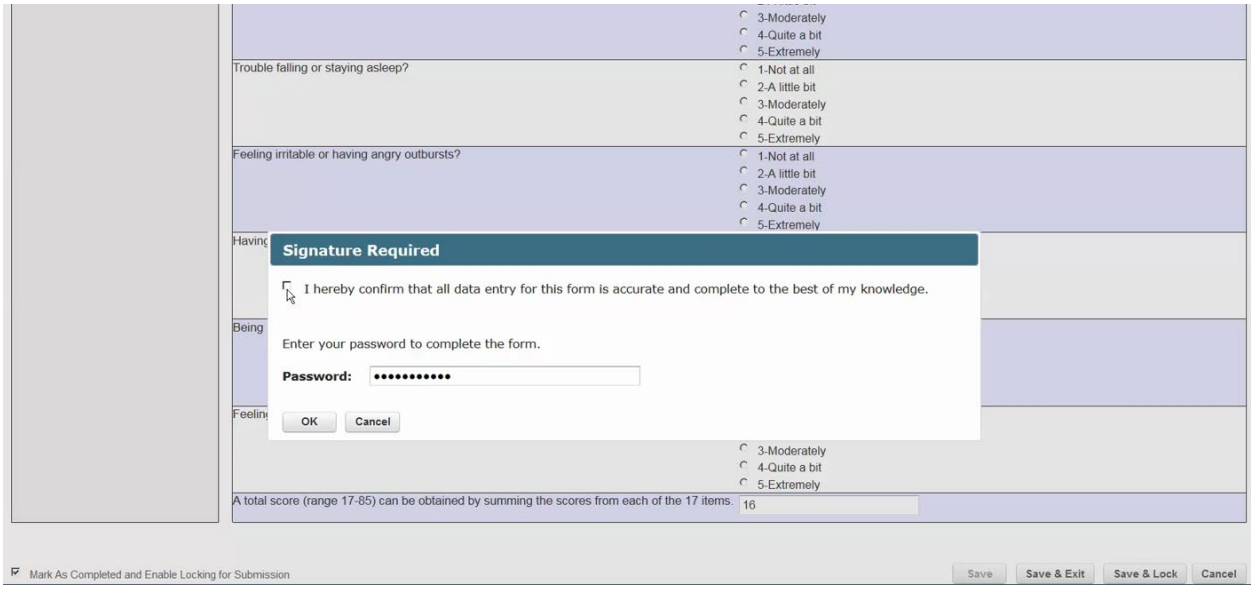
ProFoRMS – Collect Data – My Collections

My Collections view will be displayed after entering data in the form and click the Save button.

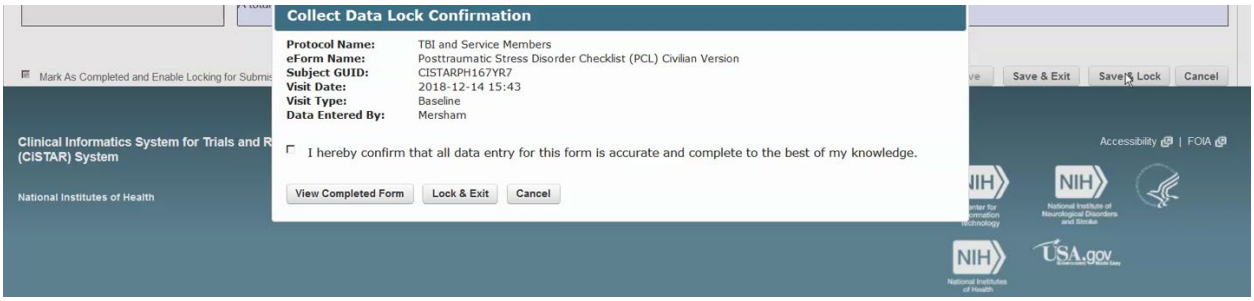




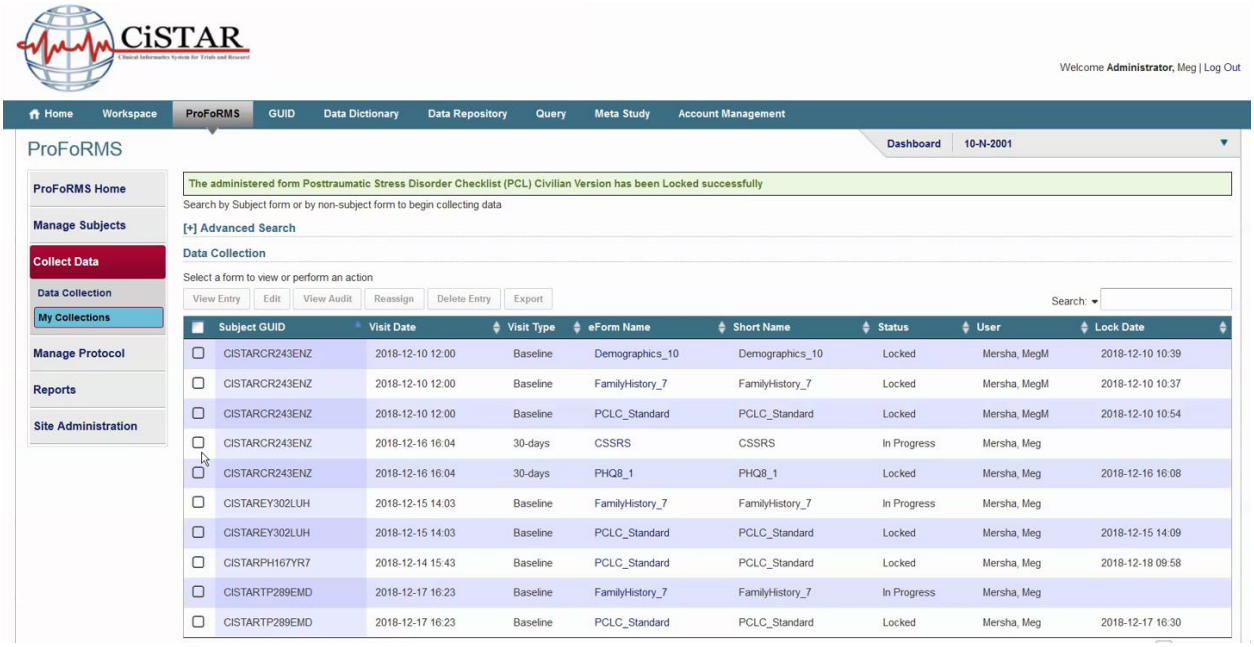
Forms will continue to show as “In Progress” until they are locked. Data should not be locked until reviewed and ready for final submission.

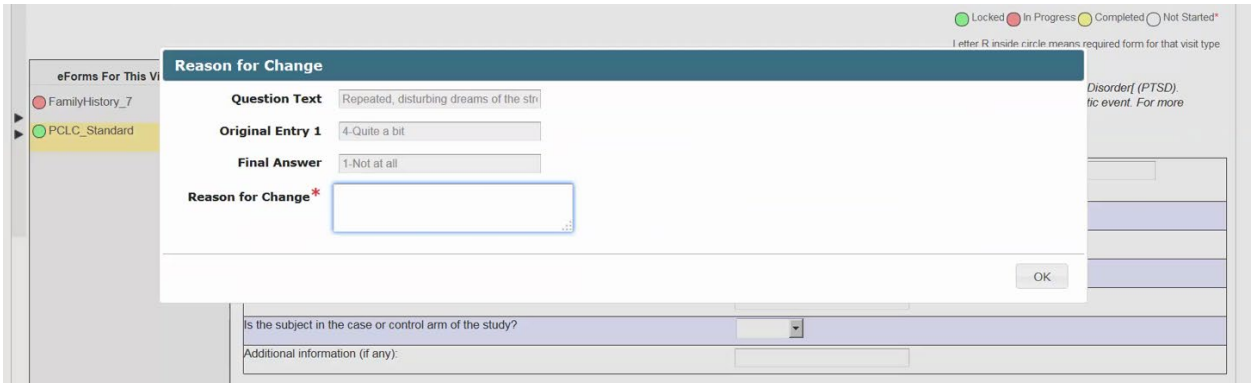


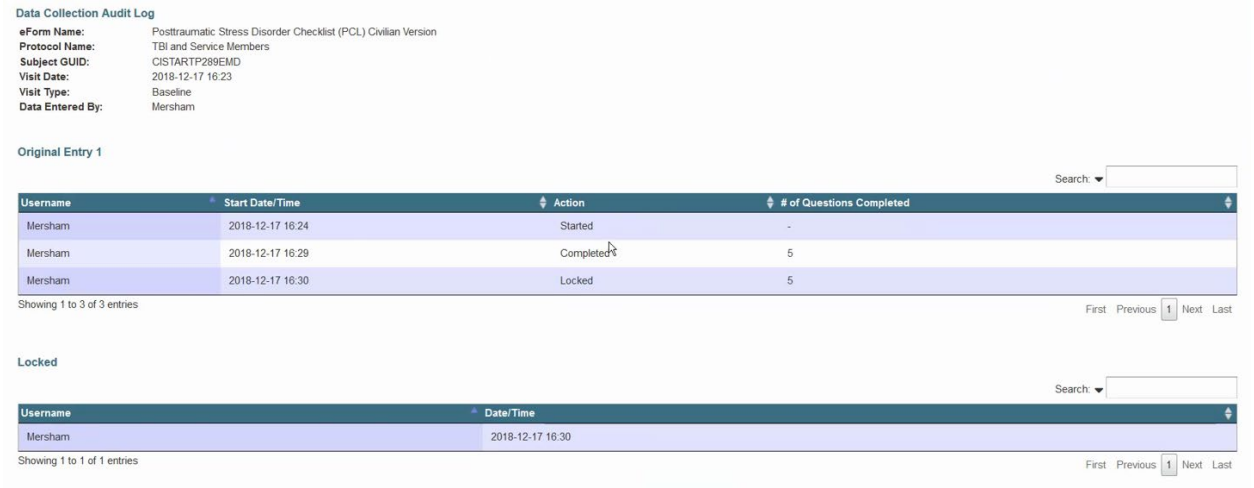
Once all of the required questions have been completed, and “Mark as Completed and Enable Locking for Submission” checkbox is checked, a pop-up will be display and asking for the user’s electronic signature if the e-signature is enabled in the protocol information section.

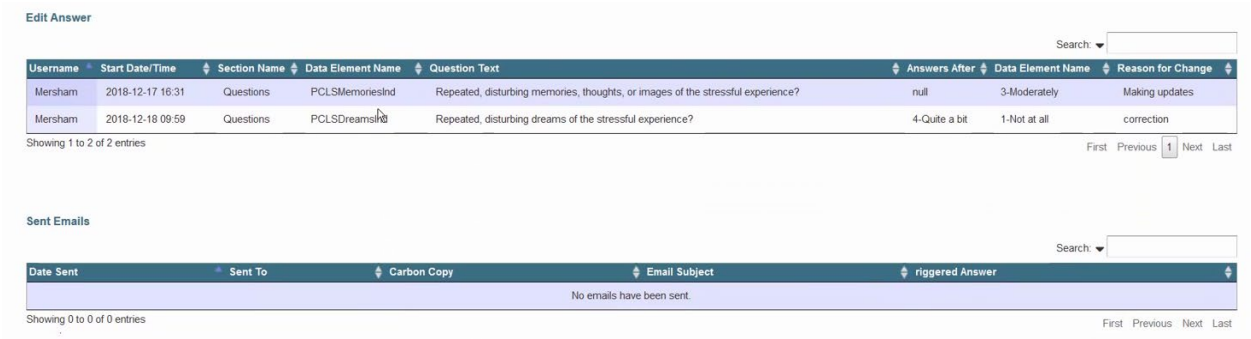


A “Collection Data Lock Confirmation” pop-up window will appear once the form is locked. User will need to select the validation checkbox and click on “Lock & Exit” button.

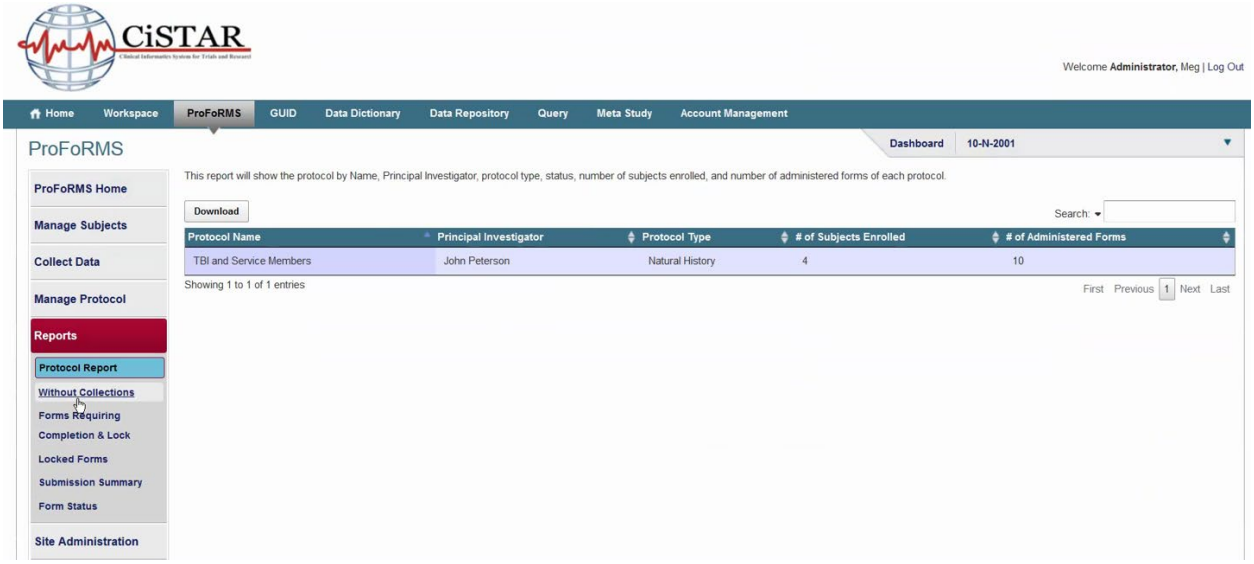

CiSTAR
Welcome Administrator, Meg | Log Out
Home
Workspace
ProFoRMS
GUID
Data Dictionary
Data Repository
Query
Meta Study
Account Management
ProFoRMS
Dashboard
10-N-2001
ProFoRMS Home
Manage Subjects
Collect Data
Data Collection
My Collections
Manage Protocol
Reports
Site Administration
The administered form Posttraumatic Stress Disorder Checklist (PCL) Civilian Version has been Locked successfully
Search by Subject form or by non-subject form to begin collecting data
[+] Advanced Search
Data Collection
Select a form to view or perform an action
View Entry
Edit
View Audit
Reassign
Delete Entry
Export
Search:
Subject GUID
Visit Date
Visit Type
eForm Name
Short Name
Status
User
Lock Date
CISTARCR243ENZ 2018-12-10 12:00 Baseline Demographics_10 Demographics_10 Locked Mersha, MegM 2018-12-10 10:39
CISTARCR243ENZ 2018-12-10 12:00 Baseline FamilyHistory_7 FamilyHistory_7 Locked Mersha, MegM 2018-12-10 10:37
CISTARCR243ENZ 2018-12-10 12:00 Baseline PCLC_Standard PCLC_Standard Locked Mersha, MegM 2018-12-10 10:54
CISTARCR243ENZ 2018-12-16 16:04 30-days CSSRS CSSRS In Progress Mersha, Meg
CISTARCR243ENZ 2018-12-16 16:04 30-days PHQ8_1 PHQ8_1 Locked Mersha, Meg 2018-12-16 16:08
CISTAREY302LUH 2018-12-15 14:03 Baseline FamilyHistory_7 FamilyHistory_7 In Progress Mersha, Meg
CISTAREY302LUH 2018-12-15 14:03 Baseline PCLC_Standard PCLC_Standard Locked Mersha, Meg 2018-12-15 14:09
CISTARPH167YR7 2018-12-14 15:43 Baseline PCLC_Standard PCLC_Standard Locked Mersha, Meg 2018-12-18 09:58
CISTARTP289EMD 2018-12-17 16:23 Baseline FamilyHistory_7 FamilyHistory_7 In Progress Mersha, Meg
CISTARTP289EMD 2018-12-17 16:23 Baseline PCLC_Standard PCLC_Standard Locked Mersha, Meg 2018-12-17 16:30


Locked
In Progress
Completed
Not Started*
Letter R inside circle means required form for that visit type
eForms For This Vi
FamilyHistory_7
PCLC_Standard
Reason for Change
Question Text
Repeated, disturbing dreams of the str
Original Entry 1
4-Quite a bit
Final Answer
1-Not at all
Reason for Change*
OK
Disorder[(PTSD).
tic event. For more
Is the subject in the case or control arm of the study?
Additional information (if any):

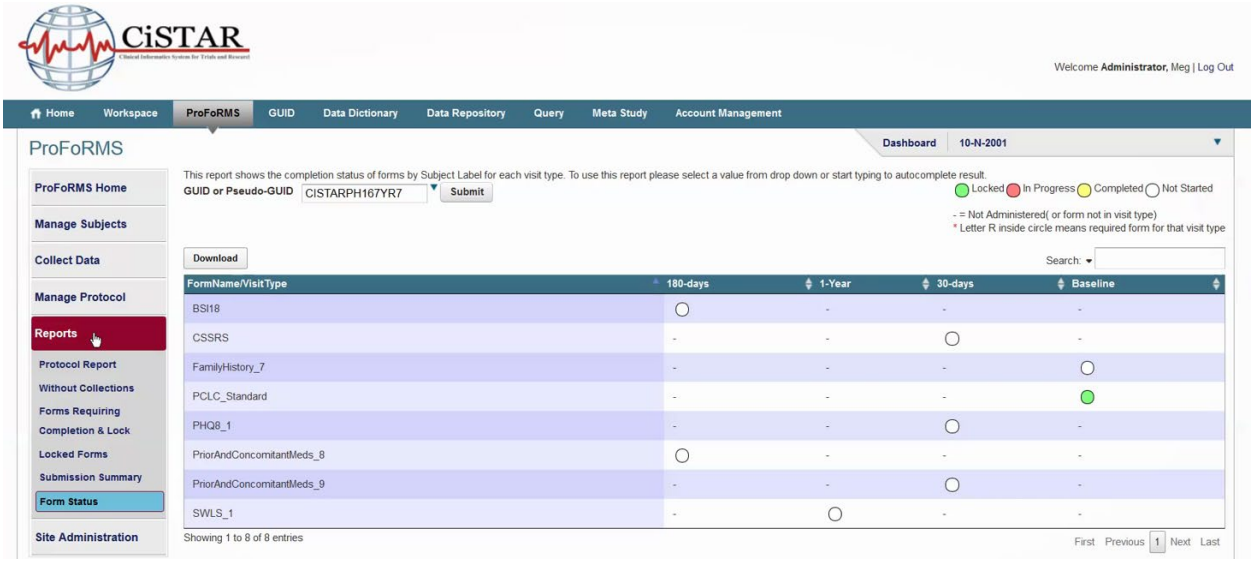

Data Collection Audit Log
eForm Name: Posttraumatic Stress Disorder Checklist (PCL) Civilian Version
Protocol Name: TBI and Service Members
Subject GUID: CISTARTP289EMD
Visit Date: 2018-12-17 16:23
Visit Type: Baseline
Data Entered By: Mersham
Original Entry 1
Search:
Username
Start Date/Time
Action
# of Questions Completed
Mersham 2018-12-17 16:24 Started -
Mersham 2018-12-17 16:29 Completed 5
Mersham 2018-12-17 16:30 Locked 5
Showing 1 to 3 of 3 entries
First Previous 1 Next Last
Locked
Search:
Username
Date/Time
Mersham 2018-12-17 16:30
Showing 1 to 1 of 1 entries
First Previous 1 Next Last



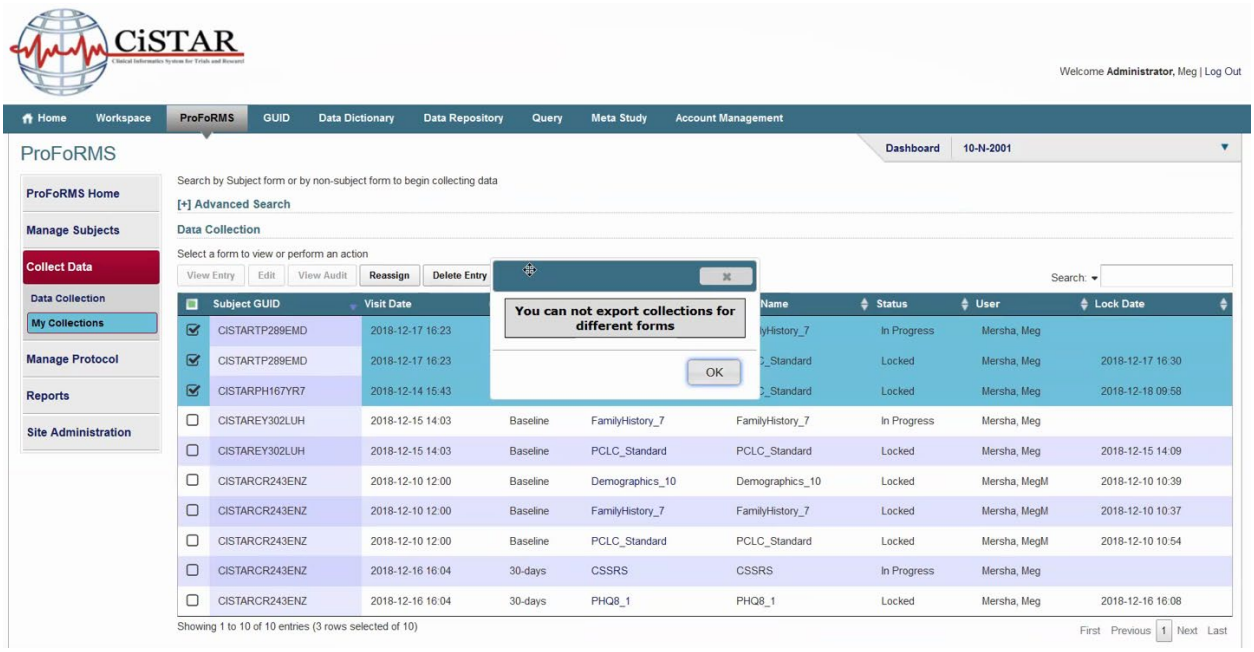
ProFoRMS – Reports – Protocol Report

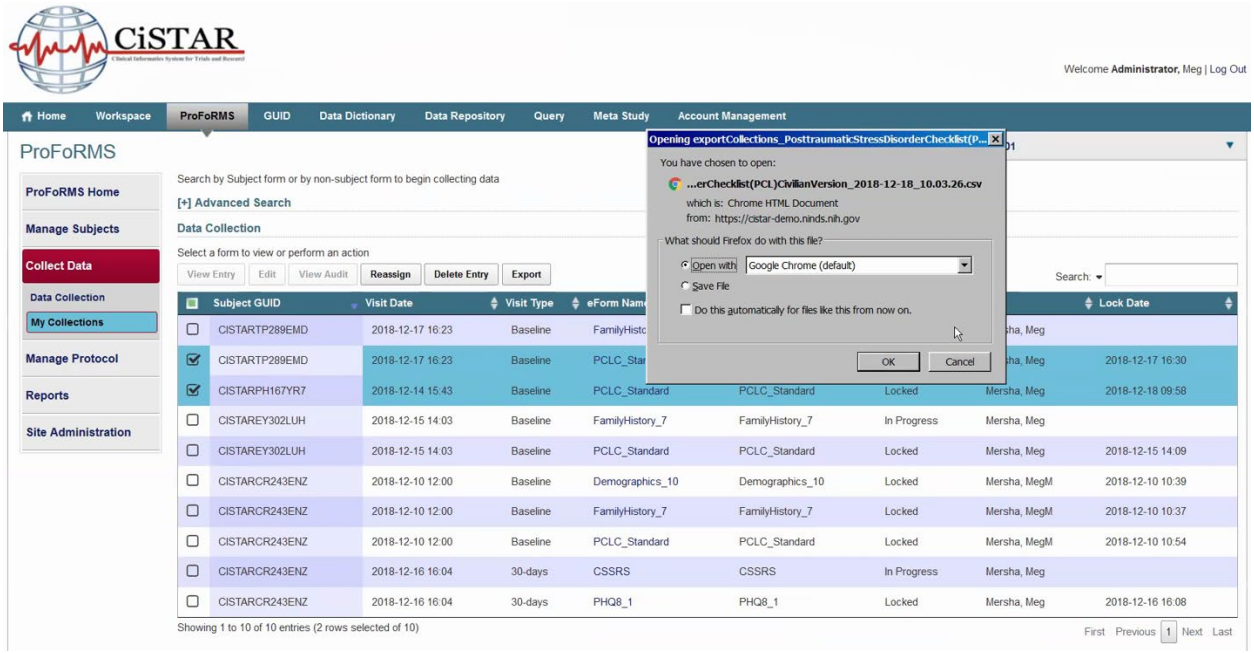


ProFoRMS – Reports – Form Status

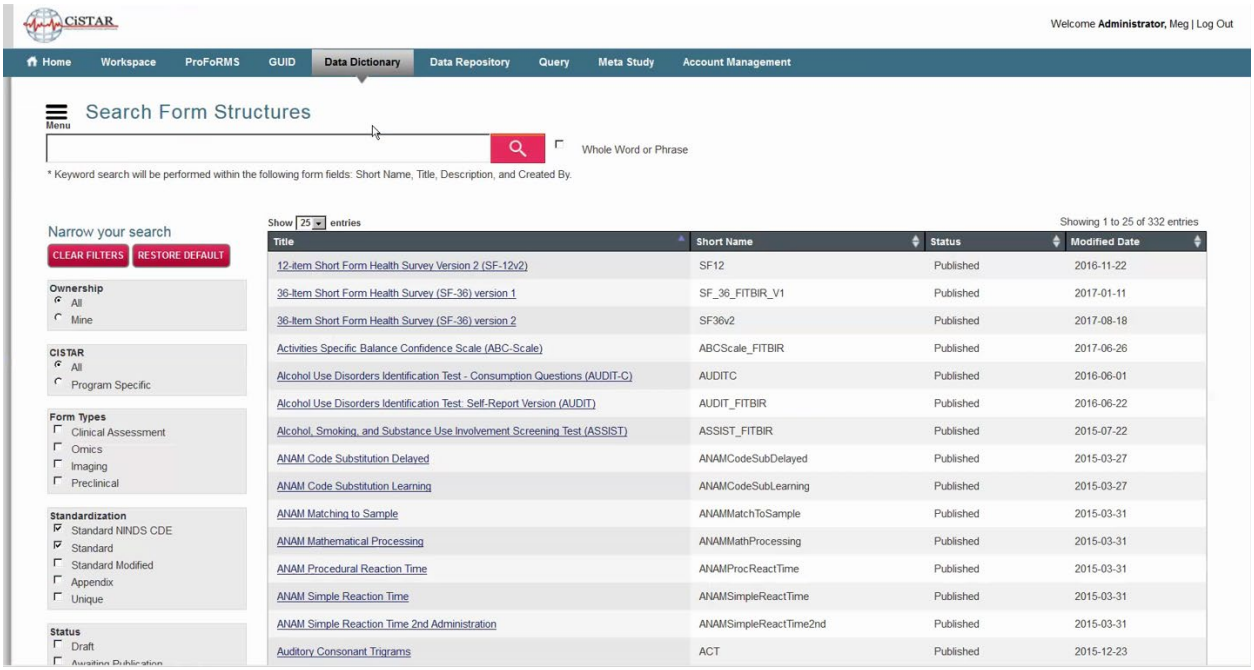


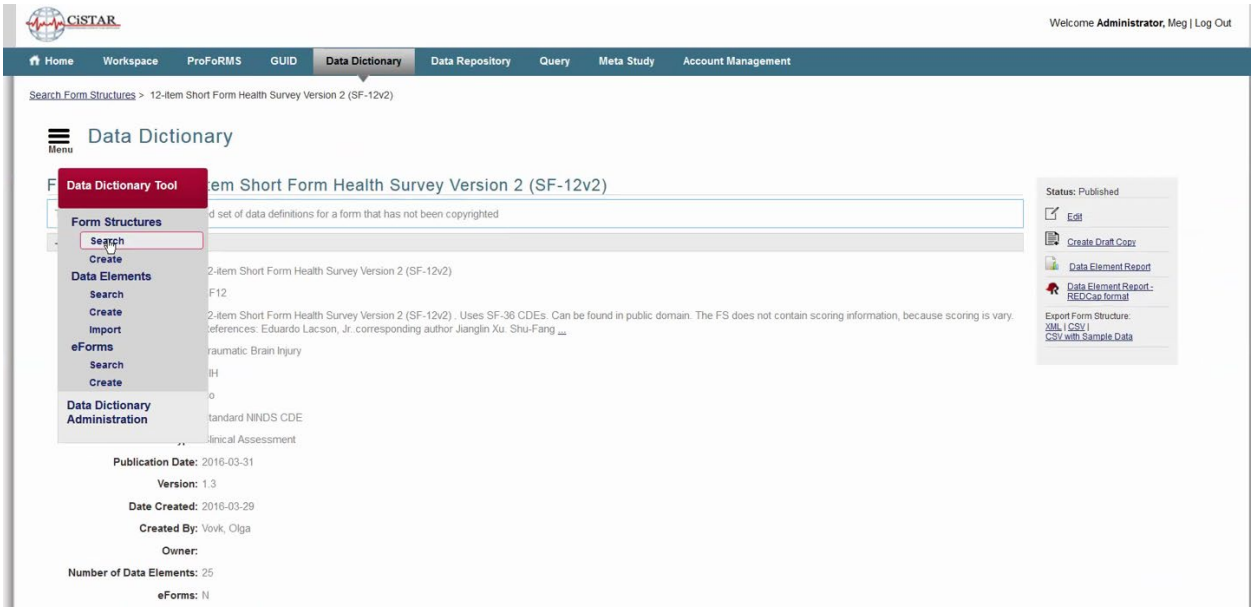
Data Collections Export





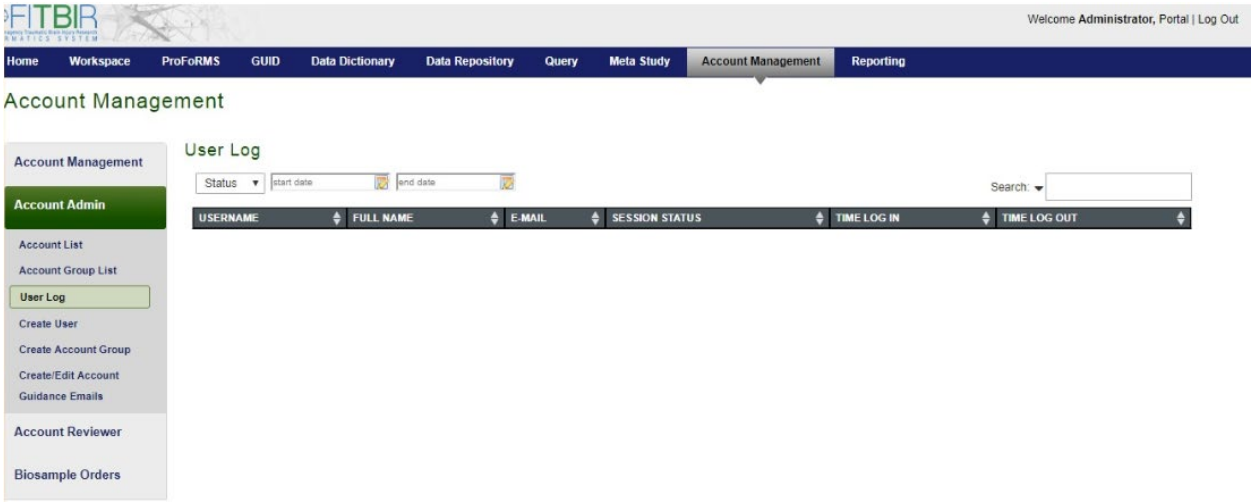
The Data Dictionary provides functionality for creating, managing, and searching data dictionary components (data elements and form structures), as well as services for validating research data against the standardized common data elements (CDEs).





Account Management

The Account Management module is for creating, approving, and managing user accounts, including management of access controls, roles, permissions groups, and authorization to other BRICS modules.



7. Records Management

All data and/or records generated during this procedure are stored in the NINDS SharePoint-based Document Library.

8. Review/Revision History

Date	Author	Description of Change
03/09/2019	Gladys Wang	Document Creation

Appendix A. RTM

The table below depicts traceability from the requirements and design of the major components for each of the modules within the system. Please refer to the Requirements Traceability Matrix (RTM) in the System Requirements Specification (SRS) to identify the allocation of the functional requirements into this design document.

Key	Requirement	Design		Reference						
PS-4420	Remove/hide the 'Biorepository Subject ID' field and user inputs in ProFoRMS	PS-4422								
PS-4378	"See also" - need to increase the size of the field in the database and the text box that displayed in DD	PS-4403								
PS-4331	Add to GUID tool Country of Birth	PS-4383								
PS-4268	As user, system should let me refresh my session in Data Dictionary	PS-4282	PS-4312							
PS-4267	As an Operation User, data error report email should be get updated with no of request for archived, deleted data set and requested study.	PS-4275	PS-4276	PS-4309						
PS-4266	As a user, system should allow me to change subject label GUID to Subject ID or vice versa in Manage Protocol Section of ProForms	PS-4273	PS-4311	PS-4424	PS-4425					
PS-4135	As a admin user, I need my previous admin noted migrated into the new admin note functionality box.	PS-4147								
PS-4031	As cdRNS user, I should able to see cdNRS specific Form Structures	PS-4067								
PS-4028	As FITBIR Public site data dictionary - default DE view to Awaiting Publication and Published DEs	PS-4162	PS-4163							
PS-4027	As a user, I should know which environment my email came from	PS-4171	PS-4207							
PS-3830	Data Repository - Research Management Table Sort Recommendation	PS-4146								
PS-3827	As a Account Admin/Reviewer, I should able to identify user, whose privileges been expired.	PS-3891	PS-4264	PS-4310						
PS-3821	As a user, I should see consistent in data set statuses across table	PS-4183	PS-4206	PS-4221						

PS-3659	Supporting Documentation | The "File" field information appears under the Column Name.	PS-4176	PS-4177	PS-4181						
PS-3441	As a user, I want files I'm attempting to upload to be maintained when there is a validation error in related fields when trying to upload the file (PF, Act, DD))	PS-3444	PS-3445	PS-3446	PS-4160	PS-4161				
PS-3309	As a user, I should have the Ability to make an optional/recommended question required on the eform level	PS-3996								
PS-3226	As an admin or end user, I want the data dictionary search to support special characters *,? and "" in order to increase the likelihood of returning a result the user is searching for.	PS-4164	PS-4165	PS-4166	PS-4167					
PS-3214	Implementation of converting byte array to hex is flawed	PS-4218								
CRIT-9581	As a developer, I should be able to migrate GUID information from one MongoDB instance to another	CRIT-9582								
CRIT-9549	As a user, I should be able to generate GUIDs in a batch process	CRIT-9737	CRIT-9738	CRIT-9739	CRIT-9740	CRIT-9741				
CRIT-9535	As a user, my PII should be sent to the server as a Hashcode	CRIT-9536								
CRIT-9534	As a user, I should be able to interface with the GUID server	CRIT-9546	CRIT-9547							
CRIT-9533	As a user, I should be able to see the interface of the GUID client	CRIT-9539	CRIT-9540	CRIT-9580						
CRIT-9532	As a user, I should not be able to enter invalid PII	CRIT-9673	CRIT-9674	CRIT-9675	CRIT-9677					
CRIT-9531	As a user, I should be able to validate that a GUID exists	CRIT-9564	CRIT-9565							
CRIT-9530	As a user, I should be able to convert a pseudoGUID to a GUID	CRIT-9560	CRIT-9561	CRIT-9562	CRIT-9563					
CRIT-9520	For large result sets in QT, adding to download queue crashes the server	CRIT-9521	CRIT-9522	CRIT-9595	CRIT-9623					
CRIT-9356	NINDS/NIA/GRDR Code Merge	CRIT-9357	CRIT-9358	CRIT-9359	CRIT-9383	CRIT-9394	CRIT-9396	CRIT-9397	CRIT-9508	CRIT-9509
CRIT-9223	GUID Javascript Client Design	CRIT-9224	CRIT-9225							
CRIT-8571	Design Basic GUID JS Framework	CRIT-8572								
CRIT-7779	As a user, I should be able to access the GUID user guide	CRIT-9272	CRIT-9273							
CRIT-7655	As a user, I should be able to generate a GUID through the new JS Client	CRIT-7657	CRIT-9543	CRIT-9544	CRIT-9545	CRIT-9548	CRIT-9879			
CRIT-7613	As a NINDS user, I should be able to access legacy NINDS GUIDs	CRIT-7622	CRIT-7623	CRIT-7624	CRIT-7625	CRIT-7626	CRIT-7627			
CRIT-7612	As an NIA user, I should be able to access legacy NIA GUIDs	CRIT-7616	CRIT-7617	CRIT-7618	CRIT-7619	CRIT-7620	CRIT-7621			