




Clinical Database Management using REDCap: Tips and Tricks for Efficient Data Capture

February 12, 2019





I have no conflicts of interest to disclose.



The views expressed in this presentation are that of my own, and they do not serve as a representation of Northwestern University nor that of the statistical community at large.

Outline for today

- Data management and electronic data capture (EDC)
- Getting started with REDCap
- Designing case report forms (CRFs)
- Customization in REDCap
- Special features
- Resources / Limitations

Keep the goals in mind

Collect all the data you need in the right format so that they can be analyzed appropriately later

1. Collecting analyzable data
2. Ensuring protocol compliance
3. Ensuring data quality (few anomalies, inconsistencies, etc.)

Why do we care about Database Management?

- General statistics tends to focus on the methods of analyzing the data and/or study design methods
- Study design → study conduct → analysis methods
- But study conduct (including capturing and managing data) can also have large impact on analysis methods appropriate
 - Bias
 - Variability
 - Poor data quality
 - Missing data
 - Etc.
- **My job as the statistician = tell a story**
 - ...but it's hard to tell a story if I only know the beginning and end
 - The middle is also important

Why do we care about Database Management?

- General statistics tends to focus on the methods of analyzing the data and/or study design methods
- Study design → study conduct → analysis methods
- Interim reporting may be important depending on the needs of the study
 - Reports to funder
 - Reports to FDA
 - Reports to Data Monitoring Committees (DMCs)
 - Reports to external advisory boards or Steering Committees
- To prevent difficulties and streamline generation of these reports, it is imperative to understand
 - Study workflow
 - Structure of database
 - Fields that we need



Electronic Data Capture

Electronic Data Capture (EDC)

Note: much of the material I cover will come from the clinical trials perspective, but much of the material can and should be extended to other study types.

- Study data are usually captured in a series of instruments or forms →
 - These are groupings of similar data fields
 - Although not required, this helps orient the data enterer

	Instrument name
	Enrollment Checklist
	Demographics
	Medical History
	Treatment Allocation
	Vitals
	Laboratory Assessment
	IP Tracking
	Termination
	Departures
	Adverse Events

Electronic Data Capture

An alternative to data collection tools or instruments...a simple (long) Spreadsheet

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1	studyid	hypertensive	age_18	premeno	negpregnant	birthcontrol	methodofbc	obese	consent	exclusion	consented	consent_dt	enroll	enrollment_checklist_complete	dob	date_enrolled
2																
3																
4																
5																
6																
7																
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22																

- This may not be ideal for data entry, but for analyses this *may* be easier to navigate
- Caveat: we would like a data dictionary/codelist to make sense of the data entered + we would like checks in place to ensure data quality
- Other options – make a new tab for each data collection tool, make a new file and merge?
- In general, it makes most sense to group similar fields together in some way: data collection tools, instruments

Electronic Data Capture (EDC)

- These instruments are given the term **Case Report Forms (CRFs)**
- Historically, CRFs were paper-based and then converted to electronic format
- Recently, CRFs → electronic CRFs (eCRFs)
 - These terms are often used interchangeably
 - eCRFs have substantial advantages over paper CRFs
 - But there are special considerations regarding EDC-only
- Example CRF →

Instrument name
Enrollment Checklist
Demographics
Medical History
Treatment Allocation
Vitals
Laboratory Assessment
IP Tracking

Demographics

Study ID _____

Date of Birth _____

Date of enrollment _____

Age _____

Gender ☐ Female
☐ Male

Race ☐ White
☐ Black or African American
☐ American Indian or Alaska Native
☐ Asian
☐ Native Hawaiian or Other Pacific Islander
☐ Other

Ethnicity ☐ Not Hispanic/Latino
☐ Hispanic/Latino

Weight in kg _____

Height in centimeters _____

BMI _____

Electronic Data Capture

Whether we like it or not, we are moving toward EDC-only studies

- Paper CRFs are becoming outdated
- There are countless ways of maintaining an electronic database
 - Excel – single sheet, multiple tabs, multiple files – THIS IS NOT RECOMMENDED IN GENERAL
 - Access
 - Oracle
 - SurveyMonkey
 - SPSS
 - OpenClinica
 - StudyTrax
 -
- Most Contract Research Organizations (CROs) or Academic Research Organizations (AROs) have home-grown platforms (e.g., EMMES: “Web Form Builder” and “AdvantageEDC”)

EDC at Northwestern

What are investigators at NU using for EDC?

- Sadly, Excel = most popular
- Study Tracker/eNOTIS
- SPSS
- REDCap!

What is REDCap ?

Research Electronic Data Capture

- Research Electronic Data Capture
- Used for building and managing surveys and study databases efficiently, on a fixed budget, and securely
 - This includes protected health information (PHI)
- Developed at Vanderbilt University in 2004
- Over 3200 institutions in about 130 countries

Why use REDCap?

Research Electronic Data Capture

- FREE
- Secure
- Easy to learn
- Easily accessible, becoming more universal (>3200 institutions, 130 countries)
- Features that allow for efficient and flexible data capture/management
- ...
-



Getting Started...

NOTE: Institutions may vary



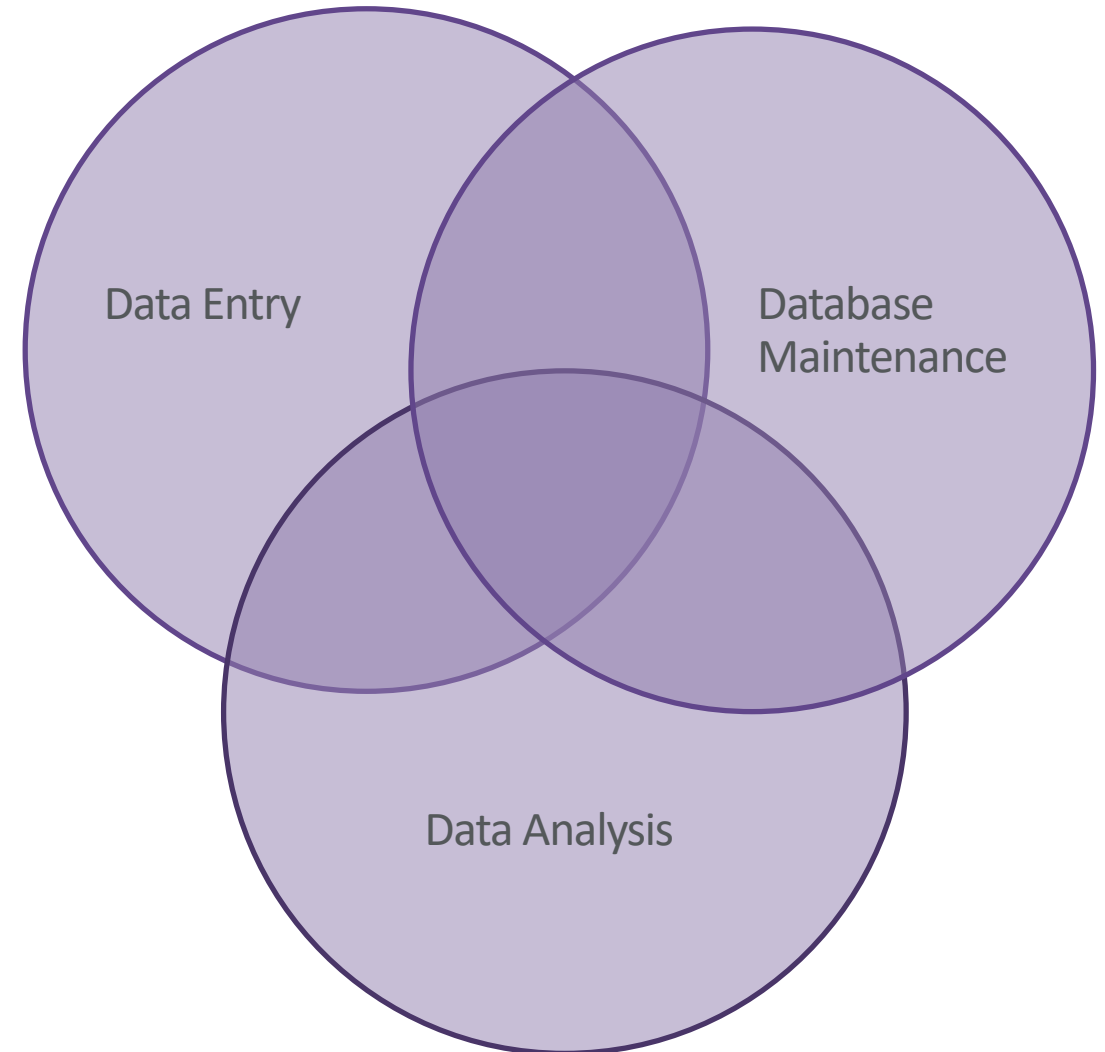
REDCap at Northwestern

- redcap@northwestern.edu
- Online session for New Project Owners (email REDCap support for link)
- All users must complete: REDCap User Agreement
(<https://redcap.nubic.northwestern.edu/redcap/surveys/?s=WK39RMR44F>)
- <https://redcap.nubic.northwestern.edu/redcap/> (must be on campus network for VPN)
- <https://nucats.northwestern.edu/>

Something to keep in mind...the key players

Who is involved?

- Those that will **enter** the data
 - Those that will **build/maintain** the database
 - Those that will **analyze** the data
-
- This is extremely important in development of AND ensuring adherence to any data management plan
-
- All the key players must be on the same page and understand study workflow for this to work



Keep the goals in mind

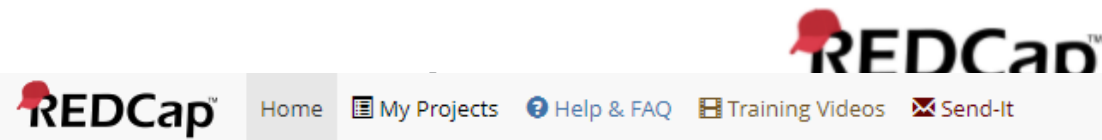
Collect all the data you need in the right format so that they can be analyzed appropriately later

1. Collecting analyzable data
2. Ensuring protocol compliance
3. Ensuring data quality (few anomalies, inconsistencies, etc.)

Some Basic Terminology

- Development mode → Production mode
- Development
 - Design the database/data collection tools
 - Customize
 - Test!!!!
- Production
 - Live data capture
 - Post-production modifications must be made with caution and may require administrator approval

Getting Started



SCHEDULED MAINTENANCE ANNOUNCEMENT:

Do you have Spanish characters in your project? The recent update may have affected your Spanish characters if you just cut & paste them into your project. Revisit your project and consider hardcoding Spanish characters so that the insertion of these characters can withstand further upgrades. [Click for more details.](#)

Welcome to REDCap!

REDCap is a mature, secure web application for building and managing online surveys and databases. Using REDCap's stream-lined process for rapidly developing projects, you may create and design projects using 1) the online method from your web browser using the Online Designer; and/or 2) the offline method by constructing a 'data dictionary' template file in Microsoft Excel, which can be later uploaded into REDCap. Both surveys and databases (or a mixture of the two) can be built using these methods.

REDCap provides automated export procedures for seamless data downloads to Excel and common statistical packages (SPSS, SAS, Stata, R), as well as a built-in project calendar, a scheduling module, ad hoc reporting tools, and advanced features, such as branching logic, file uploading, and calculated fields.

Learn more about REDCap by watching a [brief summary video \(4 min\)](#). If you would like to view other quick video tutorials of REDCap in action and an overview of its features, please see the [Training Resources](#) page.

NOTICE: If you are collecting data for the purposes of human subjects research, review and approval of the project is required by your Institutional Review Board.

If you require assistance or have any questions about REDCap, please contact

REDCap Features

Build online surveys and databases quickly and securely - Create and design your project rapidly using secure web authentication from your browser. No extra software is required.

Fast and flexible - Conception to production-level survey/database in less than one day.

Export data to common data analysis packages - Export your data to Microsoft Excel, PDF, SAS, Stata, R, or SPSS for analysis.

Ad Hoc Reporting - Create custom queries for generating reports to view or download.


Scheduling - Utilize a built-in project calendar and scheduling module for organizing your events and appointments.

Easily manage a contact list of survey

Hypertension Clinical Trial (Demo)

Project Setup Checklist (Landing Page)

[Project Home](#)[Project Setup](#)[Other Functionality](#)[Project Revision History](#)

Project status:  Development

Completed steps **5** of **9**





Complete!

[Not complete?](#)

Main project settings

Enable

 Use surveys in this project? [?](#)

 [VIDEO: How to create and manage a survey](#)

Disable

 Use longitudinal data collection with defined events? [?](#)

Modify project title, purpose, etc.



Complete!

[Not complete?](#)

Design your data collection instruments

Add or edit fields on your data collection instruments. This may be done by either using the Online Designer (online method) or by uploading a Data Dictionary (offline method). Quick links: [Download PDF of all instruments](#) OR [Download the current Data Dictionary](#)

Go to [Online Designer](#) or [Data Dictionary](#)

You may also browse for pre-built data collection instruments in the [REDCap Shared Library](#)

Have you checked the [Check For Identifiers](#) page to ensure all identifier fields have been tagged?



Complete!


[Not complete?](#)

Define your events and designate instruments for them

Create events for re-using data collection instruments and/or set up scheduling.

Go to [Define My Events](#) or [Designate Instruments for My Events](#)

Project Home Tab



Logged in as **hannah** | [Log out](#)

- My Projects
- Project Home**
- Project Setup

Project status: **Development**

Data Collection [Edit instruments](#)

- Scheduling**
- Generate schedules for the calendar using your defined events
- Record Status Dashboard**
- View data collection status of all records
- Add / Edit Records**
- Create new records or edit/view existing ones

Applications

- Calendar
- Data Exports, Reports, and Stats
- Data Import Tool
- Logging
- Field Comment Log
- File Repository
- User Rights and DAGs
- Randomization
- Data Quality
- API and API Playground
- REDCap Mobile App

Help & Information

- Help & FAQ

Hypertension Clinical Trial (Demo)

- Project Home**
- Project Setup
- Other Functionality
- Project Revision History

Quick Tasks

- Codebook**
The Codebook is a human-readable, read-only version of the project's Data Dictionary and serves as a quick reference for viewing field attributes.
- Export data**
Export your data from REDCap to open or view in Excel or various stats packages.
- Create a report**
Build custom reports for quick views of your data, and export reports to Excel/CSV.
- Check data quality**
Build or execute data quality rules to find discrepancies and errors in your project data.
- User Rights**
Grant new users access to this project or modify user privileges for current users.
- Online Designer and Data Dictionary Upload**
Create new fields/questions on your data collection instruments or modify existing ones using the Online Designer or by uploading a Data Dictionary. Quick link: [Download the current Data Dictionary](#)
- Copy this project**
Create an exact duplicate of this project, which copies over all data collection instruments, any surveys that exist, as well as the option to copy all users and reports to the new project.
- Data Access Groups**
Create groups of users to limit user access to certain records/responses, in which only users within a given Data Access Group can access records created by users within that group.

Project Dashboard

The tables below provide general dashboard information, such as a list of all users with access to this project, general project statistics, and upcoming calendar events (if any).

Current Users

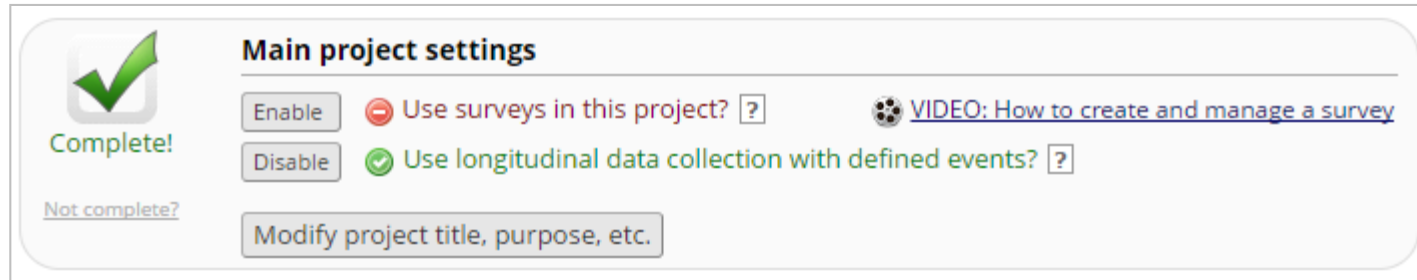
User	Expires
alison	

Project Statistics


Records in project	1
Most recent activity	05/08/2017 10:29am



Getting Started


- If designing a prospective study database, almost always will use the longitudinal setting



Main project settings

 **Complete!**
[Not complete?](#)

 Use surveys in this project? [?](#)  [VIDEO: How to create and manage a survey](#)

 Use longitudinal data collection with defined events? [?](#)

- Two options in developing data collection tools (case report forms [CRFs])
 - Online designer
 - Data dictionary
- Designing data collection tools will inevitably take the most time

Project Setup: Online Designer

[Project Home](#) [Project Setup](#) [Other Functionality](#) [Project Revision History](#)

Project status: Development Completed steps 5 of 9

Complete!
[Not complete?](#)

Main project settings

[Enable](#) Use surveys in this project? [?](#) [VIDEO: How to create and manage a survey](#)

[Disable](#) Use longitudinal data collection with defined events? [?](#)

[Modify project title, purpose, etc.](#)

Complete!
[Not complete?](#)

Design your data collection instruments

Add or edit fields on your data collection instruments. This may be done by either using the Online Designer (online method) or by uploading a Data Dictionary (offline method). Quick links: [Download PDF of all instruments](#) OR [Download the current Data Dictionary](#)

Go to [Online Designer](#) or [Data Dictionary](#)

You may also browse for pre-built data collection instruments in the [REDCap Shared Library](#)

Have you checked the [Check For Identifiers](#) page to ensure all identifier fields have been tagged?









Complete!
[Not complete?](#)

Define your events and designate instruments for them

Create events for re-using data collection instruments and/or set up scheduling.

Go to [Define My Events](#) or [Designate Instruments for My Events](#)





The Online Designer will allow you to make project modifications to fields and data collection instruments very easily using only your web browser. NOTE: While in development status, all field changes will take effect immediately in real time.

Data Collection Instruments				
Add new instrument:				
<div><div>Create</div> a new instrument from scratch</div>				
<div><div>Import</div> a new instrument from the official REDCap Shared Library</div>				
<div><div>Upload</div> instrument ZIP file from another project/user or external libraries</div>				
Instrument name		Fields	View PDF	Instrument actions
Enrollment Checklist		14		<div>Choose action</div>
Demographics		9		<div>Choose action</div>
Medical History		5		<div>Choose action</div>
Treatment Allocation		1		<div>Choose action</div>
Vitals		4		<div>Choose action</div>
Laboratory Assessment		4		<div>Choose action</div>
IP Tracking		9		<div>Choose action</div>
Termination		6		<div>Choose action</div>
Departures		5		<div>Choose action</div>
Adverse Events		14		<div>Choose action</div>

Web-based Form Builder


Add Field

Add Matrix of Fields



Variable: dob

Date of Birth







Today

M-D-Y


Add Field

Add Matrix of Fields



Variable: date_enrolled

Date of enrollment







Today

M-D-Y

Add Field

Add Matrix of Fields







Variable: age

Age

View equation

Add Field

Add Matrix of Fields



Variable: gender

Gender





☐ Female

☐ Male

reset

Add Field

Add Matrix of Fields



Variable: race

Race

☐ White

☐ Black or African American

☐ American Indian or Alaska Native

☐ Asian

☐ Native Hawaiian or Other Pacific Islander

☐ Other

reset

Add Field

Add Matrix of Fields

Hypertension Clinical Trial (Demo)

Actions:



Modify instrument



Download PDF of instrument(s) ▼



[VIDEO: Basic data entry](#)

Save & Exit Form

Save & Stay ▼

-- Cancel --

Demographics

Editing existing Study ID 1

Event Name: **Baseline**

Study ID	1
Date of Birth	<input type="text"/> Today M-D-Y
Date of enrollment	<input type="text"/> Today M-D-Y
Age	<input type="text"/> View equation
Gender	<input type="radio"/> Female <input checked="" type="radio"/> Male
Race	<input type="radio"/> White <input type="radio"/> Black or African American <input type="radio"/> American Indian or Alaska Native <input type="radio"/> Asian <input type="radio"/> Native Hawaiian or Other Pacific Islander <input type="radio"/> Other reset
Ethnicity	<input type="radio"/> Not Hispanic/Latino <input type="radio"/> Hispanic/Latino

Example Case
Report Form

Project Setup: Data Dictionary

[Project Home](#) [Project Setup](#) [Other Functionality](#) [Project Revision History](#)

Project status: Development Completed steps 5 of 9

Main project settings

Complete!

Not complete?

Enable

Disable

Use surveys in this project? [?](#)

VIDEO: [How to create and manage a survey](#)

Use longitudinal data collection with defined events? [?](#)

Modify project title, purpose, etc.

Design your data collection instruments

Complete!

Not complete?

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Have you checked the [Check For Identifiers](#) page to ensure all identifier fields have been tagged?

Define your events and designate instruments for them

Complete!

Not complete?

Create events for re-using data collection instruments and/or set up scheduling.

Go to

Define My Events

 or

Designate Instruments for My Events

Offline Form Building via Data Dictionary

Variable / Field Name												
A	B	C	D	E	F	G	H	I	J	K	L	
1	Variable /	Form Nam	Section He	Field Type	Field Labe	Choices, C	Field Note	Text Valid	Text Valid	Text Valid	Identifier	Branching
2	studyid	enrollment_checklist	text		Study ID							
3	incl_head	enrollmer	Enrollmer	descriptiv	Inclusion Criteria							
4	hypertens	enrollment_checklis	yesno		Is the participant hypertensive (defined as SBP/DBP >= 140/90)?							
5	age 18	enrollment_checklis	yesno		Is the participant at least 18 years of age?							
6	pr											
7	ne											
8	bi											
9	m											
10	ok											
11	co											
12	ex											
13	co											
14	co											
15	er											
16	de											
17	da											
18	ag											
19	ge											
20	ra											
21	et											
22	weight	demographics	text		Weight in kg							
23	height	demographics	text		Height in centimeters							
24	bmi	demographics	calc		BMI							
25	treatmnt	treatment_allocation	radio		Participant 0, Drug A 1, Drug B							

Recommendation:

1. Design a few forms the 'long' way (manually) – online designer
2. Export data dictionary to learn format
3. Create additional forms via data dictionary and import– this will save time



On designing forms...



Designing Data Collection Tools

- NOTE: REDCap platform distinguishes between data entry forms (Case Report Forms [CRFs]) and surveys (may also serve as CRF for clinical study purposes)
- “Regular” CRFs
 - Data entry must occur by authorized REDCap user (study team member with access to the database)
 - NOT participant facing

Designing Data Collection Tools

- Surveys:
 - Can be participant facing (participants do not need to access REDCap database to complete electronically)
 - Can also be completed by a study team member directly in REDCap
 - Have additional settings that allow for greater flexibility ('save and return later', 'survey queue', etc.)

Designing forms: most protocols *should* have...

...a study schedule (aka a visit matrix, a procedure matrix, etc.)

Procedure	Baseline	Week 4	Week 8	Week 12
Consent	X			
Survey Administration	X			X
Physical Examination	X	X	X	X
Laboratory Assessments	X	X	X	X
Dosing	X	X		
Adverse Events	X	X	X	X

- These matrices will vary in detail and complexity, depending upon study, IRB requirements, and the clinical teams who write them
- NOTE: “Clinical teams who write the protocols do not always provide the level of specificity that data management requires...go back to the study team and completely identify the appropriate fields”
(*Clinical Database Management*, p. 11)

In building the set of CRFs, your job is to take...

...a study schedule (aka a visit matrix, a procedure matrix, etc.)

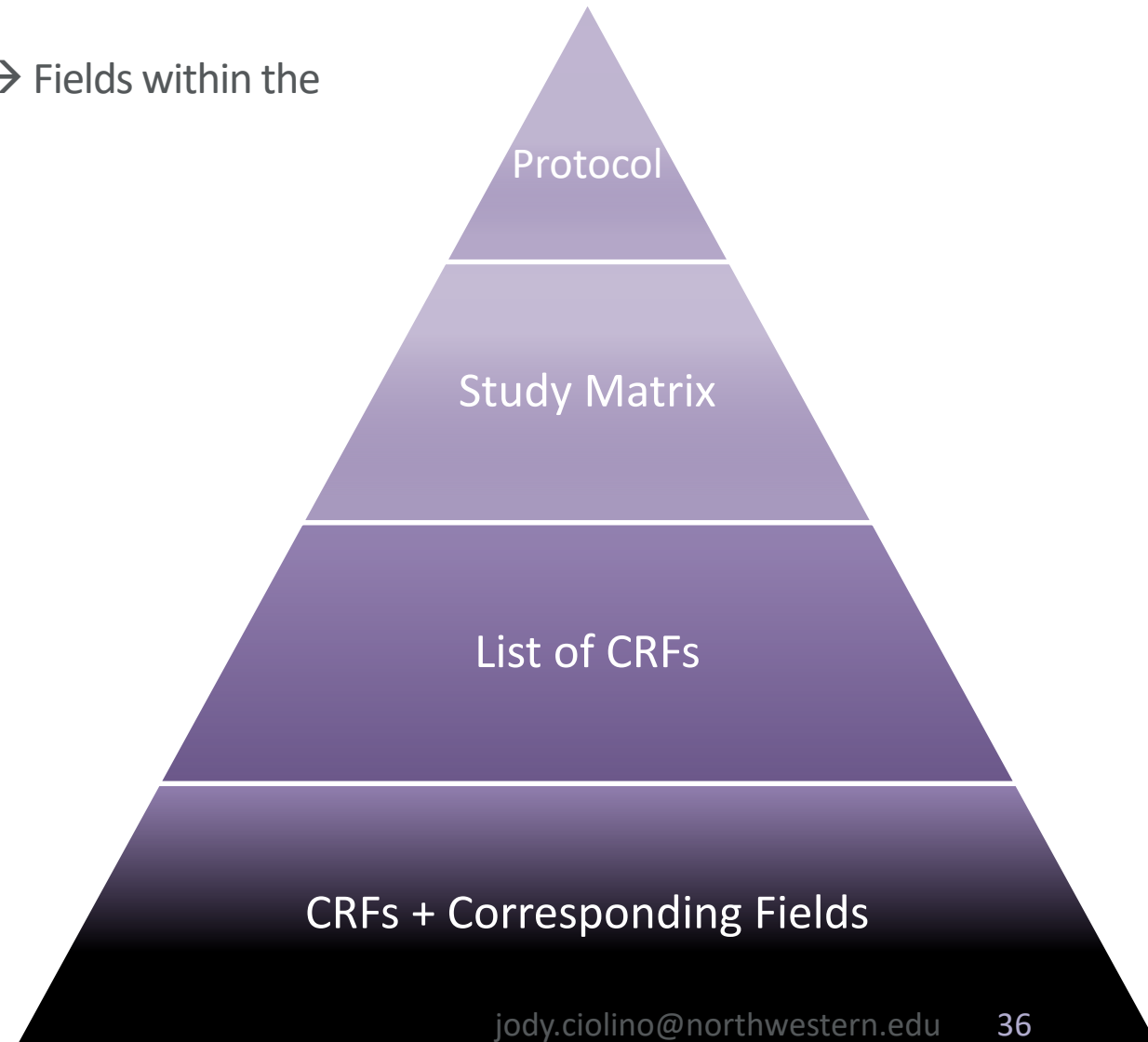
Procedure
Consent
Survey Administration
Physical Examination
Laboratory Assessments
Dosing
Adverse Events

Convert this to

CRF
Enrollment Checklist
Consent
Demographics
PROMIS-Anxiety
PROMIS-Global Health
PROMIS-Depression
Medical History
Vital Signs
Urinalysis
Hematology
PK Sampling
Intervention Dosing
Adverse Events
Concomitant Medications
Study Termination

Designing CRFs

- Protocol → Study Matrix → List of corresponding CRFs → Fields within the CRFs
- Start general and move toward specifics gradually



Some “typical” CRFs

Standard across studies; often not explicitly stated in the protocol

- Screening (enrollment checklist, may want to capture ineligibility reasons)
- Demographics (you will inevitably need to describe your participants)
 - Sex, age, race/ethnicity
 - Marital status, insurance status, income, residence, etc.
- Medical history
 - General comorbidities
 - Often ensures eligibility
 - Again, allows for description of sample
- Concomitant medications
- Adverse events/SAEs
- Participant status or study termination
- Dosing/investigational product tracking (pill counts, etc.)

Some words of caution

Things to avoid

- Duplicate data (across forms, within forms)
 - Within: DOB and age
 - Across: visit date, drug type, etc.
- Calculations within the database
 - Either by study personnel (subject to error)
 - OR automatic calculations (may or may not be a problem)
- Collecting “just in case it proves interesting”
 - There is a cost to every data point
 - Programming
 - Cleaning
 - Verification in source documents
 - Follow-up on discrepancies

Specifying fields within CRFs

Now that you have your list of CRFs

- Move through them form-by-form
- Suggest: start with the most vital data
 - Enrollment/eligibility
 - Primary outcomes
- May want to divide up the forms
- May want to have a single/few person(s) develop and others review

Instrument name
Enrollment Checklist
Demographics
Medical History
Treatment Allocation
Vitals
Laboratory Assessment
IP Tracking
Termination
Departures
Adverse Events

Field types vs. Data types

Distinguishing between field types vs. data types

- Statistically, data types are most relevant
 - Numeric/quantitative
 - Categorical/qualitative
- This will drive how we can analyze the data

Field types vs. Data types

Distinguishing between field types vs. data types

- From the database perspective, field types:
 - **Categorical data-relevant fields:**
 - Radio buttons
 - Dropdowns
 - Checkboxes
 - **Quantitative data-relevant fields:**
 - Numeric fields (integers, numbers, etc.)
 - Date fields
 - Calculated fields
 - Visual analog scales
- Field types that are often “not usable” statistically, but relevant for any database: free text, notes/comments, etc.

Common field types in REDCap

- **Text** – single-line text box (text and numbers)
 - **Dropdown** – dropdown menu with multiple choice options
 - **Radio** – radio button with multiple choice options
 - **Calculated** – perform real-time calculations (e.g., age)
-
- *Notes – larger text box*
 - *Checkbox – allow selection of > 1 option*
 - *File – upload a document*
 - *Descriptive – text displayed with no data entry and optional image/file attachment*
 - *Slider – visual analog scale (0 – 100)*

Field Types: Examples

Date of Birth	Text Boxes	<input type="text" value="05-10-1965"/> <input type="button" value="Today"/> M-D-Y
Date of enrollment		<input type="text" value="01-01-2017"/> <input type="button" value="Today"/> M-D-Y
Age	Calculated Field	<input type="text" value="51.65"/> View equation
Ethnicity	Radio Button	<input type="radio"/> Not Hispanic or Latino <input type="radio"/> Hispanic or Latino <input type="radio"/> Not reported
Race	Checkbox (Use Sparingly)	<input type="checkbox"/> Not Available <input type="checkbox"/> White <input type="checkbox"/> Black <input type="checkbox"/> Asian <input type="checkbox"/> Native Hawaiian/Other Pacific Islander <input type="checkbox"/> American Indian/Alaska Native <input type="checkbox"/> Other <input type="checkbox"/> Not reported Check all that apply
Form Status		
Complete?	Dropdown	<input type="text" value="Incomplete"/> ▼





Manual Creation of Radio Button Field

Current instrument: **Demographics**

Preview instrument


Add Field

Add Matrix of Fields







Variable: dob

Date of Birth

 Today M-D-Y


Add Field

Add Matrix of Fields







Variable: date_enrolled

Date of enrollment

 Today M-D-Y

Add Field

Add Matrix of Fields







Variable: age

Age

View equation

Add Field

Add Matrix of Fields



Variable: gender

Gender





☐ Female

☐ Male

reset

Add Field

Add Matrix of Fields



Variable: race

Race

☐ White

☐ Black or African American

☐ American Indian or Alaska Native

☐ Asian

Manual Creation of Radio Button Field

Statistically speaking...

Field Type: Multiple Choice - Radio Buttons (Single Answer) ▼

Field Label [How to use Piping](#)

Gender

Variable Name (utilized during data export)

gender

☐ Enable auto naming of variable based upon its Field Label?

Required?* ☒ No ☐ Yes
* Prompt if field is blank

Identifier? ☒ No ☐ Yes
Does the field contain identifying information (e.g., name, SSN, address)?

Custom Alignment Right / Vertical (RV) ▼
Align the position of the field on the page

Field Note (optional)
Small reminder text displayed underneath field

Choices (one choice per line) [Copy existing choices](#)

0, Female
1, Male

[How do I manually code the choices?](#)

Save **Cancel**

Field Types: Examples

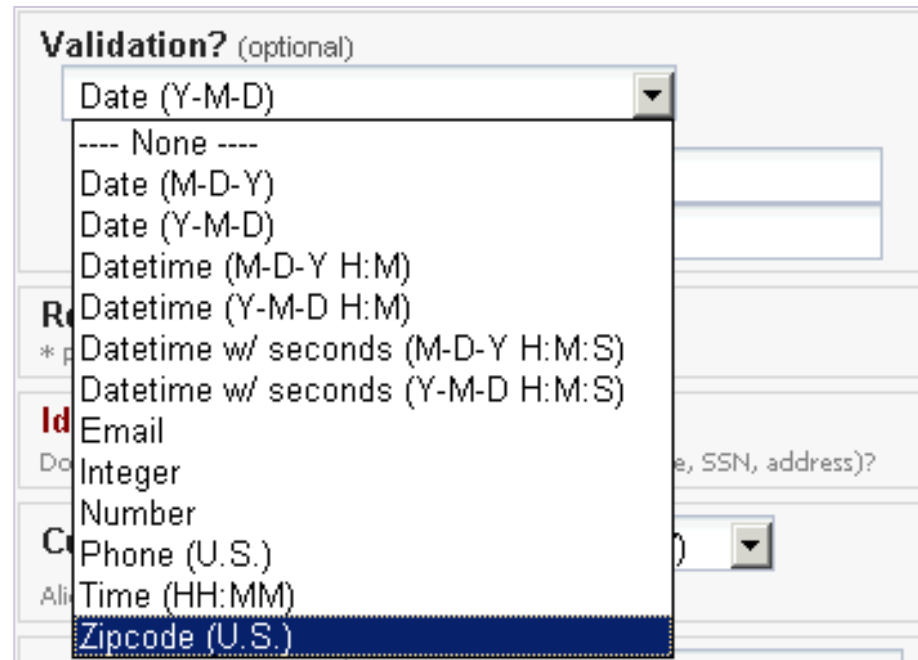
The screenshot displays a survey builder interface with four distinct field types, each highlighted by a purple arrow:

- Yes/No:** A question "Have you completed this survey in the past?" with radio buttons for "Yes" and "No". The variable is "hospital".
- Section Header:** A yellow header box titled "Staff Questionnaire".
- True/False:** A question "I am board certified in emergency medicine." with radio buttons for "True" and "False". The variable is "ercert".
- Slider/Analog:** A question "I believe crowding is the greatest patient safety concern in emergency departments." with a slider bar ranging from "Strongly Disagree" to "Strongly Agree". The variable is "crowding".

Each field type includes an "Add Field Here" button and a "reset value" link.

Text Boxes in REDCap

- REDCap **default** for a **text box** field = character
- In order to indicate that this field will be numeric in nature, you must add validation




The image shows a screenshot of the REDCap interface, specifically the 'Validation?' (optional) dropdown menu. The menu is open, displaying a list of validation options. The options are: 'Date (Y-M-D)', '---- None ----', 'Date (M-D-Y)', 'Date (Y-M-D)', 'Datetime (M-D-Y H:M)', 'Datetime (Y-M-D H:M)', 'Datetime w/ seconds (M-D-Y H:M:S)', 'Datetime w/ seconds (Y-M-D H:M:S)', 'Email', 'Integer', 'Number', 'Phone (U.S.)', 'Time (HH:MM)', and 'Zipcode (U.S.)'. The 'Zipcode (U.S.)' option is currently selected and highlighted in blue. The background shows a portion of the REDCap form with various input fields and labels.

Text Box Validation in REDCap

Preventing data entry errors

- **Hard Validation - Error**

mess

 Editing existing Study ID 1001

do

Weight in kg

for

Height in centimeters

- **Soft Validation - Warning**

BMI

Ma

Form Status

—

—

Will alert data enterer if entry is outside of range, but will still save entry

Validation? (optional)

Date (Y-M-D)

---- None ----

Date (M-D-Y)

Date (Y-M-D)

Datetime (M-D-Y H:M)

Alert

The value you provided is outside the suggested range. (10 - 500). This value is admissible, but you may wish to verify.

Close

Statistically Speaking...

- Validation feature is invaluable in ensuring high-quality data for analyses
- Prevents many headaches later...
- Example:
 - Excel

	A	B
1	pat_id	bp
2	1001	124/76
3	1002	132/90
4	1003	140/85
5	1004	nd
6	1005	not done
7		
8		

vs.

REDCap

Edit Field

You may add a new project field to this data collection instrument by completing the fields below and clicking the Save button at the bottom. When you add a new field, it will be added to the form on this page. For an overview of the different field types available, you may view the [Field Types video \(4 min\)](#).

Field Type: Text Box (Short Text, Number, Date/Time, ...) ▼

Field Label [How to use Piping](#)

Blood Pressure (Systolic):

Variable Name (utilized during data export)

vmi_bps

☐ Enable auto naming of variable based upon its Field Label?

ONLY letters, numbers, and underscores

Validation? (optional)

Integer ▼

jody.ciolino@northwestern.edu

Minimum: 50

Maximum: 300

Action Tags / Field Annotation (optional)

Required and Identifier Fields (REDCap)

Edit Field

You may add a new project field to this data collection instrument by completing the fields below and clicking the Save button at the bottom. When you add a new field, it will be added to the form on this page. For an overview of the different field types available, you may view the [Field Types video \(4 min\)](#).

Field Type: Text Box (Short Text, Number, Date/Time, ...) ▼

Field Label [How to use Piping](#)

Blood Pressure (Systolic):

Action Tags / Field Annotation (optional)

[Learn about Action Tags](#) or [using Field Annotation](#)

Variable Name (utilized during data export)

vmi_bps ☐ Enable auto naming of variable based upon its Field Label?

ONLY letters, numbers, and underscores

Validation? (optional) Integer ▼

Minimum: 50

Maximum: 300

– or –

Enable searching within a biomedical ontology ?

choose ontology to search -- ▼

Required?* ☐ No ☒ Yes

* Prompt if field is blank

Identifier? ☒ No ☐ Yes

Does the field contain identifying information (e.g. name, SSN, address)?

Custom Alignment Right / Vertical (RV) ▼

Align the position of the field on the page

Field Note (optional)

Small reminder text displayed underneath field

Required and Identifier Fields (REDCap)

- **Required** – Will alert data enterer if “required” field is left blank, but will allow you to opt to leave blank*
- **Identifier** – Tags variables with PHI for removal option during export

intake_12	Full name:	text, Identifier				
intake_105	Baby's Name(s):	text, Identifier				
intake_101	Participant date of birth:	text (date_mdy, Max: 2003-12-01)				
intake_150	Participant age: <i>MUST BE >16</i>	calc Calculation: datediff([intake_101],[intake_100],"y", "mdy")				
intake_5	Primary language:	radio <table><tr><td>1</td><td>English</td></tr><tr><td>2</td><td>Spanish</td></tr></table>	1	English	2	Spanish
1	English					
2	Spanish					
intake_2	Participant Email:	text (email), Identifier joey.dolan@northwestern.edu				

Matrix of Fields

- Ideal for grouping of questions that share same response options (i.e., Likert scale questions)
- “Answer Format” can be specified as radio buttons or checkboxes
- May use “ranking” to allow only one selection per column across all fields in the matrix (radio buttons only)

Matrix Header Text (optional)

Indicate whether the participant has a history of any of the following conditions:

Field Matrix Setup

Matrix Rows

Each row represents a different field with its own label and variable name.

☐ Enable auto naming of variable based upon its Field Label?

Field Label

Cancer

Heart disease

Lung disease

Circulatory problems

Mental health disorders

Add another row

Variable Name

ONLY letters,
numbers, and
underscores

Required?* Field Annotation ?

cancer_hx

heart_hx

lung_hx

circ_hx

mh_hx

Matrix Column Choices

Choices (one choice per line)

0, No
1, Yes

Other Matrix Info

Answer Format:

Single Answer (Radio Buttons) ▼

Ranking:

[What is a ranked matrix of fields?](#)

☐ Allow only 1 choice to be selected per column (radio buttons only)

Matrix group name: ONLY letters, numbers, and underscores

med_hx

[What is a matrix group name?](#)








Matrix of Fields: Example

Indicate whether the participant has a history of any of the following conditions:			
	No	Yes	
Cancer	<input type="radio"/>	<input type="radio"/>	reset
Heart disease	<input type="radio"/>	<input type="radio"/>	reset
Lung disease	<input type="radio"/>	<input type="radio"/>	reset
Circulatory problems	<input type="radio"/>	<input type="radio"/>	reset
Mental health disorders	<input type="radio"/>	<input type="radio"/>	reset

Codebook in REDCap (slight digression)

Oftentimes this is called the “codelist” (especially by other platforms)

- Easy-to-read version of project’s Data Dictionary
- Quick reference for viewing field attributes
- Updated in real-time

	#	Variable / Field Name	Field Label <i>Field Note</i>	Field Attributes (Field Type, Validation, Choices, Calculations, etc.)				
Instrument: Enrollment Checklist (enrollment_checklist)								
	1	studyid	Study ID	text				
 	2	incl_header	Section Header: <i>Enrollment Checklist</i> Inclusion Criteria	descriptive				
 	3	hypertensive	Is the participant hypertensive (defined as SBP/DBP >= 140/90)?	yesno <table><tr><td>1</td><td>Yes</td></tr><tr><td>0</td><td>No</td></tr></table>	1	Yes	0	No
1	Yes							
0	No							
 	4	age_18	Is the participant at least 18 years of age?	yesno <table><tr><td>1</td><td>Yes</td></tr><tr><td>0</td><td>No</td></tr></table>	1	Yes	0	No
1	Yes							
0	No							

Branching (aka “skip”) Logic

Branching Logic

- Information from other fields determines whether a particular field will be displayed (e.g., males should not have a pregnancy test, so we should not have any data on pregnancy in this population)
- Statistically speaking...this is yet another invaluable data quality tool that will make data cleaning prior to analyses much easier

Variable: premeno

Is the participant a female of childbearing age? ☐ Yes ☐ No [reset](#)

[Add Field](#) [Add Matrix of Fields](#)

Variable: negpregnant [Branching logic exists]

Is there a negative pregnancy test? ☐ Yes ☐ No [reset](#)

[Add Field](#) [Add Matrix of Fields](#)

Variable: birthcontrol [Branching logic exists]

Is the participant on birth control? ☐ Yes ☐ No [reset](#)

Choose method below for the following field: **enroll** - Enrollment Status:



Advanced Branching Logic Syntax

[\(How do I use the advanced syntax?\)](#)

Show the field ONLY if...

— OR —



Drag-N-Drop Logic Builder

Displaying field choices for the following data collection instrument:

Enrollment Checklist ▼

Field choices from other fields

(drag a choice below to box on right)

studyid = (define criteria)
hypertensive = Yes (1)
hypertensive = No (0)
age_18 = Yes (1)
age_18 = No (0)
premeno = Yes (1)
premeno = No (0)
negpregnant = Yes (1)
negpregnant = No (0)



Drag
and
Drop



Show the field ONLY if...

- ☒ ALL below are true
☐ ANY below are true

[Clear logic](#)











Best Practices: Developing Standards

Some tips to help streamline and prevent issues later

- Example: Date format will always be: YYYY-MM-DD
- Example: if “not detectable” value, enter: 8888
- Example: use <first three letters of form name>_<field #> to indicate variable name...

Best Practices: Developing Standards

Some tips to help streamline and prevent issues later

Instrument: Demographics (demographics)																
 	286	dem	Demographics	descriptive												
 	287	dem_1	1. What is your date of birth?	text (date_mdy, Max: 2003-12-01), Required												
 	288	dem_2	2. What is your current marital status?	radio <table border="1"><tr><td>1</td><td>Single</td></tr><tr><td>2</td><td>Engaged</td></tr><tr><td>3</td><td>Married</td></tr><tr><td>4</td><td>Separated</td></tr><tr><td>5</td><td>Widowed</td></tr><tr><td>6</td><td>Living with Partner</td></tr></table>	1	Single	2	Engaged	3	Married	4	Separated	5	Widowed	6	Living with Partner
1	Single															
2	Engaged															
3	Married															
4	Separated															
5	Widowed															
6	Living with Partner															
 	289	dem_3	3. What is the highest level of education you have completed?	radio <table border="1"><tr><td>1</td><td>1st to 8th grade</td></tr><tr><td>2</td><td>9th to 12th grade (no diploma)</td></tr><tr><td>3</td><td>High school diploma or GED</td></tr><tr><td>4</td><td>Some college, no degree</td></tr><tr><td>5</td><td>College degree or beyond</td></tr></table>	1	1st to 8th grade	2	9th to 12th grade (no diploma)	3	High school diploma or GED	4	Some college, no degree	5	College degree or beyond		
1	1st to 8th grade															
2	9th to 12th grade (no diploma)															
3	High school diploma or GED															
4	Some college, no degree															
5	College degree or beyond															
 	290	dem_4	4. Was your current pregnancy planned?	yesno <table border="1"><tr><td>1</td><td>Yes</td></tr><tr><td>0</td><td>No</td></tr></table>	1	Yes	0	No								
1	Yes															
0	No															

Best Practices: Developing Standards

Some tips to help streamline and prevent issues later

- Develop study-wide codes for:
 - Yes/no = 1/0
 - “Not Detectable” (example: 8888)
 - “Could not obtain” (example: 9999)
 - “Other” (example: 7777)
- Use consistent units (cm vs. inches, lbs. vs kg, temperature)
- Time variables may be tricky...try to always use 24-hour clock (military time)
- Other example regarding labeling corresponding Spanish assessment items (“sp_”)
- Avoid checkboxes
- Decide ahead of time regarding which fields are “required”
- Etc.
- Etc.



Customizations in REDCap





Longitudinal Designs

Recall...

- We previously discussed:
 - Field types (e.g., text, radio button, etc.)
 - Grouping fields in instruments or CRFs
 - These instruments are specified via the online designer or you may use the data dictionary option in REDCap

[Project Home](#) [Project Setup](#) [Other Functionality](#) [Project Revision History](#)

Project status: Development Completed steps 5 of 9

Complete!
[Not complete?](#)

Main project settings

[Disable](#) Use surveys in this project? [?](#) [VIDEO: How to create and manage a survey](#)

[Disable](#) Use longitudinal data collection with defined events? [?](#)

[Modify project title, purpose, etc.](#)

Complete!
[Not complete?](#)

Design your data collection instruments & enable your surveys

Add or edit fields on your data collection instruments (survey and forms). This may be done by either using the Online Designer (online method) or by uploading a Data Dictionary (offline method). You may then enable your instruments to be used as surveys in the Online Designer. Quick links: [Download PDF of all instruments](#) OR [Download the current Data Dictionary](#)

Go to Online Designer or Data Dictionary

You may also browse for pre-built data collection instruments in the [REDCap Shared Library](#)

Have you checked the [Check For Identifiers](#) page to ensure all identifier fields have been tagged?

Complete!
[Not complete?](#)

Define your events and designate instruments for them

Create events for re-using data collection instruments and/or set up scheduling.

Go to [Define My Events](#) or [Designate Instruments for My Events](#)

Longitudinal Designs in REDCap

Most likely the most common

- This will ensure that your data end up in “long” or “vertical” format
- Use this when:
 - Instruments/sets of fields are repeated across multiple instances
 - There are a set, finite number of “visits” or instances
- Recall, that most protocols *should* have...

Project Home Project Setup Other Functionality Project Revision History

Project status: Development Completed steps 5 of 9

Complete! [Not complete?](#)

Main project settings

☒ Use surveys in this project? [VIDEO: How to create and manage a survey](#)

☒ Use longitudinal data collection with defined events? [?](#)

Complete! [Not complete?](#)

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Go to or

You may also browse for pre-built data collection instruments in the

Have you checked the [Check For Identifiers](#) page to ensure all identifier fields have been tagged?

Complete! [Not complete?](#)

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Go to or

Most protocols *should* have...

...a study schedule (aka a visit matrix, a procedure matrix, etc.)

Procedure	Baseline	Week 4	Week 8	Week 12
Consent	X			
Survey Administration	X			X
Physical Examination	X	X	X	X
Laboratory Assessments	X	X	X	X
Dosing	X	X		
Adverse Events	X	X	X	X

- These matrices will vary in detail and complexity, depending upon study, IRB requirements, and the clinical teams who write them

Longitudinal Designs in REDCap

Most likely the most common

- To specify the events: “Define My Events”
- To specify CRFs for each event: “Designate Instruments for My Events”
- Terminology:
 - **Events** = groupings of (repeated) forms at specific study time points
 - **“Arms”** = groupings of events (schedule for participants may vary according to study arm or study progress)

Project Home Project Setup Other Functionality Project Revision History

Project status: Development Completed steps 5 of 9

Complete! Not complete?

Main project settings

Use surveys in this project? [VIDEO: How to create and manage a survey](#)

Use longitudinal data collection with defined events?

Complete! Not complete?

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Complete! Not complete?

Define your events and designate instruments for them

Create events for using data collection instruments and to set up scheduling.

Go to Define My Events or Designate Instruments for My Events

Arm 1: Prenatal

Arm 2: Postpartum














Arm 3: Rx Drug Change Log

Arm 4: Baby Pilot

+Add New Arm

Arm name: **Prenatal**

[Rename Arm 1](#)

	Event #	Days Offset	Offset Range Min / Max	Event Name	Unique event name (auto-generated) 
	1	0	-0/+0	Consent	consent_arm_1
	2	0	-0/+0	V1 Baseline	v1_baseline_arm_1
	3	28	-14/+14	V2 Prenatal	v2_prenatal_arm_1
	4	56	-14/+14	V3 Prenatal	v3_prenatal_arm_1
	5	84	-14/+14	V4 Prenatal	v4_prenatal_arm_1
	6	112	-14/+14	V5 Prenatal	v5_prenatal_arm_1
	7	140	-14/+14	V6 Prenatal	v6_prenatal_arm_1
	8	168	-14/+14	V7 Prenatal	v7_prenatal_arm_1
	9	196	-14/+14	V8 Prenatal	v8_prenatal_arm_1
	10	224	-14/+14	V9 Prenatal	v9_prenatal_arm_1
	11	252	-14/+14	V10 Prenatal	v10_prenatal_arm_1
	12	280	-14/+14	V11 Prenatal	v11_prenatal_arm_1
Add new event		<input type="text"/> Days	<input type="text"/> - <input type="text"/> + <input type="text"/>	<input type="text"/>	
		Convert from other units			Descriptive name for this event

Designate Instruments for Events

Arm name: **Prenatal**

Data Collection Instrument	Consent (1)	V1 Baseline (2)	V2 Prenatal (3)	V3 Prenatal (4)	V4 Prenatal (5)	V5 Prenatal (6)	V6 Prenatal (7)	V7 Prenatal (8)	V8 Prenatal (9)	V9 Prenatal (10)	V10 Prenatal (11)	V11 Prenatal (12)
Screen Consent Eligibility	✓											
Consent Change		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Participant Status	✓											
Visit Compliance		✓										
SSRI Dose Trajectory	✓											
Concomitant Medications	✓											
Diagnosis Trajectory	✓											
Concentration		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Blood Draw		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Vitals		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Visit Medical Information		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Alcohol Cigarette And Other Drug Use		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Abbreviated Asberg Side Effect (ASE)		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Rx Drug Change Intake												

Cross-sectional designs

Cross-sectional designs in REDCap

- Less common, but can be useful
- Common uses:
 - Cross-sectional studies (“snapshot in time”) – single instance of assessment(s)
 - Simple pre-post designs – few instruments, few time points
 - When desired output = “flat” or “horizontal” data file

Cross-sectional designs in REDCap

- These are simpler to design in REDCap, but still require careful considerations (I have an anecdote about this as well)
- Caution: for pre-post designs, ensure consistency in naming conventions of fields
 - anxiety_pre vs. anxiety_post **versus** anxiety_1 vs. anxiety_2
 - If multiple anxiety questions?
 - anx1_1, anx1_2 or anx2_1, anx2_2 – what may be the best way to program these?
 - Whatever you choose, ensure consistency!



Repeatable Events

Repeatable Events

This is a newer feature!

- Recall this OPTI-MOM study example
 - We had to pre-program 11 prenatal events
 - Reason: we didn't know how many visits an individual woman would have

Arm 1: Prenatal

Arm 2: Postpartum














Arm 3: Rx Drug Change Log

Arm 4: Baby Pilot

+Add New Arm

Arm name: **Prenatal**

[Rename Arm 1](#)











	Event #	Days Offset	Offset Range Min / Max	Event Name	Unique event name (auto-generated) 
	1	0	-0/+0	Consent	consent_arm_1
	2	0	-0/+0	V1 Baseline	v1_baseline_arm_1
	3	28	-14/+14	V2 Prenatal	v2_prenatal_arm_1
	4	56	-14/+14	V3 Prenatal	v3_prenatal_arm_1
	5	84	-14/+14	V4 Prenatal	v4_prenatal_arm_1
	6	112	-14/+14	V5 Prenatal	v5_prenatal_arm_1
	7	140	-14/+14	V6 Prenatal	v6_prenatal_arm_1
	8	168	-14/+14	V7 Prenatal	v7_prenatal_arm_1
	9	196	-14/+14	V8 Prenatal	v8_prenatal_arm_1
	10	224	-14/+14	V9 Prenatal	v9_prenatal_arm_1
	11	252	-14/+14	V10 Prenatal	v10_prenatal_arm_1
	12	280	-14/+14	V11 Prenatal	v11_prenatal_arm_1
Add new event		<input type="text"/> Days	- <input type="text"/> + <input type="text"/>	<input type="text"/>	
		Convert from other units		Descriptive name for this event	

Repeatable Events

- Additionally, we want to capture information around a dose change – each of these changes should be an “Event”...
- A woman may have 0 to many dose changes
- **An alternative to having pre-defined/pre-programmed events = Repeatable Events**

Arm name: **Rx Drug Change Log**

[Rename Arm 3](#)

	Event #	Days Offset	Offset Range Min / Max	Event Name	Custom Event Label ⓘ (optional)	Unique event name ⓘ (auto-generated)
	1	1	-0/+0	Change 1		change_1_arm_3
	2	2	-0/+0	Change 2		change_2_arm_3
	3	3	-0/+0	Change 3		change_3_arm_3
	4	4	-0/+0	Change 4		change_4_arm_3
	5	5	-0/+0	Change 5		change_5_arm_3
	6	6	-0/+0	Change 6		change_6_arm_3
	7	7	-0/+0	Change 7		change_7_arm_3
	8	8	-0/+0	Change 8		change_8_arm_3
	9	9	-0/+0	Change 9		change_9_arm_3
	10	10	-0/+0	Change 10		change_10_arm_3
<div> <div>Add new event</div> <div> <input type="text"/> Days <div>- <input type="text"/> + <input type="text"/></div> <div> Convert from other units </div> </div> <div> <input type="text"/> </div> <div> <div>Descriptive name for this event</div> <div></div> </div> <div> <div>Custom Event Label (optional)</div> <div>Example: [visit_date], [weight] kg</div> </div> <div> <input type="text"/> </div> </div>						

Example: Repeatable Events

The Retinoid Protocol (PI: Katherine Wisner [subcontract with UIC])


- Hypothesis: decreased levels of retinoic acid during pregnancy = responsible for some metabolic changes (CYP) observed during pregnancy
- Design: prospective, observational cohort study
 - Healthy, pregnant women (prior to 13 weeks gestation at entry)
 - Measure plasma levels of retinoid every four weeks during pregnancy + two visits postpartum
 - Ideally, at the same time of day (8am-noon) throughout
- Data collection tools (CRFs) →
- Since there will be varied numbers of visits per woman, we chose to use repeatable events feature

	Instrument name	Fields
	Enrollment	32
	Participant Status	26
	Visit Compliance	50
	Demographics	15
	Visit Medical Information	15
	Alcohol Cigarette	5
	Blood Draw	10
	Blood Draw Results	8
	Concomitant Medications	12
	Adverse Event Protocol Departure	46


Example: Repeatable Events

The Retinoid protocol

- Set up as a longitudinal study →
- Create instruments →
- Designate instruments for events →
- Enable repeatable events customizations →


Project status:  Development


Completed steps 3 of 8


Complete!
[Not complete?](#)


Main project settings

Disable


 Use surveys in this project? [?](#)

 [VIDEO: How to create and manage a survey](#)

Disable



 Use longitudinal data collection with defined events? [?](#)

Modify project title, purpose, etc.


Complete!
[Not complete?](#)


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Complete!
[Not complete?](#)

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Create events for re-using data collection instruments and/or set up scheduling.

Go to [Define My Events](#) or [Designate Instruments for My Events](#)



Optional
[I'm done!](#)

Enable optional modules and customizations


Modify

 Repeatable instruments and events [?](#)


Enable

 Auto-numbering for records [?](#)


Enable

 Scheduling module (longitudinal only) [?](#)

Enable

 Randomization module [?](#)

Enable

 Designate an email field to use for invitations to survey participants [?](#)

Additional customizations

Retinoid Example, Continued

Designating instruments for events

- Just two “events”: intake (consent, eligibility) + Follow-up
- **All follow-up visits are identical**
 - Visit medical information
 - Alcohol/cigarette use
 - Blood draw
- **This current setup, only assumes two events, but adding the repeatable events will allow for unlimited number of follow-up visits**
- *Side note: ConMeds and AEs/protocol departures are repeatable instruments within a single event – will discuss later*

Data Collection Instrument	Intake (1)	Follow-up (2)
Enrollment	✓	
Participant Status	✓	
Visit Compliance	✓	
Demographics (survey)	✓	
Visit Medical Information		✓
Alcohol Cigarette		✓
Blood Draw		✓
Blood Draw Results		✓
Concomitant Medications	✓	
Adverse Event Protocol Departure	✓	

Retinoid, continued

- Set up as a longitudinal study →
- Create instruments →
- Designate instruments for events →
- Enable repeatable events customizations →

Project status: Development

Completed steps 3 of 8

Complete!
[Not complete?](#)

Main project settings

Disable

Use surveys in this project? [?](#)

[VIDEO: How to create and manage a survey](#)

Disable

Use longitudinal data collection with defined events? [?](#)

Modify project title, purpose, etc.

Complete!
[Not complete?](#)

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Online Designer

 or

Data Dictionary

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Have you checked the [Check For Identifiers](#) page to ensure all identifier fields have been tagged?

Complete!
[Not complete?](#)

Define your events and designate instruments for them

Create events for re-using data collection instruments and/or set up scheduling.

Go to

Define My Events

 or

Designate Instruments for My Events

Optional

I'm done!

Enable optional modules and customizations

Modify

Repeatable instruments and events [?](#)

Enable

Auto-numbering for records [?](#)

Enable

Scheduling module (longitudinal only) [?](#)

Enable

Randomization module [?](#)

Enable

Designate an email field to use for invitations to survey participants [?](#)

Additional customizations

Specifying the repeating event...

Repeatable instruments and events

An excellent way to collect repeating data in REDCap is to use repeatable instruments and/or repeatable events. This is sometimes called one-to-many data collection. Some examples may include but are not limited to the following: data from multiple visits or observations, concomitant medications, adverse events, or repetitive surveys (daily, weekly, etc.).

Below you can specify a data collection instrument or a whole event of instruments to be infinitely repeatable, in which each repeating instrument or event can be repeated a different number of times for each record. You may set any event in the project to be repeatable *or* alternatively set selected instruments to be repeatable within an event. **The 'Repeat Entire Event' option means that all the event's instruments will repeat together and stay connected, whereas the 'Repeat Instruments' option implies that the instruments will repeat separately and independently from each other on that event.** Once an instrument or event is set to repeat, you will see options on the Record Home Page to add another instance of the instrument/event for the currently selected record.

	Event Name	Repeat entire event or selected instruments?	Instrument name (select instruments to repeat)	Custom label for repeating instruments (optional)
✓	Intake	Repeat Instruments (repeat ▼)	<input type="checkbox"/> Enrollment <input type="checkbox"/> Participant Status <input type="checkbox"/> Visit Compliance <input type="checkbox"/> Demographics <input checked="" type="checkbox"/> Concomitant Medications <input checked="" type="checkbox"/> Adverse Event Protocol Depart...	<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>
✓	Follow-up	Repeat Entire Event (repeat ▼)	<input checked="" type="checkbox"/> Visit Medical Information <input checked="" type="checkbox"/> Alcohol Cigarette <input checked="" type="checkbox"/> Blood Draw	<input type="text"/> <input type="text"/> <input type="text"/>

SaveCancel

Data entry + data export

Repeatable Events (Retinoid Example)

- This is what the record will look like →
- We have three follow-up visits logged for this participant

Record ID **RET-0004**

Data Collection Instrument	Intake	Follow-up		
		(#1)	(#2)	(#3)
Enrollment				
Participant Status				
Visit Compliance				
Demographics (survey)				
Visit Medical Information				
Alcohol Cigarette				
Blood Draw				

- Corresponding export looks like this:

record_id	redcap_event_name	redcap_repeat_instance	scr_age	scr_preg13	scr_sggle_gest	scr_bd_time
RET-0004	intake_arm_1		25	1	1	1
RET-0004	followup_arm_1	1				
RET-0004	followup_arm_1	2				
RET-0004	followup_arm_1	3				

Which is better?

Pre-defined events vs. Repeatable Events







































































































































- This will depend on the situation: study design, the study team, etc.
- Again, will require input from all key players (enterers, builders, analyzers)
- Compare “Record Status Dashboards”:

OPTI-MOM

Pre-defined events

- Dashboard is essentially useless and unmanageable
- BUT Individual record log is clean and easy to follow (next page)

Record ID	Screen Consent Eligibility Consent (Arm 1: Prenatal)	Participant Status Consent (Arm 1: Prenatal)	SSRI Dose Trajectory Consent (Arm 1: Prenatal)	Concomitant Medications Consent (Arm 1: Prenatal)	Diagnosis Trajectory Consent (Arm 1: Prenatal)	Consent Change V1 Baseline (Arm 1: Prenatal)	Visit Compliance V1 Baseline (Arm 1: Prenatal)	Concentration V1 Baseline (Arm 1: Prenatal)	Blood Draw V1 Baseline (Arm 1: Prenatal)	Vitals V1 Baseline (Arm 1: Prenatal)	Visit Medical Information V1 Baseline (Arm 1: Prenatal)	Alcohol Cigarette And Other Drug Use V1 Baseline (Arm 1: Prenatal)	Abbreviated Asberg Side Effect (ASE) V1 Baseline (Arm 1: Prenatal)	Edinburgh Postnatal Depression Scale (EPDS) V1 Baseline (Arm 1: Prenatal)	Generalized Anxiety Disorder (GAD-7) V1 Baseline (Arm 1: Prenatal)	Quick Inventory Depressive Symptomatology (QIDS) V1 Baseline (Arm 1: Prenatal)	Global Health V1 Baseline (Arm 1: Prenatal)	Demographics V1 Baseline (Arm 1: Prenatal)	Adverse Childhood Experience (ACE) V1 Baseline (Arm 1: Prenatal)	Chronic Medical Conditions (CMC) V1 Baseline (Arm 1: Prenatal)	Mood Disorder Questionnaire (MDQ) V1 Baseline (Arm 1: Prenatal)
HT05-5001																					
HT05-5002																					
HT05-5003																					
HT05-5004																					
HT05-5005																					

 Data Collection Instrument	Consent	V1 Baseline	V2 Prenatal	V3 Prenatal	V4 Prenatal	V5 Prenatal	V6 Prenatal	V7 Prenatal	V8 Prenatal	V9 Prenatal	V10 Prenatal	V11 Prenatal
Screen Consent Eligibility												
Consent Change												
Participant Status												
Visit Compliance												
SSRI Dose Trajectory												
Concomitant Medications												
Diagnosis Trajectory												
Concentration												
Blood Draw												
Vitals												
Visit Medical Information												
Alcohol Cigarette And Other Drug Use												
Abbreviated Asberg Side Effect (ASE)												
Edinburgh Postnatal Depression Scale (EPDS) (survey)												
Generalized Anxiety Disorder (GAD-7) (survey)												
Quick Inventory Depressive Symptomatology (QIDS) (survey)												
Global Health (survey)												
Demographics (survey)												
Adverse Childhood Experience (ACE) (survey)												
Chronic Medical Conditions (CMC) (survey)												
Mood Disorder Questionnaire (MDQ) (survey)												
Mini International Neuropsychiatric Interview v6 (MINI)												
Antidepressant Treatment History Form (ATHF)												

Retinoid

Note: this protocol is less complex in general BUT uses repeatable events

- Record Status Dashboard looks “better” →

Displaying: [Instrument status only](#) | [Lock status only](#) | [All status types](#)

Record ID	Enrollment Intake	Participant Status Intake	Visit Compliance Intake	Demographics Intake	Concomitant Medications Intake	Adverse Event Protocol Intake	Visit Medical Information Follow-up	Alcohol Cigarette Follow-up	Blood Draw Follow-up
1									
RET-0001					+				
RET-0002					+	+			
RET-0003					+	+			
RET-0004					+	+			

Record ID **RET-0004**

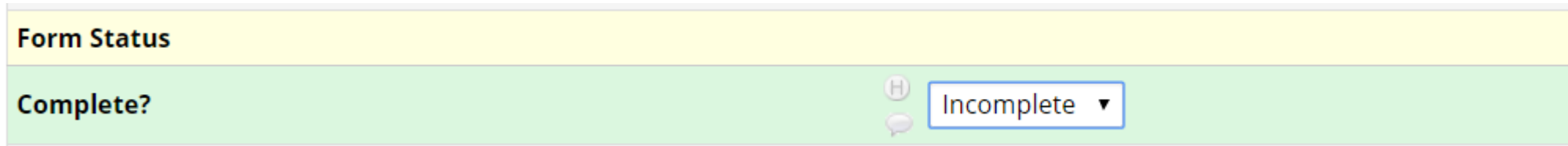
- Individual record is also relatively straightforward →

Data Collection Instrument	Intake	Follow-up (#1)	(#2)	(#3)
Enrollment				
Participant Status				
Visit Compliance				
Demographics (survey)				
Visit Medical Information				
Alcohol Cigarette				
Blood Draw				

Minor digression on data entry









We can see that the complexity of form statuses increases with repeatable instruments/events

- EVERY form in REDCap (by default) has this field at the bottom:



- These icons illustrate the status of the individual form (or groups of forms for repeating events/instruments)

Legend for status icons:

 Incomplete	 Incomplete (no data saved) ?
 Unverified	 Partial Survey Response
 Complete	 Completed Survey Response
 Many statuses (mixed)	 Many statuses (all same)

These only apply when we have repeating events/instruments!



Repeatable Instruments

Repeatable Instruments

Retinoid Study is also making use of this feature

- **Recall: ConMeds and AEs/protocol departures are repeatable instruments within a single event**
- Repeatable instruments are instruments that will vary in number per individual at any one event
- Example: a woman may have no concomitant medications (ConMeds) OR she may have *many*
- Similarly, she may have multiple or no AEs
- Note: for this study, we chose to keep the repeatable instruments at just one event (noting that they may occur at any visit or in between visits)

Data Collection Instrument	Intake (1)	Follow-up (2)
Enrollment	✓	
Participant Status	✓	
Visit Compliance	✓	
Demographics (survey)	✓	
Visit Medical Information		✓
Alcohol Cigarette		✓
Blood Draw		✓
Blood Draw Results		✓
Concomitant Medications	✓	
Adverse Event Protocol Departure	✓	

OPTI-MOM



Before repeatable instruments

- We have a separate database (OPTI-MOM Safety)
- Each record is an individual AE or departure →
- Several drawbacks:
 - Require merging of databases later (after export)
 - Require double data entry of participant IDs (opportunity for error)

Current instrument: **Adverse Event / Protocol Departure**

[Return to edit view](#)

NOTE: Please be aware that branching logic and calculated fields will not function on this page. They only work on the survey pages and data entry forms.

Record ID	<input type="text"/>
Event type	<input type="radio"/> Protocol departure <input type="radio"/> Adverse event <input type="radio"/> Other Reportable New Information reset
Participant ID	<input type="text"/> <small>Must provide for AE</small>
AE experienced by	<input type="radio"/> Mother <input type="radio"/> Fetus <input type="radio"/> Infant/neonate reset
AE description	<div><div></div><div>Expand</div></div>
AE onset date	<input type="text"/>  Today M-D-Y
AE resolution date	<input type="text"/>  Today M-D-Y
Relation to study participation	<input type="radio"/> Definitely <input type="radio"/> Probably <input type="radio"/> Possibly <input type="radio"/> Unrelated reset
Was AE expected	<input type="radio"/> Yes <input type="radio"/> No reset

OPTI-MOM

Before repeatable instruments

Concomitant Medications


196



Enable

Choose action ▾

- We have a ConMeds form within the main database
- It has 196 (-!) fields tied to it
- We pre-programmed the same set of fields for up to 15 medications...

	174	med1cyp Show the field ONLY if: [medtake]='1'	Medication 1: Is this medication one which may interact with CYPs that metabolize SSRI (see list above)?	yesno 1 Yes 0 No
	175	cypmeda Show the field ONLY if: [med1cyp]='1'	Which medication:	dropdown 1 Amiodarone 2 Aprepitant 3 Betamethasone 4 Celecoxib

















Branching logic for each medication!

This dropdown is >40 options!

OPTI-MOM

Before repeatable instruments

- We would like to collect data around each medication
- Multiple fields:
 - Name
 - Dose
 - Route of administration
 - Frequency
 - Start/end dates
 - Etc.
- X 15 !!!
- The codebook is now large simply due to the ConMeds

 	176	cypmeda_o Show the field ONLY if: [cypmeda]='0'	Please specify 'other': <i>Enter the medication name in ALL CAPS. When possible, use the generic name.</i>	text																
 	177	med1 Show the field ONLY if: [med1cyp]='0'	Medication Name: <i>Enter the medication name in ALL CAPS. When possible, use the generic name.</i>	text																
 	178	med1dose Show the field ONLY if: [med1cyp]='0' or [med1cyp]='1'	Dose:	text (number, Min: 0, Ma:																
 	179	med1unit Show the field ONLY if: [med1cyp]='0' or [med1cyp]='1'	Unit:	radio <table><tr><td>1</td><td>mg</td></tr><tr><td>2</td><td>mcg</td></tr><tr><td>3</td><td>mL</td></tr><tr><td>0</td><td>Other</td></tr></table>	1	mg	2	mcg	3	mL	0	Other								
1	mg																			
2	mcg																			
3	mL																			
0	Other																			
 	180	med1unito Show the field ONLY if: [med1unit]='0'	If other unit, please specify:	text																
 	181	med1rte Show the field ONLY if: [med1cyp]='0' or [med1cyp]='1'	Route:	radio <table><tr><td>1</td><td>Drops</td></tr><tr><td>2</td><td>Intramuscular</td></tr><tr><td>3</td><td>Inhalation</td></tr><tr><td>4</td><td>Intravenous</td></tr><tr><td>5</td><td>Oral</td></tr><tr><td>6</td><td>Subcutaneous</td></tr><tr><td>7</td><td>Topical</td></tr><tr><td>0</td><td>Other</td></tr></table>	1	Drops	2	Intramuscular	3	Inhalation	4	Intravenous	5	Oral	6	Subcutaneous	7	Topical	0	Other
1	Drops																			
2	Intramuscular																			
3	Inhalation																			
4	Intravenous																			
5	Oral																			
6	Subcutaneous																			
7	Topical																			
0	Other																			
 	182	med1rteo Show the field ONLY if: [med1rte]='0'	If other route of administration, please specify:	text																
 	183	med1freq Show the field ONLY if: [med1cyp]='0' or [med1cyp]='1'	Frequency:	radio <table><tr><td>1</td><td>Once daily</td></tr><tr><td>2</td><td>Twice daily</td></tr></table>	1	Once daily	2	Twice daily												
1	Once daily																			
2	Twice daily																			

Repeatable Instruments in Retinoid

- No need for separate database for safety
- No need for such a large ConMeds form – just program one set of fields and have as many/few completions of this form as needed
- *Note: for this study, we chose to keep the repeatable instruments at just one event (noting that they may occur at any visit or in between visits)*

Data Collection Instrument	Intake (1)	Follow-up (2)
Enrollment	✓	
Participant Status	✓	
Visit Compliance	✓	
Demographics (survey)	✓	
Visit Medical Information		✓
Alcohol Cigarette		✓
Blood Draw		✓
Blood Draw Results		✓
Concomitant Medications	✓	
Adverse Event Protocol Departure	✓	

Retinoid, continued

- Set up as a longitudinal study →
- Create instruments →
- Designate instruments for events →
- Enable repeatable events + instruments customizations →

Project status: Development

Completed steps 3 of 8

Complete!
[Not complete?](#)

Main project settings

Disable

Use surveys in this project? [?](#)

[VIDEO: How to create and manage a survey](#)

Disable

Use longitudinal data collection with defined events? [?](#)

Modify project title, purpose, etc.

Complete!
[Not complete?](#)

Design your data collection instruments & enable your surveys

Add or edit fields on your data collection instruments (survey and forms). This may be done by either using the Online Designer (online method) or by uploading a Data Dictionary (offline method). You may then enable your instruments to be used as surveys in the Online Designer. Quick links: [Download PDF of all instruments](#) OR [Download the current Data Dictionary](#)

Go to

Online Designer

 or

Data Dictionary

You may also browse for pre-built data collection instruments in the

REDCap Shared Library

Have you checked the [Check For Identifiers](#) page to ensure all identifier fields have been tagged?

Complete!
[Not complete?](#)

Define your events and designate instruments for them

Create events for re-using data collection instruments and/or set up scheduling.

Go to

Define My Events

 or

Designate Instruments for My Events

Complete!
[Not complete?](#)

Optional

I'm done!

Enable optional modules and customizations

Modify

Repeatable instruments and events [?](#)

Enable

Auto-numbering for records [?](#)

Enable

Scheduling module (longitudinal only) [?](#)

Enable

Randomization module [?](#)

Enable

Designate an email field to use for invitations to survey participants [?](#)

Additional customizations

Specifying the repeating instruments...

×

Repeatable instruments and events

An excellent way to collect repeating data in REDCap is to use repeatable instruments and/or repeatable events. This is sometimes called one-to-many data collection. Some examples may include but are not limited to the following: data from multiple visits or observations, concomitant medications, adverse events, or repetitive surveys (daily, weekly, etc.).

Below you can specify a data collection instrument or a whole event of instruments to be infinitely repeatable, in which each repeating instrument or event can be repeated a different number of times for each record. You may set any event in the project to be repeatable *or* alternatively set selected instruments to be repeatable within an event. **The 'Repeat Entire Event' option means that all the event's instruments will repeat together and stay connected, whereas the 'Repeat Instruments' option implies that the instruments will repeat separately and independently from each other on that event.** Once an instrument or event is set to repeat, you will see options on the Record Home Page to add another instance of the instrument/event for the currently selected record.

	Event Name	Repeat entire event or selected instruments?	Instrument name (select instruments to repeat)	Custom label for repeating instruments (optional)
			<input type="checkbox"/> Enrollment	
			<input type="checkbox"/> Participant Status	
			<input type="checkbox"/> Visit Compliance	
			<input type="checkbox"/> Demographics	
			<input checked="" type="checkbox"/> Concomitant Medications	
			<input checked="" type="checkbox"/> Adverse Event Protocol Deapar...	
			<input checked="" type="checkbox"/> Visit Medical Information	
			<input checked="" type="checkbox"/> Alcohol Cigarette	
			<input checked="" type="checkbox"/> Blood Draw	
✓	Intake	Repeat Instruments (repeat ▾)		
✓	Follow-up	Repeat Entire Event (repeat ▾)		

Save

Cancel

Data entry + data export

Repeatable Events + Instruments (Retinoid Example)

- This is what the record will look like →
 - We have three follow-up visits logged for this participant
 - We have also entered two ConMeds and two safety events for this participant
-
- Corresponding export...

Record ID **RET-0004**

Data Collection Instrument	Intake	Follow-up		
		(#1)	(#2)	(#3)
Enrollment				
Participant Status				
Visit Compliance				
Demographics (survey)				
Visit Medical Information				
Alcohol Cigarette				
Blood Draw				
Concomitant Medications	+			
Adverse Event Protocol Departure	+			
Delete all data on event:	✗	✗	✗	✗

Repeating Instruments

Concomitant Medications	
Intake	
1	
2	
+ Add new	

Adverse Event Protocol Departure	
Intake	
1	
2	
+ Add new	

Data export

Repeatable events + instruments (Retinoid Example)

- This is what the corresponding export will look like

record_id	redcap_event_name	redcap_repeat_instrument	redcap_repeat_instance	scr_age	scr_preg13
RET-0004	intake_arm_1			25	1
RET-0004	intake_arm_1	concomitant_medications	1		
RET-0004	intake_arm_1	concomitant_medications	2		
RET-0004	intake_arm_1	adverse_event_protocol_departure	1		
RET-0004	intake_arm_1	adverse_event_protocol_departure	2		
RET-0004	followup_arm_1		1		
RET-0004	followup_arm_1		2		
RET-0004	followup_arm_1		3		

- The fields: redcap_event_name, redcap_repeat_instrument, + redcap_repeat_instance are all default fields
- Each instance is labeled with a number to help identify individual records per person
- “...instrument” will be blank if the data do not correspond to a repeat instrument
- “...instance” will be blank for non-repeating events

Which is better?

Pre-defined events/fields vs. Repeatable Events/Instruments

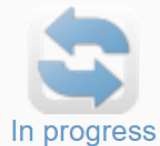
- This will depend on the situation: study design, the study team, etc.
- Again, will require input from all key players (enterers, builders, analyzers)
- Compare “Record Status Dashboards” once again
- Also think about study workflow (multiple databases vs. just one, etc.)



Randomization in REDCap

Randomization in REDCap

- Allows for custom **pre-generated** (i.e., not adaptive) randomization list
- Must be tied to a single event in a single “Arm”
- Differing rights:
 - Setup (programmer/analyst/statistician)
 - Dashboard (unblinded personnel)
 - Randomize (unblinded personnel performing randomization)
- To set up: select this option on the Project Setup checklist tab



I'm done!

Set up a randomization model

The randomization module will help you implement a defined randomization model within your project, allowing you to randomize your subjects (i.e. records in your project).

Go to

Set up randomization

Example: Hypothetical Clinical Trial

Hypertension

Instrument name	Fields
Enrollment Checklist	14
Demographics	9
Medical History	5
Treatment Allocation	1
Vitals	4
Laboratory Assessment	4
IP Tracking	9
Termination	6
Departures	5
Adverse Events	14

Field Type: Multiple Choice - Radio Buttons (Single Answer)

Field Label [How to use Piping](#)

Participant allocation

Variable Name (utilized during data export)

treatmnt

ONLY letters, numbers, and underscores

☐ Enable auto naming of variable based upon its Field Label?

Required?* ☒ No ☐ Yes

* Prompt if field is blank

Identifier? ☒ No ☐ Yes

Does the field contain identifying information (e.g., name, SSN, address)?

Custom Alignment Right / Vertical (RV)

Align the position of the field on the page

Choices (one choice per line) [Copy existing choices](#)

0, Drug A

1, Drug B

Current instrument: **Treatment Allocation**

Preview instrument

Add Field

Add Matrix of Fields

     Variable: treatmnt

Participant allocation

☐ Drug A

☐ Drug B

reset

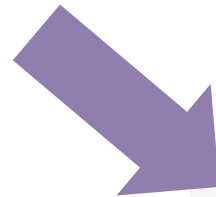
Add Field

Add Matrix of Fields

Example: Hypothetical Clinical Trial

Stratify on Sex (or gender in this case)

Instrument name	Fields
Enrollment Checklist	14
Demographics	9
Medical History	5
Treatment Allocation	1
Vitals	4
Laboratory Assessment	4
IP Tracking	9
Termination	6
Departures	5
Adverse Events	14



Field Type: Multiple Choice - Radio Buttons (Single Answ ▾)

Field Label [How to use Piping](#)

Gender

Choices (one choice per line) [Copy existing choices](#)

0, Female
1, Male

Variable Name (utilized during data export)

gender ☐ Enable auto naming of variable based upon its Field Label?

ONLY letters, numbers, and underscores

Required?* ☒ No ☐ Yes
* Prompt if field is blank

Identifier? ☒ No ☐ Yes
Does the field contain identifying information (e.g., name, SSN, address)?

Custom Alignment Right / Vertical (RV) ▾
Align the position of the field on the page

Setting up Randomization in REDCap

- To set up: select this option on the Project Setup checklist tab



In progress

I'm done!

Set up a randomization model

The randomization module will help you implement a defined randomization model within your project, allowing you to randomize your subjects (i.e. records in your project).

Go to

Set up randomization

Setting up Randomization in REDCap

Stratified on “gender” →

“treatmnt” field from Arm 1 is the field for randomization →

STEP 1: Define your randomization model

This step will allow you to define the randomization model you will be implementing and all its parameters, which includes defining strata (if applicable) and optionally randomizing subjects per group/site (if a multi-site study).

NOTE: This section is currently locked and uneditable because the randomization setup process has already been completed. If you wish to modify the randomization setup below, you will need to click the Erase Randomization Model button below.

A) Use stratified randomization? ☒

It is often necessary to ensure equal treatment among a number of factors. Stratified randomization is the solution to achieve balance within one or more subgroups, such as gender, race, diabetics/non-diabetics, etc. By choosing strata (multiple choice criteria fields), you may then be able to ensure balance within those subgroups. [Tell me more](#)

Choose strata (criteria fields used for stratification; may specify up to 14 multiple choice fields)

gender (Gender) ▼ for Baseline (Arm 1: Arm1) ▼

B) Randomize by group/site? ☐

If this is a multi-center/multi-site project (or something similar), you may want to stratify the randomization by each group/site. You can select an existing multiple choice field that represents the groups/sites, OR you can use Data Access Groups to stratify by group/site.

C) Choose your randomization field

This is the field where the allocated randomization (treatment) group will be saved and stored, and is where the Randomize button will appear on your data collection form.

treatmnt (Participant allocation) ▼ for Baseline (Arm 1: Arm1) ▼

Save randomization model

Erase randomization model

STEP 2: Download template allocation tables (as Excel/CSV files)

Below are some example files that you may download to get a general idea for how you may structure your own randomization table. You do not have to use any of these. In fact, **we recommend that you NOT use these exact templates** but instead recommend that you merely use them as an example or baseline to start from in order to create your own custom allocation file. After uploading your allocation table in Step 3 below, it will then be used as a lookup table to perform assignments when subjects are being randomized. **NOTE:** Record names (e.g., study ID) should NOT be included as a column in your allocation table, but only the fields listed in the example files below. [More details](#)

Example #1 (basic)

Example #2 (all possible combos)

Example #3 (5x all possible combos)

treatmnt	gender	
0	0	
1	0	NOTES:
0	1	- Do NOT modify the first row, although you may modify, add, or delete any other row in this file.
1	1	- Remember that this file is ONLY a template and should NOT be used as-is as your allocation table.
0	0	- You do not have to delete this 'notes' column when uploading your allocation table (it will be ignored).
1	0	- Below is a list of all raw coded values and their corresponding option labels for each strata field and/or Data Access Groups.
0	1	
1	1	Values/labels for "treatmnt" (Participant allocation):
0	0	0 Drug A
1	0	1 Drug B
0	1	
1	1	Values/labels for "gender" (Gender):
0	0	0 Female
1	0	1 Male
0	1	
1	1	
0	0	
1	0	
0	1	
1	1	

STEP 3: Upload your allocation table (CSV file)

Once you have created your custom allocation table as a CSV file and made sure that you kept the format prescribed in the template files from Step 2 above, you may now upload the file below. It will be checked for any possible errors first before it is accepted and stored in REDCap. Please note that you will need to create two different allocation tables: one to be used for testing while your project is in development status and the other for use when in production status. Below are some important reminders before you begin uploading your allocation tables.

Reminders:

- Once your project is in production status, the allocation tables will become locked and unmodifiable.
- Be sure to include more assignments in your allocation table than you think you will need (to accommodate possible drop-out and drop-in of subjects).
- Record names (e.g., study ID) should NOT be included as a column in your allocation table, but only the fields listed in the example files from Step 2 above.



Not
uploaded yet

Upload allocation table (CSV file) for use in **DEVELOPMENT** status

Choose File No file chosen

Upload File



Not
uploaded yet

Upload allocation table (CSV file) for use in **PRODUCTION** status

Choose File No file chosen

Upload File

Randomization Caution

- Always add a “cushion”
- Always test thoroughly with study team involved
- Tables will be “locked” once in production
- **Development randomization table CANNOT be the same as the production table**
- Blinded studies are rather difficult to work out logistically (possible, but may need to be creative with this – restrict access and/or use code for randomization field)



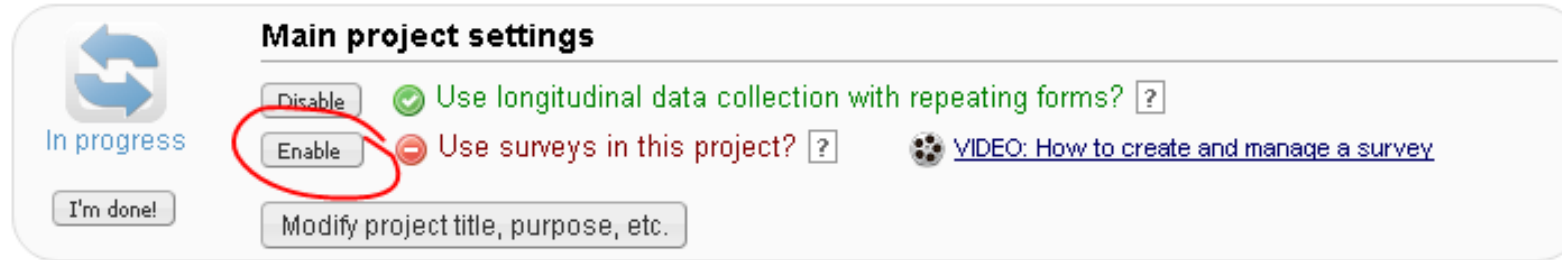
Surveys in REDCap

Survey Administration Overview


- Public survey link/URL can give access to CRF, regardless if REDCap user
- Data entry performed by the respondent
- Responses are defaulted to read-only after submission, though can be edited with appropriate user privileges to do so
- Multiple modes to administer surveys:
 - Public link (anonymous data collection)
 - Email invitation
 - Automated survey invitation


Survey Administration: Getting Started



- 1. Enable survey functionality under “Main project settings” in the Project Setup Checklist



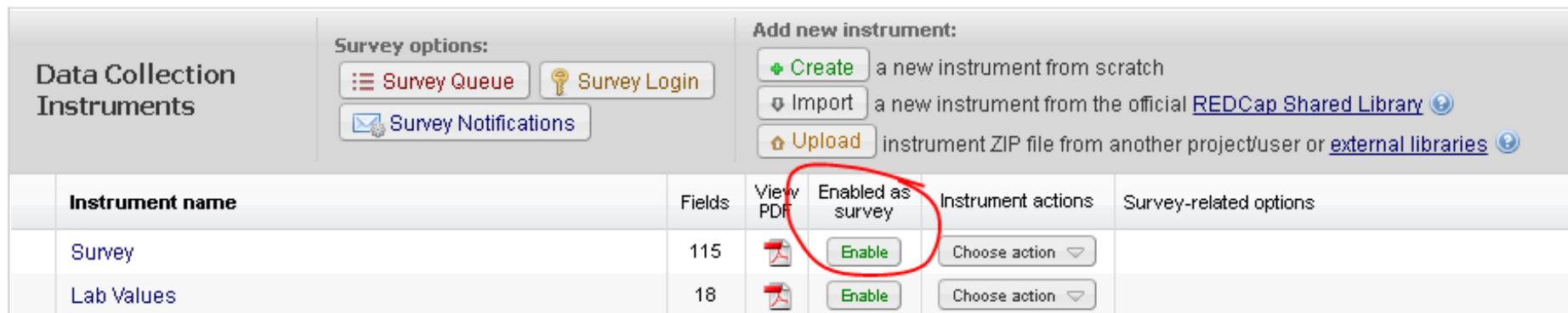
Main project settings

 **In progress**

☒ Use longitudinal data collection with repeating forms? 

☒ Use surveys in this project?   [VIDEO: How to create and manage a survey](#)

- 2. Enable CRF as survey in the Online Designer





Data Collection Instruments





Survey options:

Add new instrument:

a new instrument from scratch

a new instrument from the official [REDCap Shared Library](#) 

instrument ZIP file from another project/user or [external libraries](#) 

Instrument name	Fields	View PDF	Enabled as survey	Instrument actions	Survey-related options
Survey	115		<input checked="" type="button" value="Enable"/>	Choose action 	
Lab Values	18		<input checked="" type="button" value="Enable"/>	Choose action 	

Survey Administration: Settings & Customization

- Instructions
- Logo
- Survey aesthetics (font, font size, survey theme)
- Question numbering and display, such as single or multiple page display
- View aggregate survey results
- Text-to-Speech functionality
- Survey expiration
- Option to “Save & Return Later”
- Survey completion, such as completion text or confirmation email

Survey Administration: Additional Options

- Survey Queue
 - Displays a “to-do” list of surveys to a respondent all on a single page
- Survey Login
 - Forces respondents to authenticate (log in) survey before they are allowed to view and complete the survey
- Notifications
 - Allows users to be notified via email every time a participant completes a specified survey
- Automated Survey Invitations
 - Allows invitations to be sent to respondents based upon specific conditions rather than manually sending an invitation

Survey Examples

- Evaluation Form for workshop
- Survey(s) and queues in OPTI-MOM
- Survey safety trigger for QUARTET USA

User Rights and Permissions

- Grant role-specific access privileges to study team personnel
- User rights include:
 - Project design and setup
 - Data entry
 - Data import and export
 - Form-specific access
 - Other custom/specific rights (e.g., randomization, logging, data import, etc.)

Role name

(click role name to edit role)

Coordinator

Custom

Data Entry Person

Database Management

Project Owner

READ Only

Statistician

Editing existing user role "Statistician"

Basic Rights

Role name: Statistician

Highest level privileges:

- ☒ Project Design and Setup
- ☒ User Rights
- ☒ Data Access Groups

Privileges for data exports (including PDFs and API exports), reports, and stats:

- ☒ Data Exports
 - ☐ No Access
 - ☐ De-Identified*
 - ☒ Remove all tagged Identifier fields
 - ☐ Full Data Set

- ☒ Add / Edit Reports
 - Also allows user to view ALL reports (but not necessarily all data in the reports)

- ☒ Stats & Charts

Other privileges:

- ☐ Manage Survey Participants
- ☐ Calendar
- ☐ Data Import Tool
- ☐ Data Comparison Tool
- ☒ Logging
- ☒ File Repository
- ☒ Data Quality
 - [What is Data Quality?](#)
 - ☒ Create & edit rules
 - ☒ Execute rules
- ☐ Data Resolution Workflow
 - [What is Data Resolution Workflow?](#)
 - ☐ No Access

Data Entry Rights

NOTE: The data entry rights *only* pertain to a user's ability to view or edit data on a web page in REDCap (e.g., data entry forms, reports). It has no effect on data imports or data exports.

	No Access	Read Only	View & Edit	Edit survey responses
Screen Consent Eligibility	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	
Consent Change	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	
Participant Status	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	
Visit Compliance	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	
SSRI Dose Trajectory	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	
Concomitant Medications	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	
Diagnosis Trajectory	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	
Concentration	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	
Blood Draw	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	
Vitals	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	
Visit Medical Information	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	
Alcohol Cigarette And Other Drug Use	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	
Abbreviated Asberg Side Effect (ASE)	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	
Rx Drug Change Intake	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	
Edinburgh Postnatal Depression Scale (EPDS) (survey)	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="checkbox"/>
Generalized Anxiety Disorder (GAD-7)	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="checkbox"/>






Post Database
Development...

...Data Entry, Quality Control,
and Reporting




Data Entry


Data Collection  [Edit instruments](#) 

 **Manage Survey Participants**


- Get a public survey link or build a participant list for inviting respondents

 **Scheduling**

- Generate schedules for the calendar using your defined events

 **Record Status Dashboard**

- View data collection status of all records

 **Add / Edit Records**

- Create new records or edit/view existing ones


Add / Edit Records

You may view an existing record/response by selecting it from the drop-down lists below. To create a new record/response, type a new box below and hit Tab or Enter. To quickly find a record without using the drop-downs, the text box will auto-populate with existing records as you begin to type in it, allowing you to select it.

Total records: 8		
Choose an existing Study ID	Arm 1: Arm1 ▼	-- select record -- ▼
Enter a new or existing Study ID	Arm 1: Arm1 ▼	9999










Data Search	
Choose a field to search (excludes multiple choice fields)	-- select search field -- ▼
Search query Begin typing to search the project data, then click an item in the list to navigate to that record.	

Record Home Page





























 **Record "9999" is a new Study ID.** To create the record and begin entering data for it, click any gray status icon below.

The grid below displays the form-by-form progress of data entered for the currently selected record. You may click on the colored status icons to access that form/event. If you wish, you may modify the events below by navigating to the [Define My Events](#) page.

Legend for status icons:

-  Incomplete  Incomplete (no data saved) 
-  Unverified    Many statuses (all same)
-  Complete  Many statuses (mixed)










NEW Study ID 9999

 Data Collection Instrument	Baseline	Week2	Week4	Week6	Week8	Week10	Week12	Ad Hoc
Enrollment Checklist								
Demographics								
Medical History								
Treatment Allocation								
Vitals								
Laboratory Assessment								
IP Tracking								
Termination								
Departures								
Adverse Events								

Data Entry/Status Icons

Enrollment Status:	<input type="radio"/> Enrolled <input type="radio"/> Ineligible <input type="radio"/> Eligible, refused consent <input type="radio"/> Eligible, pending enrollment	reset
Form Status		
Complete?	<input type="radio"/> Incomplete	

Legend for status icons:

- | | |
|--|--|
|  Incomplete |  Incomplete (no data saved)  |
|  Unverified |    Many statuses (all same) |
|  Complete |  Many statuses (mixed) |

Data Collection Instrument	Consent	V1 Baseline	V2 Prenatal	V3 Prenatal	V4 Prenatal	V5 Prenatal	V6 Prenatal	V7 Prenatal	V8 Prenatal	V9 Prenatal	V10 Prenatal	V11 Prenatal
Screen Consent Eligibility												
Consent Change												
Participant Status												
Visit Compliance												
SSRI Dose Trajectory												
Concomitant Medications												
Diagnosis Trajectory												
Concentration												
Blood Draw												
Vitals												
Visit Medical Information												
Alcohol Cigarette And Other Drug Use												
Abbreviated Asberg Side Effect (ASE)												
Edinburgh Postnatal Depression Scale (EPDS) (survey)												
Generalized Anxiety Disorder (GAD-7) (survey)												
Quick Inventory Depressive Symptomatology (QIDS) (survey)												
Global Health (survey)												
Demographics (survey)												
Adverse Childhood Experience (ACE) (survey)												
Chronic Medical Conditions (CMC) (survey)												
Mood Disorder Questionnaire (MDQ) (survey)												
Mini International Neuropsychiatric Interview (MINI)												
Antidepressant Treatment History Form (ATHF)												



Data Resolution Workflow



Da



[VIDEO: Data Resolution Workflow](#)

This pop-up displays the Data Resolution Workflow for the specified record for a given field and/or Data Quality rule. Users with appropriate user privileges may open data queries to begin a documented process of resolving an issue with the data. Opened data queries may thus be responded to by users with appropriate privileges, and then they may be closed once the issue has been resolved. All data queries can also be viewed on the Resolve Issues page in this project.





Date/Time	User	Comments and Details
02/11/2015 9:19pm	hal536	Action: Opened query Assigned to user: hal536 (Hannah Louks) Comment: "Added no response (previously discussed)"
02/11/2015 9:22pm	hal536	Data Changes Made: random_clear = 'No (0)'
02/16/2015 8:26am	jdc800	Action: Closed query Comment: "agree"
03/03/2017 2:15pm	jdc800	<input type="checkbox"/> Reopen the closed query Comment: <input type="text"/>
		Comment (optional): <input type="text"/>

Data Resolution Workflow


- Use the resolution dashboard to see all queries
- You may organize/filter so that you can only view closed, open, etc. queries
- You may also filter by assigned REDCap user



Data Resolution Workflow

<div> Data Resolution Dashboard <div> Filters: <div> Closed / resolved issues (237) ▼ </div> <div> All fields and rules ▼ </div> <div> Jody ▼ </div> <div> jdc800 (Jody Ciolino) ▼ </div> </div> </div>						
Click button to view data query	Record	Data Quality rule and/or Field	User Assigned	Days Open	First Update	Last Update
 2 comments	18819705 (Garbe) Jody	Field: followup (Participant follow-up time:)	jdc800	8.7	jdc800 (02/07/2015 2:58pm): "52-week study at the patient level Study began 02/2006 and ended 11/2007"	jdc800 (02/16/2015 8:25am): "updated after form changes"
 2 comments	19059639 (Gomez) Jody	Field: followup (Participant follow-up time:)	jdc800	8.7	jdc800 (02/07/2015 3:26pm): "Study lasted (08/2000-07/2006) about 6 years. Participant follow-up was 30 days."	jdc800 (02/16/2015 8:27am): "updated after form changes"
 2 comments	19066368 (Gaziano) Jody	Field: followup (Participant follow-up time:)	jdc800	8.6	jdc800 (02/07/2015 3:42pm): "Follow-up was about 8 years and length of study was about 9 years."	jdc800 (02/16/2015 8:14am): "Updated after form changes made."
 3 comments	19070889 (ASTEC) Jody	Field: followup (Participant follow-up time:)	jdc800	8.6	jdc800 (02/07/2015 4:10pm): "July 1998-March 2005 (7 years)"	jdc800 (02/16/2015 8:20am): "updated after form changes."

Logging

 [Download entire logging record to Microsoft Excel \(CSV\)](#)

This module lists all changes made to this database, including data exports, data changes, and the creation or deletion of users.

Filter by event: All event types (excluding page views) ▼

Filter by user name: All users ▼

Filter by record: All records ▼

Displaying events (by most recent): 1 - 100 ▼

Audit Trail

Time / Date	User name	Action	List of Data Changes OR Fields Exported
4:09pm 12/22/2010	redcap3	Created User testuser	user = 'testuser'
4:09pm 12/22/2010	redcap3	Manage/Design	Create database field
4:08pm 12/22/2010	redcap3	Updated Record 1032	family_id = '1032', first_name = 'Brigitte', last_name = 'Raumann', dob = '2003-12-09', age = '7', sex = '2'
4:08pm 12/22/2010	redcap3	Created Record 1032	proband_relation = '0', subject_info_complete = '0', study_id = '1032'
4:07pm 12/22/2010	redcap3	Updated Record 1001	off_site_clinics(10) = checked
3:42pm 12/22/2010	redcap3	Data Export	study_id, proband_relation, proband_relation_other, family_id, first_name, last_name, dob, age, sex, birth, ethnic_ori, ethnic_ori_other, off_site_clinics, off_site_notes, comments, height, weight, subject_info_complete,



Reports, Graphs, and Descriptive Stats

Reports, Graphs, and Descriptive Stats

- Reporting feature may be useful for quick summarizations and tracking/coordination

Screen Failures

Record ID (record_id)	Event Name (redcap_event_name)	Participant Status: (ps_status)	Comments: (ps_comments)
HT05-5002	Consent (Arm 1: Prenatal)	Ineligible (never enrolled) (8)	Not interested, work schedule is demanding
HT05-5003	Consent (Arm 1: Prenatal)	Ineligible (never enrolled) (8)	Not interested, did not return phone calls
HT05-5004	Consent (Arm 1: Prenatal)	Ineligible (never enrolled) (8)	Interested, but lacks time
HT05-5005	Consent (Arm 1: Prenatal)	Ineligible (never enrolled) (8)	Not interested
HT05-5006	Consent (Arm 1: Prenatal)	Ineligible (never enrolled) (8)	Not interested
HT05-5007	Consent (Arm 1: Prenatal)	Ineligible (never enrolled) (8)	Not interested
HT05-5008	Consent (Arm 1: Prenatal)	Ineligible (never enrolled) (8)	Out of window

Ncenters

DISPLAY OPTIONS

Optional: Select a record to overlay onto the plots below

-- select record --

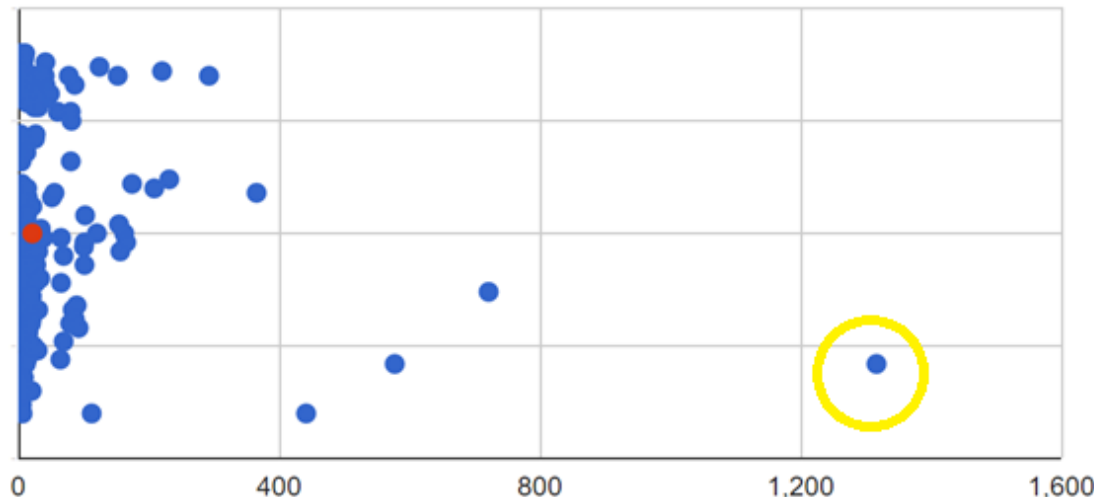
Viewing options:

How many centers? [Refresh Plot](#)

Total Count (N)	Missing	Unique	Min	Max	Mean	StDev	Sum	Percentile						
								0.05	0.10	0.25	0.50 Median	0.75	0.90	0.95
133	18 (11.9%)	69	2.00	1,315.00	65.48	148.92	8,709.00	2.00	3.00	7.00	20.00	68.00	152.60	223.40

Lowest values: 2, 2, 2, 2, 2

Highest values: 364, 440, 576, 720, 1315










- REDCap can also generate simple descriptive statistics and summaries
- You can select an individual data point to navigate to that record

Data Export

Exporting "All data (all records and fields)"

Select your export settings, which includes the export format (Excel/CSV, SAS, SPSS, R, Stata) and if you wish to perform de-identification on the data set.

Choose export format

- ☒  CSV / Microsoft Excel (raw data)
- ☐  CSV / Microsoft Excel (labels)
- ☐  SPSS Statistical Software
- ☐  SAS Statistical Software
- ☐  R Statistical Software
- ☐  Stata Statistical Software
- ☐  CDISC ODM (XML)

De-identification options (optional)

The options below allow you to limit the amount of sensitive information that you are exporting out of the project. Check all that apply.

Known Identifiers:

- ☐ Remove all tagged Identifier fields (tagged in Data Dictionary)
- ☐ Hash the Record ID field (converts record name to an unrecognizable value)

Free-form text:

- ☐ Remove unvalidated Text fields (i.e. Text fields other than dates, numbers, etc.)
- ☐ Remove Notes/Essay box fields

Date and datetime fields:

- ☐ Remove all date and datetime fields
- OR —
- ☐ Shift all dates by value between 0 and 364 days
(shifted amount determined by algorithm for each record) [What is date shifting?](#)

[Deselect all options](#)

Export Data

Cancel

REDCap API...

REDCap API

- API=Application Programming Interface
- Allows external applications (e.g., SAS, R) to connect to REDCap and retrieve and/or modify data
- Useful for performing automated data exports and transferring data between REDCap projects

API Token

- To use the REDCap API, users must be granted 'tokens' by a REDCap administrator that is specific to each username and project
- Each user running any code using the API must request their own API token, which should be treated like a password
- Token must be included in all API requests
- [REDCap API Documentation](#)

API: An Example

Crosstalk between two projects in OPTI-MOM Study at Northwestern University

- Complex specimen labeling

Core Database:

How maternal plasma is labeled:	<div>H</div> <div>HT05-5001-PRG1-PL-S</div> <div>For example, HT05-5001-PRG1-PL-S</div>
---------------------------------	---

- At each visit, we have multiple specimens labeled this way
- Need to 'track' specimens somehow (external database)
 - Each individual specimen should be a new record in this database
 - LOTS of room for data entry error/failure to enter
- API functionality will allow us to pre-populate records in a new database


Specimen

Record ID	Specimen Tracking
HT05-5001-PRG1-MDNA-S	<input checked="" type="radio"/>
HT05-5001-PRG1-PL-S	<input checked="" type="radio"/>
HT05-5001-PRG2-PL-S	<input checked="" type="radio"/>
HT05-5001-PRG3-PL-S	<input checked="" type="radio"/>
HT05-5001-PRG4-PL-S	<input checked="" type="radio"/>
HT05-5001-PRG5-PL-S	<input type="radio"/>

API: An Example

Crosstalk between two projects in OPTI-MOM

- Coordinator(s) now only need to update records in Specimen Tracking Database (will not need to enter manually)
- Example CRF completion in separate database

 Editing existing Record ID **HT05-5001-PRG1-PL-S**

Record ID	HT05-5001-PRG1-PL-S <small>(To rename this record, modify the value immediately below.)</small>
Record ID	<input type="text" value="HT05-5001-PRG1-PL-S"/>
Date Last Updated:	<input type="text" value="12-06-2016"/>
Aliquot 1 Status:	<div><input type="radio"/> Not Collected <input type="radio"/> Missing <input checked="" type="radio"/> CRU Core Lab <input type="radio"/> NUgene <input type="radio"/> Avram Lab <input type="radio"/> UTMB <input type="radio"/> University of Pittsburgh <input type="radio"/> In Transit <input type="radio"/> Analyzed (Sample No Longer Available) <input type="radio"/> Other</div>

API: Example R Script

```
#####
# User needs to replace the [API token] and [Import token] with the his/her assigned OPTI-MOM and
# OPTI-MOM specimen project tokens before running the program

#####
#install redcapAPI package if not already installed
#####
if(!require(redcapAPI)){
  install.packages("redcapAPI")
  library(redcapAPI)
}

#####
# Set up connection to NU REDCap
# The token_ex is the token for the main OPTI-MOM project
# Token is user specific
# Replace [API token] below with your assigned OPTI-MOM project token which can be found
# inside OPTI-MOM project-->API

redcap_url <- "https://redcap.nubic.northwestern.edu/redcap/api/"
token_ex <- "xxxxxxxxxxxxxxxxxxxx"

# rcon is the connect for data EXPORT from OPTI-MOM
rcon <- redcapConnection(url=redcap_url, token=token_ex)

# Export all the records' blood draw form data into bd
bd <- exportRecords(rcon, forms="blood_draw")

# Data cleaning--extract relevant sample label fields into bd1
bd1=bd[,c("mdnalb1","pl1b1","plm01b1","plm0_11b1","plm0_251b1","plm0_51b1",
"plm0_751b1","plm11b1","plm21b1","plm2_51b1","plm31b1","plp1b1","plm41b1",
"pl41b1","plm51b1","plm61b1","pl241b1","plt1b1","planes1b1","csf1b1","pldel1b1",
"cv1b1","calb1","fdnalb1","blood_draw_complete")]

# Data cleaning--filter out those without complete blood draw information
bd2=bd1[bd1$blood_draw_complete==2 & !is.na(bd1$blood_draw_complete),
c(c("mdnalb1","pl1b1","plm01b1","plm0_11b1","plm0_251b1","plm0_51b1",
"plm0_751b1","plm11b1","plm21b1","plm2_51b1","plm31b1","plp1b1","plm41b1",
"pl41b1","plm51b1","plm61b1","pl241b1","plt1b1","planes1b1","csf1b1","pldel1b1",
"cv1b1","calb1","fdnalb1")))]

# Data cleaning--remove all the label fields that are NA
d_import=bd2[!is.na(bd2)]

# Create a data frame of the sample labels and name it as "record_id"
d_import=data.frame(d_import)
names(d_import)="record_id"

# Replace [Import token] with your assigned OPTI-MOM Specimen Tracking token below
token_im="xxxxxxxxxxxxxxxxxxxx"

# Create a connection to import our d_import dataframe into the specimen database
rconim=redcapConnection(url=redcap_url,token=token_im)

# The function below will upload the d_import dataframe we created into the "record_id"
# field of the specimen database
importRecords(rconim,data=d_import,overwriteBehavior = c("normal", "overwrite"),
returnContent = c("count", "ids", "nothing"), returnData = FALSE,
logfile = "")

# If import successfully you will see a message similar to this
#REDCap Data Import Log: 2016-09-09 13:31:36
#The following (if any) conditions were noted about the data.
```




Limitations and Resources



Limitations

- REDCap is intuitive, but there is a learning curve
- Differing institutions may host different versions and enable/disable different features for end users
- REDCap alone is 21 CFR Part 11 “ready” (not necessarily compliant) as a mode of direct data entry; *may* be suitable for FDA-governed studies, but this is project / study team specific

Caution / Pitfalls

- Less is more
 - Just because technology and features are available, does not mean you need to or should use it: ***“Don’t use a hammer to swat a fly”***
 - Consider how each feature and application will fit into your data management procedures
- Education, training, communication = key
- Like many things, REDCap’s flexibility and ease of use may also open the door for error/disaster without proper education, due diligence, training, and communication
 - Test, test, and test again! (Checklist on DigitalHub: <http://dx.doi.org/10.18131/G39311>)
- **It is essential that project owners take ownership and assume all responsibility for that project**

Resources/References

- <http://projectredcap.org>
 - REDCap Shared Library – a repository for REDCap data collection instruments and forms that can be downloaded and used (for free) by consortium partners
 - Video Resources – Webinars and tutorials
 - Community Website
- Harris PA, Taylor R, Thielke R, Payne J, Gonzalez N, Conde JG. Research electronic data capture (REDCap) – A metadata-driven methodology and workflow process for providing translational research informatics support. *J Biomed Inform.* April 2009;42(2): 377-381.

REDCap at Northwestern

- redcap@northwestern.edu
- Online session for New Project Owners (email REDCap support for link)
- All users must complete: REDCap User Agreement
(<https://redcap.nubic.northwestern.edu/redcap/surveys/?s=WK39RMR44F>)
- <https://redcap.nubic.northwestern.edu/redcap/> (must be on campus network for VPN)
- <https://nucats.northwestern.edu/>



Thank you!

Questions:

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