



RC205

Collecting data in REDCap at multiple timepoints

Ryan Merrill - rmerrill@fredhutch.org
Collaborative Data Services (CDS)

Agenda

- Introduction
- Using Longitudinal Projects and Events
- Introducing Repeating Instruments
- Events that Repeat
- Importing & Exporting data across multiple timepoints
- Limitations of Repeating Instruments

Introduction

First a little terminology





- **Form vs. Instrument**


- Interchangeable
- **Survey** is not the same. In REDCap, a survey is used to describe an instrument or form that is filled out by a participant


Before repeating instruments: two choices for project design

1. Classic Project: only one of each instrument
 - Yes, but you can always make a copy of an instrument
2. Longitudinal Project: forms can live within a repeating container called an event






Switching to Longitudinal Project

 Project Home  Project Setup  Other Functionality  Project Revision History

Project status:  Development Completed


Not started

Main project settings

<input type="button" value="Enable"/>	 Use surveys in this project? 	 VIDEO: How to create and man
<input type="button" value="Enable"/>	 Use longitudinal data collection with defined events? 	

Setting up longitudinal project



In progress

I'm done!

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](#)

















1

2

1. Define events (and arms)

Arm 1: **Arm 1** +Add New Arm

Arm name: **Arm 1** [Rename Arm 1](#)

		Event #	Event Name	Custom Event Label (optional) 	Unique event name (auto-generated) 
		1	Baseline		baseline_arm_1
		2	Hospitalization 1		hospitalization_1_arm_1
		3	Hospitailization 2		hospitailization_2_arm_1
		4	Hospitlization 3		hospitlization_3_arm_1
		5	Year One Follow-up		year_one_followup_arm_1
		6	Year Two Follow-up		year_two_followup_arm_1
		7	Exit		exit_arm_1

2. Assign forms to events

Begin Editing Save Select All | Deselect All

Data Collection Instrument	Baseline (1)	Hospitalization 1 (2)	Hospitalization 2 (3)	Hospitalization 3 (4)	Year One Follow-up (5)	Year Two Follow-up (6)	Exit (7)
Demographics	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lab Tests	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Randomization	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Hospitalization	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Follow-up Survey	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Study Exit	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Longitudinal Record Home Page

Record Home Page

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
- Complete

 Choose action for record ▾

✓ Subject Id 1 successfully edited

Subject Id 1

Data Collection Instrument	Baseline	Hospitalization 1	Hospitalization 2	Hospitalization 3	Year One Follow-up	Year Two Follow-up	Exit
Demographics	●						
Lab Tests	●						
Randomization	●						
Hospitalization		●	<input type="radio"/>	<input type="radio"/>			
Follow-up Survey					●	●	
Study Exit							<input type="radio"/>
Delete all data on event:	✗	✗			✗	✗	

Limitations of longitudinal projects

1. Longitudinal projects impose a structure on data collection that make it difficult to collect ad-hoc data
2. You must add an event and add that form to the event (these are schema design operations) before you can capture data at a new timepoint
 - In Production projects User Rights need to be updated to access new forms.
3. Since longitudinal forms must repeat within their event containers, it is clumsy to create forms that repeat independently of other forms

Introducing Repeating Instruments



Optional

I'm done!

Enable optional modules and customizations


- Repeating instruments [?](#)
- Auto-numbering for records [?](#)
- Scheduling module (longitudinal only) [?](#)
- Randomization module [?](#)
- Designate an email field for communications (including survey invitations and alerts) [?](#)



Repeating instruments ✕

An excellent way to collect repeating data in REDCap is to use repeating instruments and/or repeating 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 to be infinitely repeatable, which means that an instrument can be repeated over and over again (a different number of times for each record) even without enabling REDCap's longitudinal module. Once an instrument is set to repeat, you will see options on the Record Home Page to add another instance of the instrument for the currently selected record. All instances of a repeating instrument will then be displayed as a table near the bottom of the Record Home Page, thus allowing viewing of the instances and easy navigation within them.

Repeat this instrument?	Instrument name	Custom label for repeating instruments (optional)  Example: [visit_date], [weight] kg
<input type="checkbox"/>	Demographics	<input type="text"/>
<input type="checkbox"/>	Survey	<input type="text"/>
<input type="checkbox"/>	Exit	<input type="text"/>
<input type="checkbox"/>	Labs	<input type="text"/>
<input type="checkbox"/>	Adverse Event	<input type="text"/>
<input type="checkbox"/>	Protocol Violation	<input type="text"/>







Save

Cancel

Adding instances




- Click **Add new** button or click **[+]** icon

Subject Id 2

Data Collection Instrument	Status
Demographics	
Lab Tests	
Randomization	
Hospitalization	 +
Follow-up <small>(survey)</small>	 +
Study Exit	



Repeating Instruments

Follow-up ▼

1		07-31-2017
2		08-02-2017
3		10-01-2017

+ Add new

Hospitalization ▼

1		07-31-2016
2		09-03-2016

+ Add new

Advantages that Repeating Instruments bring...

1. Longitudinal projects impose a structure on data collection that make it difficult to collect ad-hoc data
 - Repeating instruments make it easy to collect ad-hoc data
2. You must add an event and add that form to the event (these are schema design operations) before you can capture data at a new timepoint
 - No schema change necessary to add a timepoint
3. Since longitudinal forms must repeat within their event containers, it is clumsy to create forms that repeat independently of other forms
 - Every repeating instrument repeats independently of every other repeating instrument

Repeating Events

Best of Both Worlds: Repeating Events

- Basic idea is to take a longitudinal project and add repeating instruments to it
- This gives you the ability to repeat at either...
 - **Event level:** all instruments in event repeat together.
 - Users add a new instance of *event*
 - **Instrument level:** instruments repeat independently of all other events/instruments (just like repeating instrument in classic project)
 - Users add new instance of *instrument*
 - **Note:** For each event, you can choose to either repeat the container (the event) OR the items in the container (the instruments); can't do both.

Best of Both Worlds: Repeating Events

- How to use **repeating events**
 1. From Project Setup, enable **Use Longitudinal data collection with defined events**
 2. Define your events
 3. Designate instruments for events
 4. Enable **Repeating instruments and events**
 5. With longitudinal project, the dialog changes. For each event, you now select how the instruments should repeat

Repeat entire event or selected instruments?	Instrument name (select instruments to re
-- not repeating --	<input type="checkbox"/> Demographics
-- not repeating --	<input type="checkbox"/> Randomization
Repeat Entire Event (repeat all instruments together)	
Repeat Instruments (repeat independently of each other)	
	<input checked="" type="checkbox"/> Lab tests

Repeating Events Example (1 of 3)

- Setup of Events & Form designations

Data Collection Instrument	Baseline (1)	Hospitalization (2)	Follow-up (3)	Exit (4)	Ad-hoc (5)
Demographics	✓				
Randomization	✓				
Hospitalization		✓			
Lab Tests	✓	✓	✓		
Follow-up Survey			✓		
Study Exit				✓	
Adverse Event					✓
Protocol Deviation					✓
Unanticipated Problem					✓

Repeating Events Example (2 of 3)

- Repeating event setup

Event Name	Repeat entire event or selected instruments?	Instrument name (select instruments to repeat)	Custom label for repeating instruments (optional) ⓘ Example: [visit_date], [weight] kg
Baseline	-- not repeating -- ▾	<input type="checkbox"/> Demographics <input type="checkbox"/> Randomization <input type="checkbox"/> Lab Tests	<input type="text"/> <input type="text"/> <input type="text"/>
✓ Hospitalization	Repeat Entire Event (repeat ▾	<input checked="" type="checkbox"/> Hospitalization <input checked="" type="checkbox"/> Lab Tests	<input type="text"/> <input type="text"/>
✓ Follow-up	Repeat Entire Event (repeat ▾	<input checked="" type="checkbox"/> Lab Tests <input checked="" type="checkbox"/> Follow-up Survey	<input type="text"/> <input type="text"/>
Exit	-- not repeating -- ▾	<input type="checkbox"/> Study Exit	<input type="text"/>
✓ Ad-hoc	Repeat Instruments (repeat i ▾	<input checked="" type="checkbox"/> Adverse Event <input checked="" type="checkbox"/> Protocol Deviation <input checked="" type="checkbox"/> Unanticipated Problem	<input type="text" value="[aev_date]"/> <input type="text" value="[prd_date]"/> <input type="text" value="[unp_date]"/>

Repeating Events Example (2 of 3)

- Record Home Page

Subject Id 1

Data Collection Instrument	Baseline	Hospitalization (#1)	+ Add new (#2)	+ Add new Follow-up	Exit	Ad-hoc
Demographics	<input checked="" type="radio"/>					
Randomization	<input checked="" type="radio"/>					
Hospitalization		<input checked="" type="radio"/>	<input checked="" type="radio"/>			
Lab Tests	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>		
Follow-up Survey				<input checked="" type="radio"/>		
Study Exit					<input type="radio"/>	
Adverse Event						<input checked="" type="radio"/> +
Protocol Deviation						<input checked="" type="radio"/> +
Unanticipated Problem						<input checked="" type="radio"/> +
Delete all data on event:	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>

Repeating Instruments

Adverse Event
Ad-hoc

1	<input checked="" type="radio"/>	05-31-2017
2	<input checked="" type="radio"/>	06-19-2017

+ Add new

Protocol Deviation
Ad-hoc

1	<input checked="" type="radio"/>	07-15-2017
---	----------------------------------	------------

+ Add new

Unanticipated Problem
Ad-hoc

1	<input checked="" type="radio"/>	05-13-2017
2	<input checked="" type="radio"/>	05-15-2017
3	<input checked="" type="radio"/>	06-14-2017

+ Add new

Importing & Exporting data across multiple timepoints

Importing/Exporting Data – Classic Project

- Each record must have:
 - record_id + fields
- one record for each subject

	A	B	C	D	E
1	subject_id	feeling	enr_date	enr_gender	enr_birth_da
2	1		10/11/16	1	10/11/16
3	2	22	3/8/17	1	
4	3	72	3/8/17	2	5/16/56
5	13	1	10/12/16	1	10/12/67

Importing/Exporting Data – Longitudinal Project

- Each record must have:
 - record_id + redcap_event_name + fields
- One record for each subject + event

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1	subject_id	redcap_event_name	dem_gender	dem_dob	demographic	tst_date_tim	tst_glucose	tst_cholester	lab_tests_co	rnd_date	rnd_stratum	rnd_assign	randomizatio	hsp_admit_c	hsp_diag	hsp_discharg
2	1	baseline_arm_1	2	4/5/60	2	8/1/17 6:54	34	456	2	8/1/17	2	1	2			
3	1	hospitalization_1_arm_1												7/30/17	Q61.4	8/1/17
4	1	hospitalization_2_arm_1												8/3/17	Q60.3	8/5/17
5	1	year_one_followup_arm_1														
6	1	year_two_followup_arm_1														
7	1	exit_arm_1														
8	2	baseline_arm_1	2	1/1/27	2				0	8/1/17	2	2	2			
9	2	year_one_followup_arm_1														
10	3	baseline_arm_1	1	3/5/58	2	5/1/17 6:57	98	123	2	5/1/17	1	1	2			
11	3	hospitalization_1_arm_1												6/1/17	G51.4	6/2/17

Issues with Repeating Instruments

Limitations with Repeating Instruments

- Calculations, Branching, Report Filters...
 - More complex syntax to refer to a specific instance of a RI
- Surveys
 - More challenging to set up survey invites tied to a specific instance of RI
 - Survey queue only support first instance of RI
 - Can be set up to allow participants to take the survey again
- Other
 - Scheduling module doesn't work with RI
 - Double data entry: can only compare/merge first instance

Repeating Instruments and *Surveys*

- You can use surveys with repeating instruments / events, but as mentioned in last slide, support for survey features is limited
 - Automated survey invites & survey queue only work with first instance
- You can create manual survey invites to multiple instances
 - Trick is to create the instance by clicking on **[+]**
 - Open the form and select **Save & Stay**
 - Select **Survey Options > Compose survey invitation.**
- Also, from **Survey Settings**, you can enable a survey to be on auto-repeat

A screenshot of the "Survey Settings" interface in REDCap. At the top, it says "- OR -". The first option is checked: "(Optional) Allow respondents to repeat the survey: Ask them to take the survey again upon completion, if they wish." Below this, there is a text input field with the value "Take this survey again". The next option is "Location of the button on survey", which is also checked. It has two radio button options: "Before survey is completed, next to Submit button" (which is selected) and "After survey is completed, below Survey Completion Text". Below these options is the "Survey Completion Text" section, which is partially visible and shows the text "Thank you for taking the survey.".

Calculations, Piping, and Smart Variables with Events and Repeating Instruments

- Variables referenced should contain the event prefix and/or the instance suffix – if you don't the value defaults to the current event/instance
 - [baseline_arm_1][dem_dob]
 - [fav_color][2]
- Smart Variables can be used to populate the current, previous, next, first or last event name or instance.
 - [fav_color][current-instance]
- The Smart Variable [new-instance] can be used in combination with the [survey-link] or [survey-url] Smart Variables to create a survey invite that creates a new instance of a survey.

Summary

Classic vs. Longitudinal vs. Repeating

Classic Project

- Each data collection instrument can only be administered once to a participant
- Can include surveys
- Calculations and piping expressions use simplified syntax
- All data for a participant is exported as a single record
- Arms not supported

Longitudinal Project

- Each data collection instrument can be administered multiple times at events
- Can include surveys
- Calculations and piping expressions use more complex syntax
- Data for a participant is exported in multiple records
- Project may have multiple arms

Repeating Instruments/Events

- Each data collection instrument can be administered multiple times
- Can include surveys
- Calculations and piping expressions won't work across repeating elements
- Data for a participant is exported in multiple records
- May have multiple arms if part of Longitudinal project

Summary

- There are a number ways to collect data at multiple timepoints
- Repeating instruments (a.k.a. repeating forms) are a useful alternative to longitudinal project (events) and are advantageous over longitudinal project because...
 - No need to change schema to add instance
 - Instruments can repeat independently of other instruments
- You can combine repeating instruments and longitudinal design (events) to get the best of both worlds
- Importing & exporting gets more complex with multiple timepoint project designs
- Repeating instruments/events make referring to data within fields for branching logic, piping, and trigger logic more complicated



Thank you!

redcaphelp@fredhutch.org
Collaborative Data Services (CDS)