RESEARCH ELECTRONIC DATA CAPTURE

EDCAP AT THE UNIVERSITY OF IOWA
AGENDA

• What is REDCap
• What can REDCap do
• Service Features
• Advanced Feature
• Discussion & Questions
WHAT IS REDCAP?
OVERVIEW

• REDCap is a secure web application for building and managing online surveys and databases
• REDCap can be used to collect virtually any type of data
  – HIPAA-compliant
  – FISMA (moderate)
  – 21 CFR Part 11 (compatible)
• REDCap is specifically designed to support online or offline data capture for research studies and operations
REDCAP CONSORTIUM

- Consortium
  - 2,718 institutions world wide
  - 117 countries
  - 495,000 projects
  - 657,000 users
REDCAP CONSORTIUM

University of Iowa
• Research collaborations
  – 22 countries
  – 35 states
  – 2,868 projects
  – 4,388 users over time
WHO CAN USE REDCAP?

- Any University of Iowa investigator or research team can use REDCap
- Anyone with a valid HawkID and password can login:
  - [https://redcap.icts.uiowa.edu](https://redcap.icts.uiowa.edu)
- External Collaborators can be supported
- Request a new REDCap project
  - In I-CART
    - [https://i-cart.icts.uiowa.edu/](https://i-cart.icts.uiowa.edu/)
  - In Healthcare’s Enterprise Service Center (ESC)
    - [https://service.healthcare.uiowa.edu/CherwellPortal/UIHCPortal](https://service.healthcare.uiowa.edu/CherwellPortal/UIHCPortal)
THE BASICS

WHAT CAN REDCAP DO?
DESIGN

• Front end design tools
  – Drag and Drop
• Design by data dictionary
  – Offline in Excel
• Support custom logo
• Support customization of the theme
• Field sections
• Field validation

• Conditional logic
• Mark identified fields
• URL shortening for surveys
• Responsive design (Desktop/Tablet/Phone)
• Supports mid-study modification
DESIGN - FIELD TYPES

- Single line of text
- Multiple text lines
- Dropdown list (single)
- Radio buttons (single)
- Checkboxes (multiple)
- Calculated fields
- Yes/No
- Slider/Visual Analog
- Descriptive

- Embed (text/audio/image)
- File upload
- Matrix of fields
- Signature (survey)
- Signature & Record Lock (form)
- Biomedical ontologies for answer choices (ICD10, CPT etc, there are hundreds of options)
DATA COLLECTION

• Online data collection
  – Data collection by survey
  – Data collection by instrument
• Offline data collection (REDCap Mobile App Android iOS)
• Repeating Instruments and Events
  – Ability to repeat the instrument without having to specify the amount needed (one-to-many data collection)
• Support multi-armed studies

• Longitudinal data collection
  – Designate instruments by event within study arm
• Edit participant responses
• Require field comments for data changes
• Record locking (prevent changing of validated records)
• E-signature and locking management
• Default field values
• Pre-fill surveys
DATA COLLECTION
SURVEYS

• For 'Required' fields, display the red 'must provide value' text on the survey page
• Response Limit for Survey
  – Prevents respondents from starting the survey after a set number of responses have been collected.
• Time Limit for Survey Completion
  – The amount of time that each respondent has to complete the survey based on when they were initially sent the survey invitation. Note: This feature excludes public survey links.
• Survey Expiration
  – Time after which the survey will become inactive.
• Allow 'Save & Return Later' option for respondents
• Auto-continue to next survey
  – Automatically start the next survey instrument after finishing a survey
• Redirect to a specified URL on survey completion
• Send confirmation email
  – Email the respondent when they complete the survey
PARTICIPANT MANAGEMENT

• Scheduling/Calendar
  – Generate schedules for your project calendar that are auto-generated from project-defined events (e.g., visits, time-points).
  – Scheduling is only available for projects using longitudinal data collection.

• Participant Management Page
  – Public Survey Link
  – Manage Participants
  – Survey Invitation log (past & future)

• Study Arms
  – Multiple arms of a study in the same project

• Randomization
  – Assigns participants/subjects by chance (rather than by choice) into specific groups, typically for clinical research and clinical trials.

• Allow participants to download a PDF of their responses at end of survey
• Allow survey respondents to view aggregate survey results
PARTICIPANT MANAGEMENT

• Survey Queue
  - Displays a list of surveys assigned to a participant all on a single page, in which the queue comprises all surveys that are to be completed (like a 'to-do' list) as well as the surveys that the participant has already completed.
  - Surveys can be set to appear in the Survey Queue based upon:
    • if the participant has completed a particular survey, and/or
    • if certain conditions are met (based upon data values).
  - The participant will only see the surveys they have already completed and the surveys that they are being requested to take next.
PARTICIPANT MANAGEMENT

• Automated Survey Invitations (ASI)
  – A way to have invitations sent to your survey participants, rather than sending or scheduling them manually via the Participant List, the invitations can be scheduled to be sent automatically (i.e. without a person sending the invitation).
  – It is based upon specific conditions, such as if the participant completes another survey in the project or if certain data values for a record are fulfilled.
  – By managing settings, the research team may compose the survey invitation message, and then specify the conditions that must be met in order to send/schedule the invitation.
  – The time at which the invitation will be sent must also be defined.
• Survey Login
  – Require survey respondents to authenticate (log in) on surveys before they are allowed to view and complete the survey.
  – The respondent will log in to the survey by entering one or more known values for fields in the project (up to three) - e.g., last name, date of birth.
  – These values must already be saved in the respondent's record in the project.
COLLABORATION

- Supports multiple form/instrument designers
- Supports multiple data entry team members
- Supports multi-site studies
- Secure in-system messaging between study team, and REDCap administrators.
- File repository
  - Securely share documents
  - Keep previous data dictionaries
- Project bookmarks
  - Create custom bookmarks to webpages that exist inside or outside of REDCap.
USER MANAGEMENT

• Assign permissions granularly
  – Grant user access granular access to the different levels in your study (design, data entry, reports, statistics)
  – Grant access type to data (e.g. read only, read/write)
• Restrict who is able to download data, or download de-identified data only
• Data Access Groups
  – Group user by site location, role, and grant access based on that
• Assign permissions based on project role
  – PI, research coordinator, data entry staff, statistician
REPORTS & DATA VISUALIZATION

- Export PDF of Instruments (blank)
- Export PDF of Instruments with study data
- Create Reports
- Built in Analysis
- Query Tools
- Custom Report Dashboards
DATA EXPORTS

- One click de-identified data export
- Export data
  - All data, specified fields
- Limit data export access based on user or role
- Export formatted for SAS (w/ syntax file)
- Export formatted for SPSS (w/ syntax file)
- Export formatted for R (w/ syntax file)
- Export formatted for STATA (w/ syntax file)
- Export to PDF
- Export to Excel
INFRASTRUCTURE & SECURITY

- Auto Logout after 15 minutes inactivity
- Check for Identified fields
  - Ensure fields are properly marked
- REDCap in interface Auditing:
  - REDCap System level
  - REDCap Project level
- All REDCap transactions are fully encrypted
- REDCap Logins use secure authentication
  - Two-factor authentication enabled (DUO)

- Physical Security
  - Primary Data HCIS Data Center
  - Data backups – ITS ITF Data Center
  - Data centers use two-factor authentication
- REDCap Operating System Security
  - HawkID Based Logins
  - Data Encrypted
  - Remote System Audit Logs
BACKUPS

• Back-ups by the Study team
  – XML export functionality available to the researcher (i.e., project backup)
• Automatic Back-ups by the REDCap Team
  – Data is replicated every 15 minutes to remote data center (automated)
  – Over 100 versions of data are maintained
  – Reliable and tested disaster recovery strategy monthly & annually
SERVICE FEATURES
MAINTENANCE SCHEDULE

• Regular maintenance schedule
  – Second Thursday of each month, 7:30am – 9:30am
• Target dates for releases, easier to plan team resources
• REDCap community has advanced notice for planning purposes
• Why?
  – REDCap Community releases software updates every week with fixes & new features
• Not every study uses BMI or Biostats services for design help
• Issues we troubleshoot tend to have a root cause in database design issues
• Give study team members the option of a database review, by the REDCap team
• Ensure better quality data collection & data integrity
• Provide feedback, suggestions and direct help
PRODUCTION DATABASE CHANGE REVIEW

• Ensure quality data quality & data integrity
  – Verify proposed changes will not invalidate data collected
  – Verify proposed changes will not delete data collected
REDCAP BASICS ICON COURSE

• Course
  – Training available on demand
  – Provides the skills to build studies from scratch and to take advantage of walk-in hours
• Available 24x7
• Knowledge quizzes around content areas
• Final Project
• Certificate of Completion
**REDCAP IN PERSON COURSES**

**REDCap Basic Hands-On**
- This training is a basic overview of REDCap. We will go through the process of creating a REDCap project starting with instrument design, assigning users access to the project, repeating instruments, enabling surveys, project testing, and ending with production mode.

**Advanced Training-1**
- This training will cover advanced features of REDCap instruments and fields. We'll demonstrate how action tags can perform an action on a field, how data can be piped from one field to another; how using biomedical ontologies can standardize your data; and how to use validated instruments from the shared library.

**Advanced Training-2**
- This training will cover the longitudinal module and using smart variables to create more dynamic and context specific logic.

**Logic and Surveys**
- This training will cover REDCap surveys and logic. Automatic survey invitations, hiding/showing fields with branching logic, calculating the difference between 2 dates with a calculated field, and other logical functions available in REDCap.

**REDCap Tech Thursdays**
- 30 minute sessions Thursday Afternoons that cover additional advanced REDCap functionality provided by REDCap External Modules.

Register here: [http://j.mp/2E7BdUr](http://j.mp/2E7BdUr)
OBJECTIVE:

Get Hands-on Help!

- Hours:
  - Every Friday 9:30 am – 11:00 am
  - 263 Medical Research Facility
- Consulting Included:
  - All BMI services, REDCap, TriNetX, UIBioShare, Data Requests, Research Data Management & Planning,
ADVANCED
WHAT ELSE CAN REDCAP DO?
EXTERNAL MODULES

Email Alerts
• Allows users to construct and send customized email alerts to one or more recipients, in which the emails are triggered when a form/survey is completed and optionally based on conditional logic.

Inline Interactive Pop-Ups
• Allows users to specify words or phrases on a form/survey to appear as a highlighted link that will display a popup of instructive text when the cursor moves over the word/phrase.

Shazam
• A module for applying REDCap inputs into tabular or other custom layouts for surveys and data entry forms.

VoteCap
• Simple Q&A interface that allows anonymous participants to ask questions and upvote the questions of others.

Image Map
• This REDCap module replaces an input, radio, or checkbox field with an image that users can interact with to select one or more options. Specific applications include a body map (the over 70 body regions), a smile scale from 1-7 with facial expressions, and 3 representations of teeth and teeth surfaces.

Tableau Web Data Connector
• Enable Tableau users to connect Tableau to a REDCap project for which they have an API token. Project data will be exported on demand and be available for use within Tableau to produce summaries and visualizations.

Form Render Skip Logic
• This module hides and shows instruments based on the value of a single field on a single form - i.e. a branching logic for instruments.

Sticky Matrix Headers
• Makes the matrix header for a matrix of fields always visible (as long as the matrix is visible) - for surveys only.
REDCAP SHARED LIBRARY

• Repository for REDCap data collection instruments and forms that can be downloaded and used by researchers at REDCap partner institutions
  – Curated instruments highlighted with a star ★ have been approved for inclusion by the REDCap Library Oversight Committee (REDLOC) after review for research relevance, accuracy in function and coding (see guidelines), and copyright issues.
  – More than 1,500 instruments available in library
  – Some examples include: PROMIS (adaptive) BRFSS Neuro-QoL (adaptive)
DATA QUALITY

Allows a study team to execute data quality rules upon your project data to check for discrepancies in your data.

Data Quality Rules

• Check for missing values
• Check for missing values (required fields only)
• Check for field validation errors (incorrect data type)
• Check for field validation errors (out of range)
• Hidden fields that contain values
• Custom rules can also be written
DATA QUALITY

Field Comment Log
• Allows users to leave comments for any given field on a data entry form by clicking the balloon icon next to the field. All comments can also be viewed, searched, and downloaded on the Field Comment Log page.

Data Resolution Workflow (Data Queries)
• Users will be allowed to open a workflow for documenting the process of resolving issues with data in the project (i.e. opening, responding to, and closing data queries).
DATA QUALITY

Data History Widget

- Icon will appear next to every field on a data collection instrument. When the icon is clicked, the history of all data entered into that field for that record will be listed chronologically and will display all previous values, who changed the value at each instance, and the time it was changed.

Require a 'reason' when making changes to existing records

- Require users to enter a reason (200 character max) in a text box when making any data changes to an already existing record on a data collection instrument. The prompt is triggered when clicking the Save button on the page. Any 'reasons' entered can then be viewed anytime afterward on the Logging page.
ACCESSIBILITY

• Responsive Design
  – Detects device size and presents materials appropriately
  – Tab through Questions
  – Built in Text-To-Speech functionality
    • Allows text on survey page to be read audibly to participants.
CUSTOMIZE THE DATA ENTRY EXPERIENCE

@ActionTags allow customization of the data entry experience
- Capture Barcode using device camera
- Set field character limit
- Set field default value
- Hide a field
- Hide the Now/Today button
- Hide a choice
- Capture Latitude

- Capture Longitude
- Allow none of the above
- Mask a field Display hint
- Randomize choices
- Set field to read-only
- Set field to current date of user
- Set field to username of the current REDCap user
- Set field word limit
SMS AND VOICE CALL SERVICES FOR SURVEYS - TWILIO

- REDCap's Twilio module enables your project to make and receive voice calls and SMS text messages, both from and to survey respondents. This module uses a third-party web service named Twilio.

Options:
- Send survey invitation via SMS. Participants take the survey as usual, just as if they had clicked the survey link in an email.
- Initiate survey as voice call.
- Invite via SMS to take as voice call (respondent calls REDCap).
- Invite via SMS to take as voice call (REDCap calls respondent).
- Initiate survey as SMS conversation NOTE: THIS IS NOT HIPAA-COMPLIANT AND IS NOT RECOMMENDED FOR MOST PROJECTS.

No REDCap "data" is ever stored on the Twilio servers.
REDCAP MOBILE APP

• Encrypted application for
  – IOS
  – Android
• Designed for offline data capture by research team member
  – Areas with limited infrastructure/internet/cell coverage
• Collect data offline
• Connect to Internet
• Push data securely to REDCap Database
APPLICATION PROGRAMMING INTERFACE (API)

Programmatic access via API (REDCap team)

- The API is an interface that allows external applications to connect to REDCap remotely, and is used for programmatically retrieving or modifying data or settings within REDCap, such as performing automated data imports/exports from a specified REDCap project.

- It is important to remember that when making requests to the REDCap API, you should always validate the REDCap server's SSL certificate to ensure the highest level of security during communication with the API.
DATA ENTRY TRIGGER

Programmed by the REDCap team

- Provides a way for REDCap to trigger a call to a remote web address (URL), in which it will send a HTTP POST request to the specified URL whenever *any* record or survey response has been created or modified on *any* data collection instrument or survey in this project (it is *not* triggered by data imports - including API imports and Mobile App imports - but only by normal data entry on surveys and data entry forms).

- Purpose is for notifying other remote systems outside REDCap at the very moment a record/response is created or modified, whose purpose may be to trigger some kind of action by the remote website, such as making a call to the REDCap API.
NEW & COOL
REDCAP AS A PLATFORM
MYCAP: A RESEARCH PROJECT
DATA CAPTURE TOOL

• MyCap makes it easy for researchers to capture participant/patient reported outcomes using mobile devices.
• Customize the MyCap app interface to fit the specific needs for your research project using our web-based manager.
• MyCap protects participant data by requiring a 4-digit passcode to unlock the app. Data are stored in an encrypted database on the device.
• Participant data is synchronized to your REDCap project.

Features:
- Add project participants
- Create tasks/surveys using REDCap
- Create active tasks
- Schedule when and how often tasks should appear
- Send secure messages to individual participants
- Send announcements to all participants
- Create information screens
- Create a custom theme
• MyCap leverages REDCap, ResearchKit, and ResearchStack to capture participant/patient reported outcomes via mobile devices.

• REDCap is used to define tasks/instruments/surveys to be completed by participants.

• MyCap translates REDCap task metadata into a structure compatible with ResearchKit and ResearchStack.

• When a project participant completes a task, MyCap converts the results into a format compatible with REDCap before synchronizing back to the REDCap project.
How happy are you feeling right now? 0 = Unhappy, 10 = Very Happy

Did you take your medications this morning?

Yes
No
Please acknowledge the support by ICTS in any publications with the following text:

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Please cite the REDCap project when publishing manuscript using the following language:

Study data were collected and managed using REDCap electronic data capture tools hosted at University of Iowa.\textsuperscript{1} REDCap (Research Electronic Data Capture) is a secure, web-based application designed to support data capture for research studies, providing: 1) an intuitive interface for validated data entry; 2) audit trails for tracking data manipulation and export procedures; 3) automated export procedures for seamless data downloads to common statistical packages; and 4) procedures for importing data from external sources.

\textsuperscript{1}Paul A. Harris, Robert Taylor, Robert Thielke, Jonathon Payne, Nathaniel Gonzalez, Jose G. Conde, Research electronic data capture (REDCap) - A metadata-driven methodology and workflow process for providing translational research informatics support, J Biomed Inform. 2009 Apr;42(2):377-81.
UPCOMING HANDS-ON
WEDNESDAY MAY 23RD
11:30AM-1:30PM

REGISTER HERE:
HTTP://J.MP/2E7BDUR

THIS SESSION WILL BE AVAILABLE AS OF MAY 17TH.
QUESTIONS?