What's New in REDCap

Upgrading from 11.1.18 to 12.4.8

Contents

New Features

- **New feature**: Ability to make reports accessible at a public link
    - o Summary: When editing a report, users can now set a report as "public" and can obtain a public link to the report if they have User Rights privileges in the project. When a report is public, this means that all data in the report will be fully accessible (with no authentication required) to anyone with the public link to the report.
    - o In order to make a report public, all the following must be true:
        - ▪ The user must have User Rights privileges in the project or be a REDCap administrator.
        - ▪ The report cannot have any Identifier fields in it.
        - ▪ The user is required to view the report during their current REDCap session.
        - ▪ The user must agree to and check off the following statements: 1) I understand that making this report "public" means that all data in the report will be fully accessible to anyone with the public link to the report, and 2) I understand that I am responsible if any private, sensitive, or identifying data in the report is exposed to persons who should not have access to such data.
    - o The behavior of how reports are made public can be controlled at the system level near the bottom of the User Settings page in the Control Center using the setting "Allow reports to be made 'public'?". Admins may completely disallow reports to be made public (although admins will still have this ability to do so). But if enabled, they may choose to allow users to make reports public on their own or enable the To-Do List approval process by which an admin will need to approve their request to make a given report public (similar to the same system level approval process for Project Dashboards being made public).
    - o Once a report has been made public, its configuration cannot be modified while it is public (users cannot add new fields, modify filter logic, etc.). In order to modify a public report, the user will need to make it no longer public, then make their changes, and then make it public again.
- **New feature**: Tableau Data Export- Extract all records into Tableau via the REDCap API.
    - o This feature enables Tableau (v10.0+) users to connect Tableau to a REDCap project using an API token. Project data can be exported on demand and be available for use within Tableau to produce summaries and visualizations. The Other Export Option page in any given project has instructions to export project data into Tableau.
    - o NOTICE: It is required for a user to have an API token generated for the project in order to use this feature.
- **New feature**: MailGun Email API Integration
    - o As an alternative for sending outgoing emails from REDCap (rather than using the standard settings in PHP.INI to send them natively from the web server), you may use MailGun, which is a third-party paid service that can send emails on behalf of REDCap.

- o The option can be configured on the General Configuration page in the Control Center. You merely have to provide the API key and domain name for your MailGun account, and it will begin using the MailGun Web API to send *all* emails going out of REDCap.
- **New feature**: Project-level setting "Prevent branching logic from hiding fields that have values"
  - o This setting can be enabled by any project user with Project Setup/Design privileges in the Additional Customizations popup on the Project Setup page.
  - o This setting affects both data entry forms and surveys. If it is not enabled (default), then whenever a field is to be hidden by branching logic on a data entry form, it will always ask the user if they wish to hide the field and erase its value, whereas on survey pages it will automatically erase the value of the field being hidden without displaying the confirmation prompt, which has always been the default behavior for surveys. If this setting is enabled, the branching logic behavior will change so that fields with values will not cause the 'Erase the Value of the Field?' confirmation prompt to ask the user if they wish to keep the value or hide the field, and instead fields with values will not be hidden by branching logic and will stay visible. Thus they will be exempt from branching logic. This will prevent data from being erased as it normally does if fields are hidden by branching logic.
  - o When a field should be hidden by branching logic but is not hidden because it has a value, an icon will be displayed on the field to indicate this to the user.
  - o This project-level setting is included in the API Export Project Info method as "bypass_branching_erase_field_prompt". The REDCap Mobile App will soon have this same functionality, but it will only work if the REDCap server is on REDCap 11.2.0 or higher.
  - o The name of Data Quality rule F has been slightly changed when this setting is enabled from "Hidden fields that contain values" to "Fields that contain values that should be hidden".
- **New features**: New drop-down options on the User Rights page to allow users to perform the tasks listed below using a CSV file in the user interface.
  - o Upload users and their privileges
  - o Download users and their privileges
  - o Upload user roles and their privileges
  - o Download user roles and their privileges
  - o Upload user role assignments
  - o Download user role assignments
- **New feature**: "DAG Switcher" API method - When using the DAG Switcher functionality in a project, this method allows users to move themselves in and out of a Data Access Group at will using the API just as they would do the same thing in the user interface (assuming they have been assigned to multiple DAGs on the DAG Switcher page).
- **New feature**: Protected Email Mode
  - o Users can enable the Protected Email Mode on any project on the Project Setup via the Additional Customization dialog. This setting prevents identifying data (PHI/PII) from being sent in outgoing emails for alerts, survey invitations, and survey confirmation emails.
  - o If enabled, either A) all alerts, survey invitations, and survey confirmation emails or B) those whose email body is attempting to pipe data from Identifier fields will be affected, in which it will not send the full email text to the recipient but will instead send a surrogate email containing a link that leads them to a secure REDCap page to view their original email. If someone is accessing an email in the Protected Email Mode for the first time (or for the first time in the past 30 days), it will send a security code to their inbox that will allow the recipient to view any protected emails for up to 30 days on that same device. The Protected Email Mode is similar to Microsoft Outlook's "sensitivity label" feature.
  - o When enabled in a project, user's may specify custom text/HTML to display at top of the sent email and web page where the original email is viewed. This will allow users to also display logos/images pertaining to their project or institution.
  - o This feature can be disabled in all projects via a global setting on the Modules/Services Configuration page in the Control Center.
- **New feature**: Email Logging page

- o This is a new project page that contains a search interface to allow users with User Rights privileges to search and view ALL outgoing emails for that project (also includes searching and viewing of SMS messages if using Twilio services).
  - o This feature can be disabled in all projects via a global setting on the Modules/Services Configuration page in the Control Center.
  - o "Re-send email" feature - When viewing an individual email after performing a search on the page, a "Re-send email" button will be displayed in the dialog to allow users to re-send the email. Note: If the original email contained email attachments, the attachments will not be included in the email that is re-sent.
  - o Only users with User Rights privileges in the project may access the page, and additionally they must opt-in and agree to a disclaimer before being able to view the page. The following text will be presented to the user before accessing the page: "Before viewing and accessing this page, you must first agree that you understand the following important information and conditions. This page is only accessible by users having User Rights privileges in this project. The Email Logging feature allows users to search and view *all* outgoing emails related to this project, and this includes being able to view all aspects of any given email (i.e., the recipient(s), sender, subject, message body, attachment names). If you are using anonymous surveys in this project, keep in mind that viewing this page and the emails displayed therein might inadvertently cause anonymous survey responses to be identifiable/de-anonymized. Additionally, if the project is using Data Access Groups, you will be able to view the emails related to all DAGs in this project (and thus possibly any data piped into the body of those emails). If you understand and agree to these conditions, click the button below. Please note the act agreeing to this disclaimer will be documented on the project Logging page."

- **New feature**: Auto-adjudication for Clinical Data Pull (CDP) projects - As an extension of the existing "Instant Adjudication" feature for CDP projects, any projects with Instant Adjudication enabled can optionally enable the Auto-adjudication feature on the CDP Setup page in a project. Once enabled, if any records in the project have data that has already been pulled from the EHR and are awaiting adjudication, they will be adjudicated automatically by a cron job process that checks every 5 minutes. This allows the data to follow into the project automatically and prevents the need for a user to manually adjudicate data or to click the Instant Adjudicate button. Similar to the Instant Adjudication setting, only users with CDP Setup/Mapping privileges can enable the Auto-adjudication setting.

- **New feature**: Admins can set or change a user's sponsor on the "View User List By Criteria" tab on the Browser Users page in the Control Center. An administrator can click the "Set or change user's sponsor" button on the page and then select another user in the system to become their new sponsor. This feature works for any users that currently have a sponsor or that do not have a sponsor.

- **New feature**: A new Cron History table was added to the bottom of the Cron Jobs page in the Control Center to allow administrators to have more visibility regarding when certain cron jobs are run and for how long, including cron jobs for external modules. The table includes a date field to easily adjust the window of time by date.

- **New feature**: Multi-Language Management
  - o Summary: Users can create and configure multiple display languages for their projects for surveys, data entry forms, alerts, survey invitations, etc. Users can design data collection instruments and have them be displayed in any language that they have defined and translated so that their survey participants or data entry persons can view the text in their preferred language. This eliminates the need to create multiple instruments or projects to handle multiple languages. NOTE: The MLM feature will not auto-translate text, but provides tools so that users may easily translate them themselves.
  - o Usage: When entering data on a data entry form or survey, users and participants will be able to choose their language from a drop-down list or buttons on the page to easily switch to their preferred language for the text displayed on the page. This feature allows users to translate all text related to the data entry process, both for surveys and for data entry forms. Even various survey settings and email text can be translated. For users on data entry forms, if a language is selected, that selection is stored in the user's user account settings internally (in the REDCap backend database), whereas a survey participant's selected language will be stored in a cookie in their web browser as a way to remember their language preference if

they return in the future (and also to maintain their selected language from page to page). The language can be pre-selected for a participant, if desired, using the "Language preference field" setting on the MLM page in the project or via the @LANGUAGE-FORCE action tags (seen below).

- o User Rights: Users must have Project Design/Setup privileges in a project in order to see the link to the Multi-Language Management page on the left-hand menu.
- o System-level Configuration: The MLM feature can be completely disabled at the system level, if desired, via the MLM page in the Control Center (on the Settings tab). On this page in the Control Center, admins can optionally seed any User Interface (i.e., stock language) translations for the entire REDCap installation, in which users could import any activated User Interface translations into their project. This will only import the User Interface elements (since those are universal to each project), but it can be a big time saver to prevent the user from having to translate those common elements in their project. These can be imported via the Create New Language process in a project (or via the Edit Language setting also).
- o Note: The MLM feature works seamlessly with SMS messages sent via Twilio. Additionally, the MLM feature works with the e-Consent Framework, in which the archived PDF of the participant's consent form will be stored in the File Repository in the same language in which the participant took the survey.
- o Note: When a project is in production, the MLM page and all translations can only be modified when the project is in Draft Mode. So if the user desires to make edits or additions to their translations, they must first enable Draft Mode via the Online Designer, and then return to the MLM page to make translation changes while in Draft Mode. When the drafted changes are approved, their translation changes made while in Draft Mode will automatically be approved together with them.

- **New feature**: Form Display Logic
  - o Form Display Logic is an advanced feature that provides a way to use conditional logic to disable specific data entry forms that are displayed on the Record Status Dashboard, Record Home Page, or the form list on the left-hand menu. You might think of it as 'form-level branching logic'. Form Display Logic can be very useful if you wish to prevent users from entering data on a specific form or event until certain conditions have been met. The forms will still be displayed on the page, but they will be disabled in order to prevent users from accessing them. Below you may define as many conditions as you want. A form may be selected in multiple conditions, but if so, please note that the form will be enabled if at least one of the conditions is met. The Form Display Logic does not impact data imports but only operates in the data entry user interface to enable/disable forms. Additionally, Form Display Logic is not utilized by the Survey Queue at all but can affect the behavior of the Survey Auto-Continue feature if the checkbox for it is enabled in the setup dialog. The Form Display Logic setup can be found by clicking the "Form Display Logic" button at the top of the instrument list in the Online Designer.
  - o This feature serves as the official integration of the Form Render Skip Logic external module created by Philip Chase and his team. Thanks to them for their work on this module. Note: When upgrading REDCap to v12.0.0 or higher, if the Form Render Skip Logic is installed and is being used by any projects, all the configuration settings for the module will automatically be translated into the new Form Display Logic settings format, after which the external module will be disabled for each project and also for the entire system (since it will no longer be needed). This all happens automatically during the upgrade.

- **New feature**: Design Checker for the Clinical Data Mart (CDM) - The "Data Mart Design Checker" is a new tool available in the Data Mart fetch page that will report any issue related to the design of the current Data Mart project. Based on the most recent Data Mart XML template available in REDCap, the tool will check, list, and fix any of these issues: missing forms, variables, revisions, or section headers, the lack/presence of repeatability in a form, variables included in the wrong form, etc. An administrator or a user with Project Setup/Design privileges can use the tool to review and automatically fix all reported issues. This tool will mainly be utilized when users have modified the structure of an existing Data Mart project or if new forms and data types have been added to the Data Mart feature itself since the users initially created their Data Mart project.
- **New feature**: New design for the "Help & FAQ" page.
- **New feature: Conditional logic for Survey Auto-Continue** - When enabling Survey Auto-Continue on the Survey Settings page for a survey, users may now optionally specify conditional logic to determine whether or not the

auto-continue should be applied. As such, REDCap will auto-continue to the next survey *only* if the conditional logic is TRUE or if the logic textbox has been left blank. This new option can be used as a simpler alternative to the Survey Queue, which can require more complex instrument-event level configurations for longitudinal projects.

- **New feature: Dynamic min/max range limits for fields** - Instead of using exact values as the minimum or maximum range of Textbox fields (e.g., "2021-12-07"), you may now also use "today" and "now" as the min or max so that the current date or time is always used. These can be used to prevent a date/time field from having a value in the past or in the future. Additionally, you can now pipe a value from another field into the field's min or max range setting - e.g., [visit_date] or [event_1_arm_1][age]. This can help ensure that a Textbox field (whether a date, time, or number) has a larger or smaller value than another field, regardless of whether the field is on the same instrument or not.

- **New field validation: "Time (HH:MM:SS)"** - This new time-based field validation (unique name "time_hh_mm_ss") will be added automatically and enabled by default during the upgrade process. This validation forces users/participants to enter a time value that contains the hour, minute, and second components. It also includes the usage of the "Now" button and the timepicker popup widget, both of which are displayed next to the field on the survey page or data entry form. Note: Fields with this field validation can be utilized inside the datediff() function.

- **New feature: Instrument-level Data Export Rights**
  - Users may specify instrument-level privileges regarding a user's data export capabilities on the User Rights page in a project. A user may be given "No Access", "De-Identified", "Remove All Identifier Fields", or "Full Data Set" data export rights for EACH data collection instrument. This improvement will make it much easier to match a user's Data Exports Rights with their Data Viewing Rights, if you wish, and will give users more granular control regarding what data a user can export from your project.
  - Note: Whatever a user's data export right was in the previous version, that export right will be subsequently extrapolated to all instruments after upgrading. Thus, their export privileges will behave exactly the same as before.
  - Improvement: The table displayed on the User Rights page that lists all users' privileges now includes an instrument count for each category for both Data Viewing Rights and Data Export Rights - e.g., "3 No access, 2 Full Data Set". This helps provide summary information regarding the user's instrument-level rights.
  - Improvement: When adding/editing a user's or user role's privileges in the popup on the User Rights page, as a convenience, users may click the table headers for each Data Export Rights setting or Data Viewing Rights setting to set that setting for all instruments in the project (i.e., as a "check all checkboxes").
  - Note: When adding a new data collection instrument to a project, if the project is in development status, all users will automatically receive "Full Data Set" data export rights for that new instrument. Whereas if the project is in production, all users will automatically receive "No Access" data export rights for the new instrument. This behavior matches how instrument-level rights currently work for Data Viewing Rights when adding a new instrument.
  - Change: When importing or exporting users and/or user roles (whether as a CSV file on the User Rights page or via the API), the new instrument-level data export rights are represented as a new column named "forms_export" and are formatted exactly how instrument-level Data Viewing Rights ("forms") are currently formatted in comma-delimited fashion - e.g., "demographics:1,baseline_data:2,prescreening:3". In this format, the following represents each data export rights level: 0=No Access, 2=De-Identified, 3=Remove Identifier Fields, 1=Full Data Set.

- **New feature: Survey Start Time and related Smart Variables**
  - REDCap now collects when participants begin a survey (i.e., the initial time the survey page is opened). Going forward, any responses collected (partial or completed) will have their start time displayed at the top of the data entry form when viewing the response. NOTE: If the start time is a blank value, it implies that the response began while on an earlier version of REDCap when start times were not yet collected.
  - New Smart Variables for Survey Start Date/Time: Users can access the start time via piping by using the new Smart Variables [survey-time-started:instrument] and [survey-date-started:instrument], which can be used

inside the @DEFAULT or @CALCTEXT action tags, among other places. If users wish to have them return the raw value, which will be in 'YYYY-MM-DD HH:MM:SS' format and would be more appropriate for conditional logic or calculated fields, simply append ':value' after the unique instrument name - e.g., [survey-date-started:instrument:value].

- o New Smart Variables for Survey Duration: Users can obtain the total amount of time that has elapsed since the survey was started (in seconds, minutes, etc.) by using [survey-duration:instrument:units] and [survey-duration-completed:instrument:units]. The Smart Variable [survey-duration] represents the difference between the survey's start time and either its 1) completion time (if completed) or 2) the current time (if not completed), whereas [survey-duration-completed] represents the difference between the survey's start time and completion time, in which a blank value will be returned if the survey has not been completed. Options for 'units': 'y' (years, 1 year = 365.2425 days), 'M' (months, 1 month = 30.44 days), 'd' (days), 'h' (hours), 'm' (minutes), 's' (seconds).
- **New feature:** Integration of the "MySQL Simple Admin" External Module
  - o The integrated version of this EM works exactly the same way, and additionally, has the bonus feature of being able to export the query results to a CSV file. Also, the page has been renamed to "Database Query Tool".
  - o Note: The upgrade process contains a migration script that will auto-migrate all existing custom queries saved in the EM, after which it will disable the EM for the system.
- **New feature:** OpenID Connect authentication method - The "Security & Authentication" page contains a section of new custom settings for using this new OpenID Connect authentication method in REDCap.
- **New feature:** Integration of many features from the "Survey UI Tweaks" External Module
  - o Thanks to Andy Martin and his team at Stanford for their creation and support of the EM. Several (but not all) of the features in the Survey UI Tweaks EM have been integrated as-is. Some features from the EM have actually existed in REDCap for a while. As such, the Survey UI Tweaks EM will not be disabled for any projects or even at the system level when upgrading to this version.
  - o **Improvement**: If custom question numbering is used on a survey page in which no questions have a custom question number defined, the extra space on the left of the questions will be removed to give the questions more room for display on the page.
  - o **Improvement**: On the Survey Settings page, the setting "For Required fields, display the red 'must provide value' text on the survey page?" now has a new option: "Display only the red asterisk". This provides an additional option rather than having to choose between the binary options to hide or not hide the text.
  - o **Improvement**: When taking a survey while on a mobile device, the survey page will auto-scroll whenever selecting a value for a drop-down or radio button field to help the participant scroll down the page more easily.
  - o **Improvement**: New survey setting allows users to set a custom width of the survey displayed on the page between 50% and 100%. The default value for the setting is "Fixed width (default)".
  - o **Improvement**: New survey setting allows users to display or hide the font resize icons at the top of the survey page. By default, it is set to display the font resize options.
  - o **Improvement**: New survey setting allows users to show or hide the Submit buttons displayed at the bottom of every survey page (including the 'Next Page' and 'Previous Page' buttons).
  - o **Improvement**: New survey setting allows users to provide alternative text for the 'Submit', 'Next Page', and 'Previous Page' buttons displayed at the bottom of every survey page.
- **New feature:** Calendar Sync
  - o Users may sync their REDCap project calendar or perform a one-time import of their project calendar events to external calendar applications such as Google Calendar, Outlook, Office 365, Zoho, Apple Calendar, or any application that supports iCal or ICS files. They may choose one of the two options below to sync or import their project calendar events to an external calendar application.
    1. Live calendar feed: Add calendar from URL/Internet - A unique web address will be displayed in a dialog on the Calendar page, in which the URL represents a real-time live feed of the REDCap project calendar. Users may copy the URL to paste it as the calendar URL in their calendar

application using the option "Add calendar from URL/Internet". This will subscribe their external application to the REDCap project calendar. Privacy Note: This calendar feed URL on the Calendar page is unique to the user in the project. So if the user gets expired, removed from the project, or deleted from the system, their unique calendar feed will go blank and will not output anything anymore (for privacy purposes).

2. One-time import: Download ICS file - Download and open the calendar ICS file below to import REDCap calendar events manually into the calendar application on your computer, or upload the file to a web-based calendar service. Notice: This is not a live feed but a one-time import. Thus, any new events added to the REDCap calendar in the future will not be automatically added to the external calendar application.

- o Disabling: The Calendar Sync feature can be disabled at the system level on the Modules/Services Configuration page in the Control Center.
- o Feed-syncing Notice: Different calendar applications have different refresh rates. So if new events are added to the calendar in REDCap, they may not immediately appear in the external application that is consuming the feed but will appear after the next refresh interval, which might be some time later that day or the next day (depending on the calendar application). Additionally, the calendar feed represents a one-way feed. This means that while changes made to the calendar in REDCap will automatically show up in the external calendar application, users will not be able to modify them in the external calendar application because they will be read-only.
- o Privacy Note: When viewing events from the Calendar page's feed or downloadable ICS file, any data from Identifier fields will be automatically removed from the feed/file (e.g., if identifier fields are included in the Custom Record Label or Secondary Unique Field, or if the record name is an identifier), in which their data will be replaced with the text "**DATA REMOVED**".
- o New calendar-specific Smart Variables
  1. [calendar-url] - The web address (URL) of the calendar feed or downloadable ICS calendar file belonging to the current record.
  2. [calendar-link:Custom Text] - The HTML web link that, when clicked, will navigate to the calendar feed or downloadable ICS calendar file belonging to the current record. 'Custom Text' is an optional parameter whereby you can specify the visible link text, and if it is not provided, it defaults to simply displaying the URL as the link text.

- **New feature:** SendGrid Dynamic Templates for Alerts & Notifications
  - o SendGrid Dynamic Templates give users significantly more control over the style and design of emails when compared to the standard email alert type. Enabling this feature on the Project Setup page will give users another alert type to choose from on the Alerts & Notifications page called "SendGrid Template". Thus, similar to Twilio, this feature is a project-level feature that users may enable on individual projects (or users can have administrators enable it for them).
  - o DISABLING: The SendGrid Dynamic Templates feature can be disabled at the system level on the Modules/Services Configuration page in the Control Center. There are also other additional features on that page that determine who can enable the SendGrid services in a given project.
  - o SETUP & CONFIGURATION: This integration requires that you have an account setup on sendgrid.com. After creating a SendGrid account, you'll need to configure senders for the account, create the dynamic templates you wish to use for REDCap alerts, and generate an API Key with appropriate permissions for REDCap to use. When configuring senders on your SendGrid account, you may specify individual senders, authenticate an entire domain so that any email address associated with that domain may be a sender, or both. Please refer to SendGrid's documentation on how to set up Domain Authentication and how to add individual Verified Senders. To create a dynamic template in your SendGrid account, login to your SendGrid account and use the sidebar to navigate to Email API→Dynamic Templates. Here you can create a dynamic template, give it a name, and associate an email design with it. Please reference SendGrid's documentation on Dynamic Templates and Handlebars to learn more about creating templates in your SendGrid account. Lastly, to create an API Key for REDCap, login to your SendGrid account and use the sidebar to navigate to

Settings→API Keys. Here you can create a new API Key and specify its permissions. It is recommended that you create a Restricted Access API Key and only give the API Key the permissions REDCap needs to function. REDCap will need Full Access to Mail Send, Read Access to Sender Authentication, and Read Access to Template Engine. Once you have your API Key, you may use it to configure SendGrid Template email services for alerts & notifications through the REDCap Project Setup page.

- o ALERTS & NOTIFICATIONS: The SendGrid Template alert type will allow you to specify a sender email address that's in your SendGrid account's list of Verified Senders or an email address that matches an Authenticated Domain associated with your SendGrid account. You'll also have an interface to choose which of your SendGrid account's dynamic templates you'd like to use for the alert as well as an interface to specify key/value pairs that will be used to populate your template with REDCap data. Lastly, choosing recipients for SendGrid alerts works the same way as choosing recipients for email alerts.
- o COST: As REDCap makes API calls to SendGrid's Email API using your account's API Key, your SendGrid account will keep track of REDCap's usage and your SendGrid account will be charged accordingly. This is not done by REDCap but is done internally by SendGrid as you use its services. In this way, no monetary transactions are made by REDCap, and thus it is your responsibility to maintain the funds in your SendGrid account in order to ensure that the service continues to work for your REDCap project. If your SendGrid account runs out of funds, the SendGrid services in REDCap will cease to function. You may reference SendGrid's pricing page to get their latest pricing.
- o Thanks to Remi Frazier and Kaizen Towfiq at University of California San Francisco for their code contributions, which made this new feature possible.

- **New feature:** "OpenID Connect & Table-based" authentication
  - o Admins may enable this new authentication method on the Security & Authentication page. It functions exactly like "OpenID Connect" authentication, and has the added bonus of providing some users with the ability to log in via REDCap's local Table-based authentication (if they will not log in via OIDC).
  - o Additionally, admins may optionally define the display name of the OpenID Connect system (e.g., Google, NIH), which gets displayed in a button on the login page that says "Log in using [X] or [Local REDCap Login]". If a value is not provided for this setting, it will simply output "OpenID Connect" as the button text. Clicking that button will take the user to the OIDC login page.

New Action Tags

- **New Action Tag**: **@MAXCHOICE-SURVEY-COMPLETE** - Similar to @MAXCHOICE but only counts choices on completed survey responses (does not count data entered as data entry only or on partial responses). Causes one or more specified choices to be disabled (i.e., displayed but not usable) for a checkbox, radio button, or drop-down field after a specified amount of records have been saved with that choice for completed survey responses only.
- **New action tag**: **@RICHTEXT** - Adds the rich text editor toolbar to a Notes field to allow users/participants to control the appearance (via styling and formatting) of the text they are entering into the field.
- **New action tag**: **@IF** - Allows various action tags to be set based on conditional logic provided inside an @IF() function - e.g., @IF(CONDITION, ACTION TAGS if condition is TRUE, ACTION TAGS if condition is FALSE). Simply provide a condition using normal logic syntax (similar to branching logic), and it will implement one set of action tags or another based on whether that condition is true or false. For example, you can have @IF([yes_no] = '1', @HIDDEN, @HIDE-CHOICE='3' @READ-ONLY), in which it will implement @HIDDEN if the 'yes_no' field's value is '1', otherwise, it will implement the two action tags @HIDE-CHOICE='3' and @READ-ONLY. If you wish not to output any action tags for a certain condition, set it with a pair of apostrophes/quotes as a placeholder - e.g., @IF([my_radio]='1', @READONLY, ''). You may have multiple instances of @IF for a single field. You may also have multiple nested instances of @IF() inside each other. Both field variables and Smart Variables may be used inside the @IF condition. The @IF action tag is also evaluated for a given field when downloading the PDF of an instrument/survey, in case there are any PDF-specific action tags used inside of @IF(). Note: The conditional logic will be evaluated only when the survey page or data entry form initially loads; thus the action tag conditions will not be evaluated in real time as data is entered on the page.

- **New action tag**: **@DOWNLOAD-COUNT** - The @DOWNLOAD-COUNT action tag provides a way to automatically count the number of downloads for a File Upload field or a Descriptive field attachment. It can be used on a Text field or Notes field so that its value will be incremented by '1' whenever someone downloads the file for either a File Upload field or a Descriptive field attachment. The variable name of the File Upload field or Descriptive field whose downloads are to be counted should be provided inside the @DOWNLOAD-COUNT() function. For example, the Text field 'my_download_count' might have its action tag defined as @DOWNLOAD-COUNT(my_upload_field), in which 'my_upload_field' is the variable of a File Upload field. Whenever the file is downloaded on a data entry form, survey page, or report, the value of the field with this action tag will be incremented by '1'. If that field has no value or has a non-integer value, its value will be set to '1'. NOTE: The download count field must be in the same context as the File Upload field or a Descriptive field. This means that in a longitudinal project the two fields must be on the same event, and in a repeating instrument context, they must be on the same repeating instrument.
- **New Action Tags** for Multi-Language Management
  - **@LANGUAGE-CURRENT-FORM** - Allows you to capture the currently used language in projects where multilingual data is enabled on data entry forms. The @LANGUAGE-CURRENT-FORM action tag can be used on fields of type 'Text Box' (no validation), and 'Drop-down List', or 'Radio Buttons' (these need to have choices whose codes correspond to the IDs of the defined languages - e.g., 'en'). This action tag is only active on data entry forms and will always, when possible, set the field's value to the currently active language.
  - **@LANGUAGE-CURRENT-SURVEY** - Same as @LANUGAGE-CURRENT-FORM, but works only on survey pages. For multi-page surveys, @LANGUAGE-CURRENT-SURVEY needs to be used on a field of each page where capture of the language is relevant (e.g. for performing branching).
  - **@LANGUAGE-FORCE** - When used on a field, the data entry form or survey on which the field is located will be rendered in the specified language (which must have been set up using the Multi-Language Management feature). The format must follow the pattern @LANGUAGE-FORCE="???", in which the ID of the desired language should be inside single or double quotes - e.g., @LANGUAGE-FORCE="de". Piping is supported - e.g., @LANGUAGE-FORCE="[field_name]". When the language is forced successfully (i.e., it exists and is active), the language selector is hidden. Using this together with @LANGUAGE-CURRENT-FORM/SURVEY on the source field for @LANGUAGE-FORCE may be used to 'lock in' a user to their selected language.
  - **@LANGUAGE-FORCE-FORM** - Same as @LANGUAGE-FORCE, but the effect is limited to data entry forms (i.e. this does not affect surveys).
  - **@LANGUAGE-FORCE-SURVEY** - Same as @LANGUAGE-FORCE, but the effect is limited to surveys (i.e. this does not affect data entry forms).
  - **@LANGUAGE-SET** - When used on a Drop-down or Radio Button field only, this action tag will allow the field's value to control the currently shown language (in the same way as switching the language via the buttons at the top of the page). Tip: When used in a survey, this field could be prepopulated (and thus auto-selected) by embedding a participant's language ID in the survey URL itself (for details, see the FAQ's "How to pre-fill survey questions" section).
  - Thanks to Günther Rezniczek for all his work to help build the new Multi-Language Management feature.
- **New action tag: @FORCE-MINMAX** - The action tag @FORCE-MINMAX can be used on Textbox fields that have a min or max validation range defined so that no one will not be able to enter a value into the field unless it is within the field's specified validation range. This is different from the default behavior in which out-of-range values are permissible. Note: @FORCE-MINMAX is also enforced for data imports to ensure the value is always within the specified range.

New Smart Variables

- **New Smart Variables**
  - **[event-id]** - (longitudinal only) The event id number of the current event.

- o **[survey-access-code:instrument]** - The Survey Access Code of the specified survey for a given record/event/instance. The format must be [survey-access-code] or [survey-access-code:instrument], in which 'instrument' is the unique form name of the desired instrument. This can be used simply as [survey-access-code] inside the content of a survey invitation, in which 'instrument' is assumed to be the current survey instrument.
  - o **[survey-return-code:instrument]** - The Survey Return Code of the specified survey for a given record/event/instance in order to allow a participant to return to a completed or partially completed survey response when using the 'Save & Return Later' survey feature. The format must be [survey-return-code] or [survey-return-code:instrument], in which 'instrument' is the unique form name of the desired instrument. This can be used simply as [survey-return-code] inside the content of a survey invitation, in which 'instrument' is assumed to be the current survey instrument.
  - o **[user-role-id]** - The Role ID of the user role to which the current user is assigned (blank if not assigned to any user role). This value is auto-generated for each user role. NOTE: This value is not just unique for all roles within the project but is also unique across all REDCap projects. Thus, if the project and its user roles are copied, the Role IDs of the user roles in the resulting copy will be different from the ones in the original project.
  - o **[user-role-name]** - The unique role name of the user role to which the current user is assigned (blank if not assigned to any user role). This value is auto-generated for each user role. NOTE: This value is only unique for roles within the project. Thus, if the project and its roles are copied, the new project will retain the same unique role names, which allows you to utilize the unique role names in conditional logic, calculations, branching logic, etc. that will not break when the project is copied.
  - o **[user-role-label]** - The name/label of the user role to which the current user is assigned (blank if not assigned to any user role). This value is defined by the user that creates the user role.
- **New Smart Variable**: **[event-number]** - The current event's ordinal number as listed on the Define My Events page that denotes the order of the event within a given arm.

New API/Developer Methods

- **New API methods**
  - o Delete User - Remove a specified user from a project.
  - o Export User Roles - Returns a list of user roles, including their role name, unique role name, and privileges, from a project.
  - o Import User Roles - Allows one to create new roles (specifying their role name and privileges) or edit the role name and privileges of existing roles.
  - o Delete User Role - Deletes a specified user role from a project.
  - o Export User-Role Assignment - Returns a list of project users and what user role to which they are assigned.
  - o Import User-Role Assignment - Allows one to assign, reassign, or unassign one or more users to/from a user role in a project.
- **New API method "Rename record" and new developer method REDCap::renameRecord()** allows users/developers to rename a record in a project. For multi-arm longitudinal projects where a record might exist on multiple arms, the $arm number can be specified to rename the record only on the specified arm, otherwise by default it will rename the record in all arms in which it exists.
- **New developer method: REDCap::deleteRecord()** - Plugin/hook/module developers may utilize this new method to delete entire records from a project or to delete the data from a specified instrument, event, or repeating instrument/event for specific records.

New Changes & Improvements

- **Improvements** for report display and/or data exports- When creating/editing a report, the "Additional report options" section in Step 2 now contains the new options below:
  - For projects that have repeating instruments and/or repeating events, the repeating fields that are automatically added (e.g., redcap_repeat_instrument and redcap_repeat_instance) can now be excluded from the report and data export. These fields are displayed by default in reports/exports.
  - Users may choose to display the field label, variable name, or both (default) in the header of a report. Note: This is only used when viewing reports and thus is not applicable for exports since there already exist options for choosing raw vs label format in data exports.
  - Users may choose to display the field label, raw data value, or both (default) for multiple choice fields in the data displayed in a report. Note: This is only used when viewing reports and thus is not applicable for exports since there already exist options for choosing raw vs label format in data exports.
- **Improvement**: If the value of a Text field or Notes field contains a URL or email address, the URL or email address will be converted into clickable link and mailto link, respectively, when viewing the data in a report.
- **Improvement**: More detailed logging descriptions on the Logging page for report-related logged events, such as mentioning the report name and report ID.
- **Improvement**: When users download an Instrument ZIP file for a given instrument in the Online Designer, the zip file now includes all survey settings for the instrument if the instrument has been enabled as a survey, including various files (e.g., survey logo, confirmation email attachment). The downloaded Instrument ZIP can then be uploaded into any project to transfer both the fields and all the survey settings.
- **Improvement**: In the Online Designer, the "Custom text to display at top of survey queue" now utilizes the rich text editor to make it easier to style the custom text.
- **Change**: PHP 7.2.5 is now the new minimum PHP version that is required for running REDCap. Note: All versions of PHP 8 are currently supported.
- **Change**: Added a dark gray line above the Custom Application Links section (if used) on the project left-hand menu to help differentiate the Custom Application Links from REDCap's built-in application page links.
- **Improvement**: New piping parameter ":ampm" - When piping a time, datetime, or datetimes w/ seconds Text field, appending ":ampm" to the variable name (e.g., [visit_time:ampm]) will display the time in am/pm format (e.g., 4:45pm, 10:35am) instead of military time.
- **Improvement**: Ability for admins to configure the required password length and password complexity for user accounts when using Table-based authentication. These settings will default to requiring a 9-character password that must contain lowercase letters, uppercase letters, and numbers (but does not require any special characters. The following new controls have been added to the "Additional Table-based Authentication Settings" section of the Security & Authentication page in the Control Center.
  - Password Minimum Length - any length between 6 and 99 characters
  - Password Complexity options
    - Requires both letters and numbers
    - Requires lowercase and uppercase letters and numbers
    - Requires lowercase and uppercase letters with either numbers or special characters
    - Requires lowercase and uppercase letters, numbers, and special characters
- **Improvement/change:** Any HTML used in the value of a Text field or Notes field will no longer be escaped on a report (i.e., displayed as-is) but instead the HTML will be interpreted on the report to allow for the styling of text on the page. This means that while previous versions would have displayed the text value "Word" literally as "Word" (without quotes) on a report, it now instead displays "Word" as bolded text on a report. Note: This does not affect data exports or any pages other than reports.
- **Improvement**: On the External Modules page in a project, users with appropriate privileges may now import and export the configuration settings for any module that is enabled in the project. This feature functions as a convenience by allowing users to easily migrate the configuration settings of one or more modules to another project that has the same module(s) enabled.

- **Improvement**: If a user is not assigned to a Data Access Group in a project, the user will now see a new "[No assignment]" option in the "Displaying Data Access Group" drop-down list on the Record Status Dashboard, in which selecting that option will display only records that have not been assigned to any DAG.
- **Change/improvement**: "Previous instrument" and "Next instrument" buttons were added at the top right of the Online Designer field-view page to allow easier navigation between instruments.
- **Improvement**: More options/parameters for the API Delete Record method - Users can now specify instrument, event, and/or repeat_instance to delete the data from a specified instrument, event, or repeating instrument/event for the records specified in the API request. In previous versions, the only option was to delete the entire record.
- **Change/improvement**: When an administrator is reviewing a user's submitted production changes for Draft Mode on the "Project Modification Module" page and then clicks the "Compose confirmation email" button in the blue "Administrator Actions" box, the email template displayed in the dialog now contains clearer wording to help users better understand how to respond. This helps make the production change process faster and more efficient.
- **Change**: If new instruments are created in a project while in production status, all users and user roles will no longer automatically get full "View & Edit" rights to that instrument for their Data Viewing Rights but instead will receive "No Access (Hidden)" rights by default for new instruments. When in development status, the instrument-level rights still defaults to "View & Edit" for new instruments. This change helps improve security when a project is in production to ensure that users do not accidentally gain access to data that they should not see if new instruments are still being added to the project. (Ticket #54096)
- **Change/improvement**: When viewing the Record Status Dashboard in which one or more repeating instrument tables are displayed at the bottom of the page, if any of the tables were collapsed on a previous visit of the page, the page will load much faster, especially for records containing hundreds or more repeating instances.
- **Change**: All cookies created on the client side (JavaScript) will now have the same "SameSite" and "Secure" attributes as cookies created on the server side (PHP). This helps improve general security.
- **Change**: Any multi-select drop-downs that are enhanced using the Select2 JavaScript library (e.g., the "Email To" field when creating/editing an alert) now display a down arrow on their right edge to better indicate that they are a clickable drop-down list.
- **Change**: The REDCap Install page now returns a notice to anyone who accesses it that the page is no longer functional or available if it detects that REDCap has already been fully installed.
- **Change**: In all outgoing emails, the "font-size" attribute for the "body" tag is no longer explicitly defined in the HTML of the email. This should have little (if any) effect on the appearance of emails sent from REDCap.
- **Improvement**: The Project Revision History page now displays icons next to each production revision and snapshots, and after being clicked, will display options to compare that revision/snapshot with any other revision/snapshot in the project. (This feature represents the integration of the "Data Dictionary Revisions" external module created by Ashley Lee at BC Children's Hospital Research Institute).
- **Improvement**: When using the eConsent Framework in a project, the "PDF Survey Archive" tab on the File Repository page now displays a "Download all" button that will download all PDF files displayed on the page in a single zip file. Additionally, there is a record filter drop-down list and a "file type" drop-down list, which distinguishes between general "PDF Auto-Archiver" PDFs and "eConsent Framework" PDFs. Note: If a user is in a Data Access Group, they will only be able to download and filter on records in their DAG.
- **Change**: Renamed the "My Profile" page to "Profile".
- **Change/improvement**: Added "ICD-10 Australian Modification" to the list of parsed coding systems in the Condition resource for Clinical Data Interoperability Services (both CDP and Data Mart).
- **Improvement**: When executing many data quality rules at once, the total time to finish all the rules occurs 3X faster. Instead of running only one rule at a time in a serial fashion, REDCap now executes three rules simultaneously when clicking the "All", "All except A&B", and "All custom" buttons at the top of the Data Quality page.
- **Improvement**: SQL fields can now be used in the following Smart Charts: bar-chart, pie-chart, and donut-chart.
- **Improvement**: SQL fields can now be used as Live Filters in reports.
- **Change**: Added the "Microsoft Authenticator" mobile app as a two-factor authentication method that is equivalent to using the "Google Authenticator" mobile app.

- **Change**: When viewing a report while using a mobile device, it will no longer enable the floating table headers or floating first column automatically for the report table. This was changed because the floating headers/column made it difficult to view parts of a report while on a mobile device with a small screen.
- **Improvement**: New "Banned IP Addresses'' page in the Control Center allows administrators with "Manage User Accounts'' privileges to add or remove IP addresses to/from the blocklist of banned IP addresses for the REDCap installation. The IP addresses listed on that page are IPv4 or IPv6 addresses that have been blocked manually using that page or have been banned automatically via the Rate Limiter feature (enabled on the General Configuration page in the Control Center).
- **Improvement**: When using the ''Reason for Change'' feature in a project, a new button is displayed underneath each "reason for change" textbox on the Data Import Tool summary page. Users can simply click the button to copy the text to all other "reason for change" textboxes on the page, thus saving lots of time of having to add text to each individually. This feature is the integration of Luke Steven's "Copy Change Reason" external module, which will be automatically disabled at the system-level when upgrading to (or past) REDCap 11.4.0 to prevent any conflicts.
- **Improve**: New data export option - Export blank values for gray instrument status
  - All instrument complete status fields having a gray icon can be exported either as a blank value or as "0"/"Incomplete". In previous versions, they could only be exported as "0". By default, they are now exported with a value of "0", but this option can be changed via a drop-down option in the "Advanced data formatting options" section of the data export dialog.
  - When exporting the Project XML file with both metadata & data, the option to export gray instrument status as a blank value will be preselected by default, whereas in other data export contexts (e.g. My Reports & Exports page), the option to export them as "0" will be preselected by default.
  - The API method "Export Records" has a new optional parameter "exportBlankForGrayFormStatus" that can accept a boolean (true/false) with default value = false, and it functions the same as its equivalent data export option in the user interface.
  - Note: Exporting gray instrument statuses as blank values is recommended if the data will be re-imported into REDCap. For example, when users export a Project XML file for a project and then create a new project with it, all the gray instrument status icons will be preserved in the new project, whereas in previous versions they were all converted into red status icons.
- **Improvement**: New option "Allow normal users to edit their primary email address on their Profile page" on the User Settings page in the Control Center. This setting will be enabled by default, but an admin can disable it if they wish to prevent any users from modifying their primary email address for their user account.
- **Improvement**: The developer methods REDCap::getSurveyLink() and REDCap::getSurveyQueueLink() now have an optional parameter "project_id" that (when provided) allows one to call the method outside of that target project's context. If project_id is not explicitly provided, then the methods must still be called within their target project's context.
- **Change**: All CDIS-related features and functionality now utilize a centralized set of assets in the code, rather than each feature having only their own private set of assets. This change reduces the entire size of the REDCap code by half, thus saving lots of space on the REDCap web server.
- **Improvement**: "Google Cloud Storage using API Service Account" as new file storage option - To store REDCap's edoc files via Google Cloud Storage, this option can be selected in the File Upload Settings page in the Control Center. An additional option exists to organize files by REDCap project ID when storing them in Google Cloud. (Thanks to Andy Martin and his team for this contribution.)
- **Improvement**: New CDIS setting - Admins now have the option to use the CA bundle from REDCap or the verification provided by the webserver for HTTPS connections.
- **Improvement**: New option for Protected Email Mode - Users may now upload a custom logo that they wish to be displayed on the webpage and in emails utilizing the Protected Email Mode. This feature is supplementary to the existing custom text option for Protected Email Mode. This option is located in the Protected Email Mode section of the Additional Customizations popup on the Project Setup page.
- **Change**: When viewing an individual email on the Email Logging page, it now logs the record name, event_id, and instrument name (when applicable) in the redcap_log_view database table.

- **Improvement**: If using Amazon S3 or Azure Blob Storage for the system-level File Storage Method, the same file storage method may also be used for the following system-level settings: 1) 'File Upload' field enhancement: Password verification & automatic external file storage, 2) Record-level Locking Enhancement: PDF confirmation & automatic external file storage, and 3) e-Consent Framework: PDF External Storage Settings (for all projects). These three settings will each utilize a different bucket/container than the system-level file storage method where all other REDCap files are stored (as a means of keeping them separate from the other files). These settings are often utilized for compliance with 21 CFR Part 11 and similar regulations. The addition of the S3/Azure options will be helpful when already running REDCap on AWS/Azure. The bucket/container where the files will be stored for these three options may be set for each near the bottom of the Modules/Services Configuration page in the Control Center.
- **Change**: The email that users receive from an administrator that has just approved their production changes now reminds them that the default Data Viewing Rights for any newly added instruments will be 'No Access (Hidden)'.
- **Change/improvement**: A button to open the Codebook page as a floating popup window was added inside the Logic Editor popup to allow users to easily find and reference fields they want to use in their logic while in the editor.
- **Improvement/change**: The underlying business logic of REDCap's cron job processing methods have been changed so that long-running cron jobs will not block other jobs from running at their scheduled time.
- **Improvement**: New parameter "repeat_instance" was added to the API method "Export PDF file of Data Collection Instruments" to allow users to export a PDF of an instrument for a specific repeating instance of a repeating instrument/event. (Ticket #117182)
- **Change/improvement**: When a survey participant partially completes a survey that has the Save & Return Later feature enabled, and an email is then sent to the participant to remind them to finish their survey later, instead of sending that email from the system-level "Email Address of REDCap Administrator" (as in previous versions), the "From" email address of the "Survey partially completed" email will be set to the sender's address from the most recent survey invitation received by the participant. This will create more consistency and will reduce confusion for participants when attempting to reply back to the email, as has been a problem in the past.
- **Change**: The explanation text for the "Re-evaluate Automated Invitations" process was modified to improve clarity with regard to how the re-evaluation process works.
- **Change/improvement**: The Configuration Check page now checks to ensure that the "Email Address of REDCap Administrator" on the General Configuration page has a valid email entered. Without an email entered there, some features might not work correctly.
- **Change**: Updated setup instructions zip file for Clinical Data Interoperability Services by including a new CDIS Manual (PDF) in the zip file.
- **Change**: Added clarifying text regarding the behavior of a non-active Automated Survey Invitations in the ASI dialog in the Online Designer.
- **Improvement**: Errors displayed in the Survey Invitation Log when sending SMS or Voice Calls via Twilio will now display the full error message returned by Twilio's API to provide the user with more information regarding why the SMS/Voice Call failed to send successfully.
- **Change**: The text for the "Example code" link at the bottom of the API Playground was modified for clarity
- **Change**: The Control Center now recommends using **PHP 7.4, 8.0, or 8.1**, which are the only currently supported versions of PHP (by the PHP Team)
- **Improvement/change**: When using Multi-Language Management on a survey, the current language name is now displayed next to the globe icon at the top right of the survey page so that participants more intuitively understand what the current language is and to click it to change the language.
- **Improvement/change**: The Online Designer now denotes whether a field on the instrument contains embedded fields inside its label, choices, notes, etc. by displaying a blue box saying "Contains embedded fields", similar to the green "Field is embedded elsewhere on page" boxes for embedded fields themselves. This will provide users with visual cues to know when and where field embedding is occurring.
- **Improvement**: The Design Checker feature for Clinical Data Mart now has improved descriptions of changes that will be made, including the severity of the design issue.

- **Change/improvement**: A link to the "Language File Creator/Updater" page was added to the Control Center's left-hand menu in the Administrator Resources section.
- **Change/improvement**: When printing a report, the "Number of results returned" and "Total number of records queried" counts are now included in the printout of the page.
- **Improvement/change**: The Define My Events page now displays a new column to display each event's Event ID number. Also, the Smart Variable corresponding to each column in the table on the Define My Events page (e.g., [event-number], [event-label) are displayed in small gray text below the header text in the table to help users more easily learn where the values of those Smart Variables originate.
- **Improvement**: When using OAuth2 Azure AD Authentication, you may now specify a different AD attribute whose value determines the REDCap user's username. By default, it uses the AD attribute "userPrincipalName", which often resolves to the user's email address. The Security & Authentication page has a new drop-down setting to allow admins to alternatively specify the AD attribute "samAccountName", which would resolve to something like "pharris", for example. This provides an option if the institution prefers not to use a user's email address as their REDCap username. Note that this setting does not change the Azure AD login name, which is still the user's email address / userPrincipalName. Administrators may want to select the samAccountName to help retain account usernames when transitioning from LDAP to Azure AD, or if samAccountName is considered an immutable (and thus more reliable) user ID at your institution.
- **Change**: Although REDCap sets the cookie "samesite" attribute to "Lax" by default, the "samesite" attribute can be overridden by adding the following line of code in the REDCap database.php file on the web server: $GLOBALS['cookie_samesite'] = "None"; // Possible values: "None", "Lax", or "Strict".
- **Change**: Added user's REDCap username to the email subject for REDCap Messenger email notifications to help distinguish them if the same primary email address is used for multiple users.
- **Change/improvement**: New CDIS setting - "Identity provider (optional)" - If specified on the Clinical Data Interoperability Services page in the Control Center, the identity provider will be used in the OAuth2 authorization process to identify the server that will exchange the FHIR access token with REDCap. This setting should only be set if the real FHIR base URL of the EHR system is different from the one specified on this page (e.g., the EHR system is behind a proxy).
- **Change**: The dialog that is displayed when editing a field's branching logic in the Online Designer, in which one or more fields have the exact same branching logic as the current field, contains different text to better explain what clicking "Yes" will do.

- **Improvement:** For projects using the Clinical Data Interoperability Services (CDIS), a new observation category "social history" was added for both CDM and CDP projects, thus allowing them to import this new type of EHR data into REDCap.
- **Improvement:** New CDIS panel on the left-hand project menu to display information and links that are relevant to projects using either Clinical Data Pull or Clinical Data Mart.
- **Improvement:** When performing a keyword search on the "Help & FAQ" page, it now displays in red a count of keyword matches for each category in the tabs near the top of the page. Previously, the user would have to click on each tab in order to know if there were any keyword matches in that particular category.
- **Improvement:** Each tab on the "Help & FAQ" page now has a drop-down list of subsections that, when selected, will auto-scroll the webpage down to that subsection on the page.
- **Improvement:** The Codebook now contains a "Field Finder" to allow users to quickly search for a field by keyword or phrase in the field label or by variable name. Also, the gray "Instrument Name" rows in the table will float at the top of the page while scrolling so that it is always apparent the instrument to which a field belongs. Additionally, when scrolling down the page, an up-arrow image will appear at the bottom right of the page that (when clicked) will quickly scroll the page back to the top.
- **Improvement:** When using Multi-Language Management, it will now display a list of possible issues to users when entering the page if any elements have been modified since they have been translated. For example, if a field label is translated, and then a user modifies the Default language text via the Online Designer, the MLM page will display a warning in a popup dialog that will ask the user to confirm that the current translation is okay or else to provide a

new translation to match the updated Default text. This will help notify users about potential issues with their translations to keep them updated if they are still modifying the Default language text in the project.

- **Improvement:** Piping can now be performed inside the value of the @PLACEHOLDER action tag - e.g., @PLACEHOLDER="[first_name] [last_name]".
- Change/improvement: Two new LOINC codes added to CDIS mapping.
- **Improvement:** When using Multi-Language Management, in which some of the Default language text has changed since the text was translated, the new "Review Changed Items" dialog on the MLM page will now display an "Export" option to export as JSON or CSV all the translated items that need to be reviewed and/or retranslated.
- **Improvement:** If the Multi-Language Management feature is disabled for a project, it will now show a red notice at the top of the MLM page.
- **Improvement:** Sub-sections on the "Help & FAQ" page can now be accessed via hyperlinks near the top of each section. Previously there was a drop-down for this, which was slightly slower. Having sub-section links near the top of the page should make it faster for users to jump to a specific section.
- **Improvement:** The Multi-Language Management setup page now displays a download option for each instrument under the Forms/Surveys tab to allow users to export->import the translations for that single instrument to another project that has the same instrument with the same fields and variable names.
- **Improvement:** The Multi-Language Management setup page now displays the Default text above (rather than below) the input text box for each translatable item. This reversal appears to be more intuitive for users as they translate each element.
- **Improvement:** In the "Compose Survey Invitations" dialog on the Participant List page, the Actions drop-down for auto-selecting checkboxes for participants in the participant list now contains a new option: "Check Not Responded and Partial Response".
- **Improvement:** When scrolling down the page in the Online Designer when adding/editing fields, an up-arrow image will appear at the bottom right of the page that (when clicked) will quickly scroll the page back to the top.
- **Improvement:** Concurrent user checks have now been added to the Multi-Language Management setup page to prevent multiple simultaneous users from affecting each others' work while on the page.
- **Improvement/change:** The Multi-Language Management setup page is slightly less restrictive now while in production status. For example, users may now export language configurations while in production even when not in draft mode.
- **Improvement/change**: If any suspended users have access to a project, the User Rights page will display a button to easily show/hide suspended users on the User Rights page. Initially, all suspended users will be displayed, but if the button is clicked, then all suspended users will remain hidden on the User Rights page of *any* project until the button is clicked again.
- **Improvement:** The "Email Users" page in the Control Center now sends emails using a cron-job based queueing process. This means that emails are no longer sent in real time on the page, and thus there is no longer a need for the admin sending the email to stay on the page while all the emails are sent. This makes the process much faster and easier for admins using this page.
- **Improvement:** When using S3 for file storage, you may now specify a custom S3 endpoint URL on the "File Upload Settings" page in the S3 section. This helps support the use of alternative S3 destinations.
- **Improvement:** New system-level option to disable the E-signature feature so that its checkbox option is not displayed at the bottom of data entry forms (immediately above the Submit buttons). You might wish to disable this feature if you are not using Table-based, LDAP, or LDAP+Table-based authentication since the e-signature feature will not function for certain external authentication methods (e.g., Shibboleth, OAuth2) due to its requirement for the user to re-authenticate. This feature is enabled by default but can be disabled on the "Modules/Services Configuration" page in the Control Center.
- **Improvement:** In many places that display a drop-down list of records (e.g., Logging page, Email Logging, Field Comment Log, Data Quality page, ad hoc calendar event popup, Alerts & Notifications Log, Survey Notification Log), it will display a normal drop-down list if the project contains 5000 records or less, and if the project contains more than 5000 records, it will instead automatically revert to displaying an auto-suggest textbox to allow the user to

manually enter the record name (rather than attempting to display an extremely long drop-down). This should make these pages load much faster and also make them easier to use in projects containing many records.

- **Improvement/change:** Password recovery questions have been removed as a feature for Table-based authentication. Password recovery questions will no longer be utilized as a part of the process whereby Table-based users reset their password. They are an unnecessary part of that process, they only cause issues and confusion for users, and they do not add much security-wise.

- **Change/improvement**: If an [aggregate-X] Smart Function is used inside a calculation or in branching logic, the function is no longer subject to the minimum data point threshold when viewing a survey page. In previous versions, under certain situations this could lead to a calculation/branching logic error on the survey page when too few data points had been entered. Note: If the Smart Function is being utilized for piping on a survey page, it is still subject to the minimum data point threshold though (i.e., different behavior for piping vs branching/calc). (Ticket #113901)

- **Change/improvement**: A value of "0" can now be used for the setting "Minimum number of data points required to display Smart Charts..." on the system-level "User Settings" page and on the project-level "Edit a Project's Settings" page. Previous versions would not allow "0" but would allow "1" as the smallest possible value.

- **Improvement:** New field validation type: "Phone (UK)". This validation type supports phone numbers from the United Kingdom (e.g., +44 7911 123456, +447911123456). Note: This validation type will be disabled by default after installing or upgrading, but it can be easily enabled on the Field Validation Types page in the Control Center. Thanks to the Field Validation Committee for donating this.

- **Improvement:** If using Two-Factor Authentication, users can be allowed to use their 6-digit 2FA one-time PIN for e-signing processes in place of their password (e.g. performing an e-signature on data entry forms or when utilizing the 'File Upload' field enhancement feature when uploading a file on a data entry form - often used for 21 CFR Part 11 compliance for FDA trials). Normally, e-signing requires a username and password, but when this system-level setting is enabled while also having REDCap's Two-Factor Authentication enabled, users can alternatively provide their username and 2FA one-time PIN to perform the e-signing. A user can obtain their one-time PIN from their Google Authenticator or Microsoft Authenticator app, or else there will be an option available to send the user the PIN via email and/or SMS whenever they need to enter it. Note: This setting is disabled by default but can be enabled in the "Two-Factor Authentication" section on the Security & Authentication page.

- **Change/improvement**: Hyperlinks created in the rich text editor will now default to being opened in a new tab/window rather than defaulting to being opened in the current tab/window. This default value can be changed by the user when saving/inserting the link. (Ticket #124813)

- **Change/improvement**: The rich text editor might be finicky when dealing with non-Latin characters, such as converting them to HTML character codes when enabling and then disabling the rich text editor in the Edit Field popup in the Online Designer.

- **Improvement:** When the authentication method is set to "OpenID Connect" or "OpenID Connect & Table-based", you may define which OIDC attribute will serve as the REDCap user's username. Simply set the setting "Attribute to use for REDCap username" on the Security & Authentication page. It will default to "username" when installing/upgrading REDCap, but also provides the other options "nickname" and "email". Note: If the selected attribute does not have a value for the current user, it will revert to using the user's associated email address to serve as their username.

- **Improvement:** New v2 endpoint for Azure AD authentication
    - The "Additional OAuth2 Azure AD Authentication Settings" section on the Security & Authentication page now contains a new "Endpoint Version" setting, which can be set as "V1" (default) or "V2" to allow REDCap to utilize different versions of the Azure AD authentication. Previously, only V1 could be utilized in REDCap. Now V2 can also be used.
    - Thanks to Paul Ryan (University of Hawaiʻi at Mānoa) and Eric Wagner (The Ohio State University) for their code contributions, which made this new feature possible.

- **Improvement:** REDCap now implements a new version of the two "datediff" cron jobs that run frequently each day and are utilized for Alerts & Notifications and Automated Survey Invitations. Instead of having a single cron job for each that runs a very long time every 4 hours, the two cron jobs will now run more often in a batched mode to

spread out the same amount of work in smaller batches over time. This allows the processes to be done more efficiently (and sometimes faster in many cases) without the risk of the cron jobs timing out, which has been a concern with them in the past.

- **Improvements:** The following are enhancements for the Multi-Language Management system setup page in the Control Center:
  - Additional column "Initial" - this governs the language that is initially shown on the translatable non-project pages (essentially, this is only the generic Survey Access page) when no browser cookie is set yet.
  - Designates the "Default" column to identify the language that matches that from the active Language.ini file
  - Adds popups with explanations to the various columns.
- **Improvement:** When viewing a suspended user's account on the Browse Users page in the Control Center, it now displays the text "Suspended" in red next to the user's name and username to help admins more easily identify if the user is suspended or not.
- **Change/improvement**: When defining the footer links on the Footer Settings page in the Control Center, if the administrator fails to enter the link values correctly by forgetting to add a label for each URL, the resulting link displayed in the project footer would not be clickable. In this case, it now displays the URL as the label and will be clickable.
- **Improvement:** New two-factor authentication option - If using an "X & Table-based" authentication method, you can make non-Table-based users be exempt from 2FA. This can be set on the Security & Authentication page, in which a new setting "Enforce two-factor authentication ONLY for Table-based users?", which defaults to "No", can be enabled so that only Table-based users will have to go through the 2-step login process if the system is using an "X & Table-based" authentication method. This will be useful if 2FA is already implemented on the other non-Table authentication process - e.g., OpenID Connect, thus preventing the non-Table users from having to perform 2FA twice (once outside REDCap and then once inside REDCap). (Ticket #128474)
- **Change/improvement:** The "sub" attribute was added to the "Attribute to use for REDCap username" drop-down in the OpenID Connect authentication settings in the Control Center to provide greater compatibility with OIDC providers. (Ticket #128417)
- **Change/improvement:** When a user logs in to REDCap the first time via OpenID Connect authentication, it now automatically adds their first name, last name, and email address to their REDCap user account.
- **Improvement:** New "Multi-Language Management" video (9 minutes) added to the MLM setup page and the Training Videos page.
- **Improvement:** New and improved user interface for the Email Users page in the Control Center.
- **Improvement:** A new option ("View & Edit / De-Identified") has been added to the system-level setting "Default instrument-level user access set for all project users' Data Viewing Rights and Data Export Rights whenever a new instrument is created while in production status" on the User Settings page in the Control Center. This new option will allow users to automatically have View & Edit viewing rights to all new instruments created while in production but will provide limits on their data export privileges for those new instruments.
- **Improvements for CDIS:**
  - Added RxNorm code and display fields in Clinical Data Mart (R4 and DSTU2).
  - Updated the Clinical Data Mart templates to accommodate the new data.
- **Change/improvement**: When using "OpenID Connect & Table-based" authentication, if the OIDC authentication process fails with an error that is returned to REDCap in the URL query string, the error description will now be displayed on the page for the user to see, whereas previously the error message might not be displayed on the page in certain situations. Additionally, if a Table-based user fails to successfully log in, as a convenience the login form will now automatically be displayed again without the user having to click the "Local REDCap Login" button.
- **Improvement**: To improve page-loading performance of the Data Access Groups page, the DAG Switcher table at the bottom of the page will no longer be displayed when the page is initially loaded if the number of project users X the number of DAGs is greater than 5000. If the threshold is reached, then a big button saying "Display the DAG Switcher" will be displayed, and after clicking it, it will then display the DAG Switcher table. This will improve overall load time of the page in extreme cases.

- **Improvement:** The Multi-Language Management setup page now has an option to "Export or import general settings". This includes which languages are set as active, default, or fallback, which fields and survey settings are excluded, as well as the settings on the Alerts tabs and Settings tab. Note: The export/import option will appear when at least one language has been created in the project. This option is available as a JSON file only for import/export.