Using REDCap:
Data management in studies linking primary and secondary data

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Tennessee Valley Healthcare System &
Vanderbilt University Medical Center

VIReC

Acknowledgements

- VIReC REDCap group
- Vanderbilt REDCap
- CTSA
- My collaborators at the VA and elsewhere

Poll #1: About you – research role

- What is your role in research?
  - Research investigator
  - Data manager/analyst
  - Project coordinator
  - Other – please describe via the Q&A function

Poll #2: About you – data experience

How many years of experience do you have working with VA data?

- Less than 1
- 1-2
- 3-6
- 7+

Session Overview

- **Brief introduction to REDCap**
- Examples of REDCap in research
  - Combining primary and secondary derived data
  - Complex studies-Longitudinal
- Reporting and reproducible research
- Other capabilities

Poll #3: REDCap Use

Please choose the category that best describes your familiarity & use of REDCap.

- Heard of REDCap, but know very little about it.
- Somewhat aware of REDCap and how it can be used
- Very aware of REDCap and use it occasionally
- I use REDCap frequently

REDCap Consortium

- Developed as part of Vanderbilt University's CTSA
- Get **database creation** and data acquisition out of IT and **back to the researcher**
- Make the creation of databases and surveys **technically easy, secure and responsive**/nimble for individual researchers and the general research enterprise
- **NO PROGRAMMING EXPERIENCE NEEDED**

Features: 3 Things REDCap can do

- Handle a wide variety of data types (multiple categories, memo, calculated, branching logic) in an equally wide combination of applications (sample tracking, survey data, combining multiple sources, etc.) with EASE
- Secure access and activity tracking in single and multi-institutional settings
- Reporting capabilities and export with de-identification capacity to most common statistical packages or flat file

Project Home Page

Pandora Internet Radio - ... | Thoracic pilot project | RE...

https://redcap.vanderbilt.edu/redcap_v6.9.2/ProjectSetup/index.php?pid=36794

Most Visited REDCap

Logged in as deppensa | Log out

My Projects
Project Home
Project Setup
Project status: Production

Data Collection

Record Status Dashboard
Add / Edit Records

Data Collection Instruments:
Nodule Study

Applications

Calendar
Data Exports, Reports, and Stats
Data Import Tool
Data Comparison Tool
Logging
Field Comment Log
File Repository
User Rights and DAGs
Data Quality

Reports Edit reports

1) Patients
2) Surgery
3) Serology
4) No serology
5) Yes serology
6) Not excluded
7) Excluded
8) Missing nodule size
9) Missing nodule shape
10) Indeterminate/unknown dx
11) Missing FEV1
12) All included data
13) Research bronchoscopies
14) PET scan data
15) "Other" exclusions besides research bronch

Help & Information

Help & FAQ
Video Tutorials
Suggest a New Feature

If you are experiencing problems, please contact your REDCap administrator.

Project Home | Project Setup | Other Functionality | Project Revision History

Project status: Production

Main project settings

Complete!

Not complete?

Some options below are disabled because they may not be modifed once the project is in production status.

Enable Use longitudinal data collection with repeating forms? ?

Enable Use surveys in this project? ? VIDEO: How to create and manage a survey

Modify project title, purpose, etc.

Enable optional modules and customizations

Complete!

Not complete?

Some options below are disabled because they may not be modifed once the project is in production status.

Enable Auto-numbering for records ?

Enable Scheduling module (longitudinal only) ?

Enable Randomization module ?

Enable Designate an email field to use for invitations to survey participants ?

Enable Dynamic Data Pull (DDP) from StarPanel ?

Enable Twilio SMS and Voice Call services for surveys ?

Additional customizations

Test your project thoroughly

Complete!

Not complete?

It is important to test the essential components of your project before moving it into production. Try creating a few test records and entering some data for each to ensure that your data collection instruments look and behave how you expect, especially branching logic and calculations. Then review your test data by creating reports and exporting your data to view in Excel or a statistical analysis package. If you have surveys, complete the surveys as if you were a participant by using the Public Survey Link or Participant List by sending a survey invitation to yourself. If other project modules will be used regularly, test them out a bit too. The best way to test your project is to use it as if you were entering real production data, and it is always helpful to have colleagues (especially team members) take a look at your project to get a fresh set of eyes looking at it.

Move your project to production status

Complete!

Move the project to production status so that real data may be collected. Once in production, you will not be able to edit the project fields in real time anymore. However, you can make edits in Draft Mode, which will then need to be approved by a REDCap administrator before taking effect.

Set up project bookmarks (optional)

Optional

I'm done!

You may create custom bookmarks to webpages that exist inside or outside of REDCap. These bookmarks will be seen as links on the left-hand project menu and can be accessed at any time by users who are given privileges to do so. Every project bookmark has custom settings that allow one to control its appearance and behavior.

Go to Add or edit bookmarks

User Rights and Permissions

Complete!

You may grant other users access to this project or edit the user privileges of current users on this project by navigating to the User Rights page. Additionally, if you wish to limit user access to certain records/responses for

Features: Easy modification

https://redcap.vanderbilt.edu/redcap_v6.9.0/Design/online_designer.php?pid=178

REDCap

Logged in as **deppensa** | Log out

My Projects
Project Home
Project Setup
Project status: **Production**

Data Collection

Record Status Dashboard
Add / Edit Records

Data Collection Instruments:
Z4031
Nodule Study

Applications

Calendar
Data Exports, Reports, and Stats
Data Import Tool
Data Comparison Tool
Logging
Field Comment Log
File Repository
User Rights and DAGs
Data Quality

Reports Edit reports

1) gender and bmi
2) clinical staging
3) benign _disease check old data
4) Smoking
5) Jamii Analysis ALL Variables
6) PET and Cancer
7) histology
8) pre op tissue diagnosis
9) missing path size
10) prev cancer

Help & Information

ACOSOG Nodule

Project Setup | Online Designer | Data Dictionary

Since this project is currently in PRODUCTION, changes will not be made in real time. Tell me more

Submit Changes for Review

Fields to be added: **0** / Total resulting field count: **94**
Fields to be deleted: **0** / Existing field count: **94**

Remove all drafted changes

View detailed summary of all drafted changes

VIDEO: How to use this page

The Online Designer will allow you to make project modifications to fields and data collection instruments very easily using only your web browser. Below you have the options to modify an existing instrument, delete an instrument, create a new instrument, download an instrument as a PDF document, or reorder your instruments.

Data Collection Instruments

Add new instrument:
Create a new instrument from scratch
Import a new instrument from the official REDCap Shared Library
Upload instrument ZIP file from another project/user or external libraries

Instrument name	Fields	View PDF	Instrument actions
Z4031	26		Choose action
Nodule Study	66		Choose action

Features: Code can be re-used

N2QODSurgeon_DataDictionary_2015-05-22 - Microsoft Excel

Variable / Field Name	Form Name	Section Header	Field Type	Field Label	Choices, Calculations, OR Slide	Field Note	Text Valida	Text Valida	Text Valida	Identifier?	Branching Logic (Show field only	Required Fi	Custom Ali	Ques
surgeon_id	surgeon		text	Surgeon ID										
surgeon_first_name	surgeon	<font face="arial" color="black'	text	First Name										
surgeon_middle_initial	surgeon		text	Middle Initial										
surgeon_last_name	surgeon		text	Last Name										
surgeon_suffix	surgeon		radio	Suffix	1, Sr | 2, Jr | 3, II | 4, III | 5, IV								RH	
surgeon_dob	surgeon		text	Date of Birth			date_mdy							
surgeon_gender	surgeon		radio	Gender	1, Male | 2, Female | 3, Unknown								RH	
surgeon_ethnicity	surgeon		radio	Ethnicity	1, Hispanic or Latino | 0, Not Hispanic or Latino									
surgeon_race	surgeon		checkbox	Race	1, American Indian or Alaska Native | 2, Asian | 3, Black or African American | 4, Native Hawaiian or Other Pacific Islander | 5, White | 6, Other									
other_race_surgeon	surgeon		text	Other - Race							[surgeon_race(6)] = '1'			
surgeon_npi	surgeon		text	Surgeon's National Provider Identifier			integer							
npi_validated	surgeon		yesno	Surgeon's NPI was validated									RH	
indicate_profession	surgeon		radio	Please indicate the discipline of	1, Neurosurgeon | 2, Orthopaedic surgeon | 3, Other									
surgeon_residency	surgeon		text	Medical School of Residency										
surgeon_residency_year	surgeon		text	Year Graduated Residency										
surg_fellowship	surgeon		radio	Did surgeon complete a post-re	1, Yes | 0, No								RH	
surg_fellow_type	surgeon		checkbox	If Yes, indicate type (check all th	1, Spine | 2, Cerebrovasculer | 3, Tumor | 4, Pediatrics | 5, Functional | 6, Transsphenoi						[surg_fellowship]='1'			
other_fellowship	surgeon		text	Other Fellowship Type							[surg_fellow_type(7)] = '1'			
practice_grp	surgeon	<font face="arial" color="black'	sql	Surgeon's Practice Center	select value from redcap_data where project_id = 7481 and field_name = 'practice_id' order by value									
practice_type	surgeon		radio	Practice Type	1, Individual | 2, Group								RH	
surg_join_date	surgeon		text	Date the Surgeon joined the Practice Center			date_mdy							
surg_depart_date	surgeon		text	Date the Surgeon left the Practice Center			date_mdy							
hospital_id1	surgeon		sql	Hospital Name - first	select concat_ws(",									
hospital_id2	surgeon		sql	Hospital Name - second	select concat_ws(",									
hospital_id3	surgeon		sql	Hospital Name - third	select concat_ws(",									
hospital_id4	surgeon		sql	Hospital Name - fourth	select concat_ws(", (select b.value from redcap_data b where a.project_id = b.project_id and a.record = b.record and b.field_name = 'hospital_name'									
hospital_id5	surgeon		sql	Hospital Name - fifth	select concat_ws(", (select b.value from redcap_data b where a.project_id = b.project_id and a.record = b.record and b.field_name = 'hospital_name'									
hospital_id6	surgeon		sql	Hospital Name - sixth	select concat_ws(", (select b.value from redcap_data b where a.project_id = b.project_id and a.record = b.record and b.field_name = 'hospital_name'									
hospital_id7	surgeon		sql	Hospital Name - seventh	select concat_ws(", (select b.value from redcap_data b where a.project_id = b.project_id and a.record = b.record and b.field_name = 'hospital_name'									
hospital_id8	surgeon		sql	Hospital Name - eighth	select concat_ws(", (select b.value from redcap_data b where a.project_id = b.project_id and a.record = b.record and b.field_name = 'hospital_name'									
hospital_id9	surgeon		sql	Hospital Name - ninth	select concat_ws(", (select b.value from redcap_data b where a.project_id = b.project_id and a.record = b.record and b.field_name = 'hospital_name'									
surg_pager	surgeon	<font face="arial" color="black'	text	Surgeon's Pager Number			phone							
pager_extension	surgeon		text	Pager extension			number							

Features: Access

- Specific invitation with notification by e-mail (individual)

TEST: Survey to Evaluate Usefulness of Quarterly CMS Data - Message (HTML)

File | Message | McAfee E-mail Scan | Adobe PDF

You replied to this message on 8/19/2015 10:16 AM.

From: virec.vacmsdata@va.gov
Sent: Tue 8/18/2015 2:47 PM
To: Kok, Linda
Cc:
Subject: TEST: Survey to Evaluate Usefulness of Quarterly CMS Data

Dear Dr. Kok,

You are receiving this email because you are a user of Centers for Medicare and Medicaid Services (CMS) data within VHA. CMS data continues to be a critical component for evaluating Veteran healthcare within the VHA. Historically, the VHA has distributed only annual data, but some users have expressed interest in obtaining quarterly CMS data in order to receive patient level information on a timelier basis. The VHA Medicare and Medicaid Analysis Center (MAC) and the VA Information Resource Center (VIReC) are surveying current CMS data requestors to evaluate the potential usefulness of quarterly data.

The primary advantage of using quarterly data is a reduction in lag time in receiving the data compared to that for annual data delivery. Due to the nature of quarterly data, in the best case scenario, first quarter data would be available approximately 13 months earlier than annual data, while data for 2nd, 3rd, and 4th quarters would be available approximately 10, 7, and 4 months earlier, respectively.

The disadvantages of quarterly CMS data are: 1) increased data purchasing costs, 2) increased personnel necessary at MAC and VIReC for data processing and distribution, and 3) since quarterly data are only 90-93% complete, analytic results calculated using quarterly data may be inconsistent with results calculated using annual data, potentially leading to confusion in VHA-wide reporting.

Survey Instructions
Please complete a survey for each CMS data project no later than **Wednesday, September 9, 2015** . All questions can be emailed to either MAC at macstaff@va.gov or VIReC at virec.vacmsdata@va.gov. Please enter "Survey" in the email subject line.

You may open the survey in your web browser by clicking the link below:
Quarterly Data Survey

If the link above does not work, try copying the link below into your web browser:
https://vhacdwweb05.vha.med.va.gov/surveys/?s=Hs3GD3jvh6

This link is unique to you and should not be forwarded to others.

Features: Audit trail

Pandora Internet Radio - ... | Thoracic pilot project | RE...

https://redcap.vanderbilt.edu/redcap_v6.9.2/Logging/index.php?pid=36794

Most Visited REDCap

Applications

- Calendar
- Data Exports, Reports, and Stats
- Data Import Tool
- Data Comparison Tool
- Logging
- Field Comment Log
- File Repository
- User Rights and DAGs
- Data Quality

Reports Edit reports

1) Patients
2) Surgery
3) Serology
4) No serology
5) Yes serology
6) Not excluded
7) Excluded
8) Missing nodule size
9) Missing nodule shape
10) Indeterminate/unknown dx
11) Missing FEV1
12) All included data
13) Research bronchoscopies
14) PET scan data
15) "Other" exclusions besides research bronch

Help & Information

- Help & FAQ
- Video Tutorials
- Suggest a New Feature

If you are experiencing problems, please contact your REDCap administrator.

09/22/2015 8:18pm	deppensa	Manage/Design	Download data dictionary
09/22/2015 8:16pm	deppensa	Manage/Design	Edit project field
09/22/2015 8:15pm	deppensa	Manage/Design	Edit project field
09/22/2015 8:15pm	deppensa	Manage/Design	Reorder project fields
09/22/2015 8:15pm	deppensa	Manage/Design	Edit project field
09/22/2015 8:14pm	deppensa	Manage/Design	Enter draft mode
09/16/2015 2:16pm	maigaaw	Manage/Design	Download exported data file (CSV labels)
09/16/2015 2:16pm	maigaaw	Data Export	report_id: ALL, export_format: CSV, rawOrLabel: label, date_shifted: Yes, deidentified: Yes, fields: "study_id, mrn, pulmdate, exclude, excl_reason, dob, gender, race, height, weight, bmi, smokeyn, smoke_quit, pack_years, symptoms, copd, lung_disease, fam_hist, discover, preop_biopsy, preop_ca_dx, preop_disease, prev_cancer, prev_cancer_loc, fev1_pred, nodule_no, ct_edge, ct_growth, ct_location, prior_pet, pet_type, priorpet_path, pet_suv, serotest, sero_test_type, dxmethod, clinic_biopsy, postop_dx, opdate, benign_disease, benign_micro, path_histology1, final_stage, living_status, death_date, live_date, nodule_study_complete"
09/16/2015 2:15pm	maigaaw	Manage/Design	Download exported data file (CSV raw)
09/16/2015 2:15pm	maigaaw	Data Export	report_id: ALL, export_format: CSV, rawOrLabel: raw, date_shifted: Yes, deidentified: Yes, fields: "study_id, mrn, pulmdate, exclude, excl_reason, dob, gender, race, height, weight, bmi, smokeyn, smoke_quit, pack_years, symptoms, copd, lung_disease, fam_hist, discover, preop_biopsy, preop_ca_dx, preop_disease, prev_cancer, prev_cancer_loc, fev1_pred, nodule_no, ct_edge, ct_growth, ct_location, prior_pet, pet_type, priorpet_path, pet_suv, serotest, sero_test_type, dxmethod, clinic_biopsy, postop_dx, opdate, benign_disease, benign_micro, path_histology1, final_stage, living_status, death_date, live_date, nodule_study_complete"
09/16/2015 9:57am	pottermh	Updated Record 640	linkid = 'VUMCRick-640'
09/16/2015 9:57am	pottermh	Updated Record 639	linkid = 'VUMCRick-639'
09/16/2015 9:57am	pottermh	Updated Record 638	linkid = 'VUMCRick-638'
09/16/2015 9:57am	pottermh	Updated Record 637	linkid = 'VUMCRick-637'
09/16/2015 9:57am	pottermh	Updated Record 636	linkid = 'VUMCRick-636'
09/16/2015 9:57am	pottermh	Updated Record 635	linkid = 'VUMCRick-635'
09/16/2015 9:57am	pottermh	Updated Record 634	linkid = 'VUMCRick-634'
09/16/2015 9:57am	pottermh	Updated Record 633	linkid = 'VUMCRick-633'
09/16/2015 9:57am	pottermh	Updated Record 632	linkid = 'VUMCRick-632'
09/16/2015 9:57am	pottermh	Updated Record 631	linkid = 'VUMCRick-631'

Features: Security

- Definable roles with corresponding access levels
  - Data entry, de-identified download, etc.
- Definable groups with security based on roles
  - A group may only see its own data
  - A role may only manipulate or change data (delete records)

Features: User Rights
Control of access and groups

Vanderbilt University Med... | Pandora Radio - Listen to ... | TREAT model multi-institu...

https://redcap.vanderbilt.edu/redcap_v6.9.0/UserRights/index.php?pid=40638

REDCap

Logged in as **deppensa** | Log out

- My Projects
- Project Home
- Project Setup

Project status: **Production**

Data Collection

- Record Status Dashboard
- Add / Edit Records

Data Collection Instruments:

Nodule Study

Applications

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

Reports Edit reports

1) Final diagnosis
2) Malignant
3) Benign
4) Exclusions
5) Missing H&P
6) Contain History and Physical
7) no pathological diagnosis
8) Missing documentation comments
9) Insufficient data for size
10) Spiculated

TREAT model multi-institutional verification

Project Setup | User Rights | Data Access Groups

This page may be used for granting users access to this project and for managing the user privileges of those users. You may also create roles to which you may assign users (optional). User roles are useful when you will have several users with the same privileges because they allow you to easily add many users to a role in a much faster manner than setting their user privileges individually. Roles are also a nice way to categorize users within a project. In the box below you may add/assign users or create new roles, and the table at the bottom allows you to make modifications to any existing user or role in the project, as well as view a glimpse of their user privileges.

Add new users: Give them custom user rights or assign them to a role.

Add new user | Add with custom rights

— OR —

Assign new user | Assign to role

Create new roles: Add new user roles to which users may be assigned.

Enter new role name | Create role

(e.g., Project Manager, Data Entry Person)

Role name (click role name to edit role)	Username or users assigned to a role (click username to edit or assign to role)	Expiration (click expiration to edit)	Project Design and Setup	User Rights	Data Access Groups	Data Export Tool	Reports & Report Builder	Graphical Data View & Stats	Calendar	Data Import Tool	Data Comparison Tool	Logging	File Repository
—	**deppensa** (Stephen Deppen)	never	✓	✓	✓	Full Data Set	✓	✓	✓	✓	✓	✓	✓
—	**grogane1** (Eric Grogan)	never	✗	✗	✗	De-Identified	✓	✓	✓	✗	✗	✗	✓
—	**maigaaw** (Amelia Maiga)	never	✗	✗	✗	Full Data Set	✓	✓	✓	✗	✗	✗	✓
—	**pinkark** (karen pinkard)	never	✗	✗	✗	De-Identified	✓	✓	✓	✗	✗	✗	✓
—	**pottermh** (Melissa Potter)	never	✓	✓	✗	Full Data Set	✓	✓	✓	✓	✓	✓	✓

10:58 PM
9/4/2015

Features: Report creation and facilitating IRB review

- Pdfs of data collection tools/forms available for review (paper data capture)
- Report creation for internal QA and external review
- Security features that appeal to IRB
  - VINCI firewall
  - Access controls
  - Easy to de-identify archived data?

Session Overview

- Brief introduction to REDCap
- **Examples of REDCap in research**
  - **Combining primary and secondary derived data**
  - **Complex studies-Longitudinal**
- Reporting and reproducible research
- Other capabilities

Example 1

TREAT Lung Cancer Clinical Predictive Model

Deppen et. al, JTO 2014

Example #1 – Lung Cancer

- Initially a single institution retrospective chart review
- Clinical prediction model of suspicious lung nodules at the time of surgical evaluation
- After publication, multi-center data collection
  - 3 US sites, 1 VA and 1 International
  - Screening population, pulmonary clinic
- Metadata used in varying ways for data collection at each site

1

Example – Lung Cancer

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https://redcap.vanderbilt.edu/redcap_v6.9.0/DataEntry/index.php?pid=40638&page=nodule_study&id=1010.1

Study ID **1010.1** Select other record

Data Collection Instruments:

Nodule Study

Applications

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1) Final diagnosis
2) Malignant
3) Benign
4) Exclusions
5) Missing H&P
6) Contain History and Physical
7) no pathological diagnosis
8) Missing documentation comments
9) Insufficient data for size
10) Spiculated
11) Cancer staging
12) Decreased
13) Ground Glass Opacity
14) Shape
15) symptoms
16) Missing required data
17) Pneumonia
18) Missing symptoms
19) chest pain
20) Missing Nodules

Help & Information

- Help & FAQ
- Video Tutorials
- Suggest a New Feature

If you are experiencing problems, please contact your REDCap administrator.

Institutional ID # * must provide value: LCBRN-V0011
not the REDCap study ID which is sequential, but which allows linking back in originating institution's database

Does case meet an exclusion criteria: No / Yes (reset)
Reasons include, known benign disease, surgery after chemo-rads, re-operation, surery for known metastatic disease, etc.

Missing Documentation Comments: Missing H&P (Expand)
Describe any missing documents, incorrect documents or other documentation issues.

Date of Birth: Today M-D-Y
MM-DD-YYYY (for calculating age at time of surgery/evaluation)

Age * must provide value: 59
age at time of surgery or diagnosis

Gender * must provide value: Female

Race: Caucasian / African American / Hispanic / Asian or Pacific Islander / Native American / Other / Missing (reset)

Height (cm): 163
for BMI calculation, measured in cm

Weight (kilograms): 151.9
for BMI calculation, measured in kg

BMI * must provide value: 57.17189205465016 View equation
Automatically calculated by entering height and weight

BMI (already calculated):

Pack Years (20Cig per pack): 35

Save Record
Save and Continue

Imported

demographics and basic epidemiological data from enterprise data warehouse

11:10 PM 9/4/2015

Example – Lung Cancer

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https://redcap.vanderbilt.edu/redcap_v6.9.0/DataEntry/index.php?pid=40638&page=nodule_study&id=1010.1

Is there a pathological diagnosis of cancer pre-operatively?	No Yes if pathological diagnosis of lung cancer from biopsy
Clinical Pre-op diagnosis	Lung Mass (NOS) 518.89
Any previous history of cancer * must provide value	◉ No ○ Yes Any previous cancer including skin cancer reset
Predicted FEV1 * must provide value	45 Pre-op PFT's only. Enter as a whole number 89% = 89. If no record of pre-op pft's then enter 999
Pre-Op Data: CT Imaging	
Number of lung lesions recorded	2 Use most recent CT scan or other imaging
CT Maximum Diameter (mm) of largest lesion * must provide value	23 Maximum Diameter in mm, If unknown enter 999. If multiple nodules then chose largest. If GGO, then chose largest shadow/semi-solid diameter.
CT Tumor shape * must provide value	Poorly defined or GGO Spiculated- coronal, carona, needle, or spindle shaped Lobulated - fingered, lumps, or irregular shaped
CT Tumor Growth * must provide value	Increased Growth/change on serial radiographs occurring at least 60 days apart is defined as an increase/decrease in mean diameter of 2 mm for nodules initially less than 15 mm in size and an increase of at least 15% compared to a baseline scan for lesions more than 15 mm in size at baseline. If nodule increases in size from baseline CT or if no nodule on previous radiograph, then growth=increase.
CT Tumor Location * must provide value	Upper Right Lobe
Pre-Op Data: PET Imaging	
PET Results * must provide value	Highly avid/Cancerous (>5)
Reported SUV	9.9 If unknown or not reported, enter 999
Post Operative	
Final diagnosis * must provide value	Malignant As determine by final pathological report
Pathological histology	Squamous Cell Carcinoma Histology as reported on final pathological report

Save Record

Save and Continue

Abstracted imaging, diagnosis, and clinical risk factors from patient medical record

11:15 PM
9/4/2015

Example #2

A Meta-analysis

Meta Analysis Study

- Import data from external data source with a common meta-data model, but slight differences – PUBMED & EMBASE
- Data entry for study review abstraction
- Supports systematic data collection (2 reviewers and study adjudication)
- Export data for analysis and reproducible research

Deppen et al, JAMA 2014

PUBMED/EMBASE data - imported

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https://redcap.vanderbilt.edu/redcap_v6.9.0/DataEntry/index.php?pid=22500&page=study_characteristics&id=20936411

REDCap

Logged in as deppensa | Log out

My Projects
Project Home
Project Setup
Project status: Production

Data Collection
Record Status Dashboard
Add / Edit Records

Study ID 20936411 Select other record
Data Collection Instruments:
Study Characteristics

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User Rights and DAGs
Data Quality

Reports Edit reports
1) exclusion

Help & Information
Help & FAQ
Video Tutorials
Suggest a New Feature
If you are experiencing problems, please contact your REDCap administrator.

MetaAnalysis Final Review

Save Record
Save and Continue

VIDEO: Basic data entry

Actions: Download PDF of instrument(s) | Share instrument

Study Characteristics

Editing existing Study ID 20936411

Study ID	20936411
Full Endnote Citation	Can multimodality imaging using 18F-FDG/18F-FLT PET/CT benefit the diagnosis and management of patients with pulmonary lesions?
Authors	Xu, B., Guan, Z., Liu, C., Wang, R., Yin, D., Zhan All authors
Abstract	PURPOSE: Dual-tracer, (18)F-fluorodeoxyglucose and (18)F-fluorodeoxythymidine ((18)F-FDG/(18)F-FLT), dual-modality (positron emission tomography and computed tomography, PET/CT) imaging was used in a clinical trial on differentiation of pulmonary nodules. The aims of this trial were to investigate if multimodality imaging is of advantage
Year study was published	2011
1st Author	Xu, B
Last Author	Tian J
Include study?	◉ Yes ○ No
Reason for exclusion	☐ Systematic Review ☐ Case Review ☐ 100% cancer prevalence ☐ 100% benign prevalence ☐ Staging only, no nodules

Data imported from PUBMED and imported to both ENDNOTE and REDCap with a common data structure

Systematic Review

Vanderbilt University Med... | Pandora Radio - Listen to ... | MetaAnalysis Final Review...

https://redcap.vanderbilt.edu/redcap_v6.9.0/DataEntry/index.php?pid=22500&page=study_characteristics&id=20936411

Type of confounding disease if any	tuberculoses
Confounding disease prevalence	as % of local population or describe
Quality assessment	
1. Was the spectrum of patients representative of the patients who will receive the test in practice? (at least 25 benign/25 cancer or broadly representative)	yes Was it a clincial population with consecutively acrued patients (if so, then "Yes"), or a speciality population (if so then likely "No")?
2. Were patients recruited consecutively?	yes Beware if paper have high prevalences of specific benign or cancerous pathology
3. Is the time period between pathology and index test short enough to be reasonably sure that the target condition did not change between the two tests?	yes Index test is resection or Watch and wait as lung cancer takes 20 years to develop.
4. Did the whole sample or a random selection of the sample, receive verification using a reference standard of diagnosis?	yes
5. Did patients receive the same reference standard regardless of the index test result?	no If any wree watch and wait, by definition, this must be NO.
6. Was the execution of the index test described in sufficient detail to permit replication of the test?	yes
7. Reporting who performed the clinical evaluation and image analysis?	yes Radiologist, Nuclear Medicine specialist, pulmonologist, chart reviewer or surgeon?
8. Was the study and/or collection of clinical variables conducted prospectively?	yes
9. Were the reference standard results interpreted without knowledge of the results of the index test?	yes Often YES if blinding occurred, but be careful for blinding to outcome only and blinding to all aspects of per-operative or pathological work up.
10. Were the same clinical data available when test results were interpreted as would be available when the test is used in practice?	yes YES if article reporting clinical use of PET or retrospective in clinical applicaiton.
11. Were uninterpretatable/intermediate test results reported?	not applicable Most do not describe non-diagnostic results or uninterpretable results chose not applicable (we assume no uninterpretable results).. If nondiagnostic results described chose YES. Exclusion of non-diagnostic results is reporting and YES should be chosen.
12. Were withdrawals from the study explained?	not applicable Withdrawls or exclusions from analysis then chose YES
	○ Yes ● No

Save Record

Save and Continue

QUADAS

standardized questions adapted

and additional guidance specific to this study

10:27 PM
9/4/2015

Export for Analysis

meta-analysis final - Microsoft Excel

G13 | 2009

id	study_id	citation	authors	abstract	study_yr	first_aut	last_aut	include	agree	exclude___	exclude___	exclude___	exclude___	exclude___	exclude___	exclude___	other_reas	begin_
1	21592456.2	"Accuracy of FDG-PET to	Deppen, SA. Putnam Jr, Joe B. Andra	Background: 18 F-fl	2011	Deppen	Grogan, EL	1	0	0	0	0	0	0	0	0		2005-0
2	21295203.2	Macdonald K, Searle J, Ly	Macdonald K, Searle J, Lyburn I.	To evaluate the acc	2011	Macdonald		1	0	0	0	0	0	0	0	0		
3	21273522.2	Ohno Y, Koyama H, Mats	Ohno Y, Koyama H, Matsumoto K, O	To prospectively co	2011	Ohno		1	3	0	0	0	0	0	0	0		2008-0
4	19525359.2	Barnett PG, Ananth L, Gc	Barnett PG, Ananth L, Gould MK; Ve	No prior study to o	2010	Barnett		1	0	0	0	0	0	0	0	0		1999-0
5	19543947.2	Chang CY, Tzao C, Lee SC	Chang CY, Tzao C, Lee SC, Cheng CY,	The objective of thi	2010	Chang		1	0	0	0	0	0	0	0	0		
6	20140611.2	Grgic A, Y?ksel Y, Gr?sche	Grgic A, Y?ksel Y, Gr?schel A, Sch?fer	(18)F-fluorodeoxyg	2010	Grgic		1	0	0	0	0	0	0	0	0		
7	20739905.2	Huang YE, Pu YL, Huang	Huang YE, Pu YL, Huang YJ, Chen CF,	To determine the a	2010	Huang		1	0	0	0	0	0	0	0	0		2004-0
8	20822650.2	Sathekge MM, Maes A, F	Sathekge MM, Maes A, Pottel H, Sto	Fluorodeoxyglucose	2010	Sathekge		1	0	0	0	0	0	0	0	0		
9	19687763.2	Aukema TS, Vald?s Olmo	Aukema TS, Vald?s Olmos RA, Klomp	The aim of our stud	2009	Aukema		1	0	0	0	0	0	0	0	0		2005-0
10	19194704.2	Kagna O, Solomonov A, K	Kagna O, Solomonov A, Keidar Z, Bar	To evaluate whethe	2009	Kagna	Guralnik, L	1	0	0	0	0	0	0	0	0		2001-0
11	19618610.2	Ning XH, Meng QL, Wang	Ning XH, Meng QL, Wang YZ, Bai CM	To testify the effica	2009	Ning	C. M. Bai	0	0	0	0	0	0	0	0	0		
12	19231413.2	Ohba Y, Nomori H, Shiba	Ohba Y, Nomori H, Shibata H, Kobay	To determine the o	2009	Ohba		1	0	0	0	0	0	0	0	0		2005-0
13	19579015.2	Schillaci O, Travascio L, B	Schillaci O, Travascio L, Bolacchi F, C	The aim of our pros	2009	Schillaci		1	0	0	0	0	0	0	0	0		2006-1
14	17938921.2	Alkhawaldeh K, Bural G,	Alkhawaldeh K, Bural G, Kumar R, Al	Our aim was to ass	2008	Alkhawaldeh		1	0	0	0	0	0	0	0	0		
15	18591921.2	Baram D, Bilfinger TV. In	Baram D, Bilfinger TV.	This study assesses	2008	Baram		1	0	0	0	0	0	0	0	0		
16	18528184.2	Chundru S, Wong CY, Wu	Chundru S, Wong CY, Wu D, Balon H,	To evaluate combin	2008	Chundru	D. Fink-DBe	1	0	0	0	0	0	0	0	0		
17	18528183.2	Degirmenci B, Wilson D,	Degirmenci B, Wilson D, Laymon CM	Combined positron	2008	Degirmenci		1	0	0	0	0	0	0	0	0		
18	18280613.2	Jeong SY, Lee KS, Shin KM	Jeong SY, Lee KS, Shin KM, Bae YA, K	We aimed to evalua	2008	Jeong		1	0	0	0	0	0	0	0	0		2004-0
19	18498030.2	Kim SC, Machac J, Krynyc	Kim SC, Machac J, Krynyckyi BR, Kne	To assess the diagn	2008	Kim		1	0	0	0	0	0	0	0	0		2001-0
20	18555033.2	Lan XL, Zhang YX, Wu ZJ,	Lan XL, Zhang YX, Wu ZJ, Jia Q, Wei	To assess the clinica	2008	Lan		1	0	0	0	0	0	0	0	0		
21	18504748.2	Ohno Y, Koyama H, Take	Ohno Y, Koyama H, Takenaka D, Nog	To compare the no	2008	Ohno		1	0	0	0	0	0	0	0	0		
22	18204955.2	Pauls S, Buck AK, Halter (	Pauls S, Buck AK, Halter G, Mottaghy	The purpose of the	2008	Pauls		1	0	0	0	0	0	0	0	0		2003-0
23	18199618.2	Tian J, Yang X, Yu L, Chen	Tian J, Yang X, Yu L, Chen P, Xin J, Ma	Some new radiotra	2008	Tian		0	3	0	0	0	0	0	0	0		
24	18520552.2	Yamamoto Y, Nishiyama	Yamamoto Y, Nishiyama Y, Ishikawa	The purpose of this	2008	Yamamoto		1	0	0	0	0	0	0	0	0		
25	17268017.2	Kim SK, Allen-Auerbach M	Kim SK, Allen-Auerbach M, Goldin J,	Characterization of	2007	Kim		1	0	0	0	0	0	0	0	0		2002-0
26	17662186.2	N??ez R, Kalapparambat	N??ez R, Kalapparambath A, Varela J	This study was und	2007	Nunez		1	0	0	0	0	0	0	0	0		2001-1
27	17361379.2	Orlacchio A, Schillaci O, A	Orlacchio A, Schillaci O, Antonelli L,	This study was don	2007	Orlacchio		1	0	0	0	0	0	0	0	0		
28	17219276.2	Tsunezuka Y, Shimizu Y, T	Tsunezuka Y, Shimizu Y, Tanaka N, Ta	F-18 fluorodeoxygl	2007	Tsunezuka		1	0	0	0	0	0	0	0	0		2003-0
29	17720408.2	Veronesi G,Bellomi M,Ve	Veronesi G, Bellomi M, Veronesi U, F	BACKGROUND: Ind	2007	Veronesi	Spaggiari L.	1	0	0	0	0	0	0	0	0		2004-1
30	17704242.2	Wang F, Wang Z, Yao W,	Wang F, Wang Z, Yao W, Xie H, Xu J,	The aim of this stud	2007	Wang		1	0	0	0	0	0	0	0	0		
31	16928527.2	Bryant AS, Cerfolio RJ. Th	Bryant AS, Cerfolio RJ.	Positron emission t	2006	Bryant		1	0	0	0	0	0	0	0	0		2001-1
32	17056930.2	Christensen JA, Nathan M	Christensen JA, Nathan MA, Mullan I	The purpose of this	2006	Christensen		1	0	0	0	0	0	0	0	0		2000-0
33	16710105.2	Ferran N, Ricart Y, Lopez	Ferran N, Ricart Y, Lopez M, Martine	To evaluate the dia	2006	Ferran		0	0	0	0	0	0	0	0	0		2004-0

meta-analysis chris | raw data | REmodel

Example 3

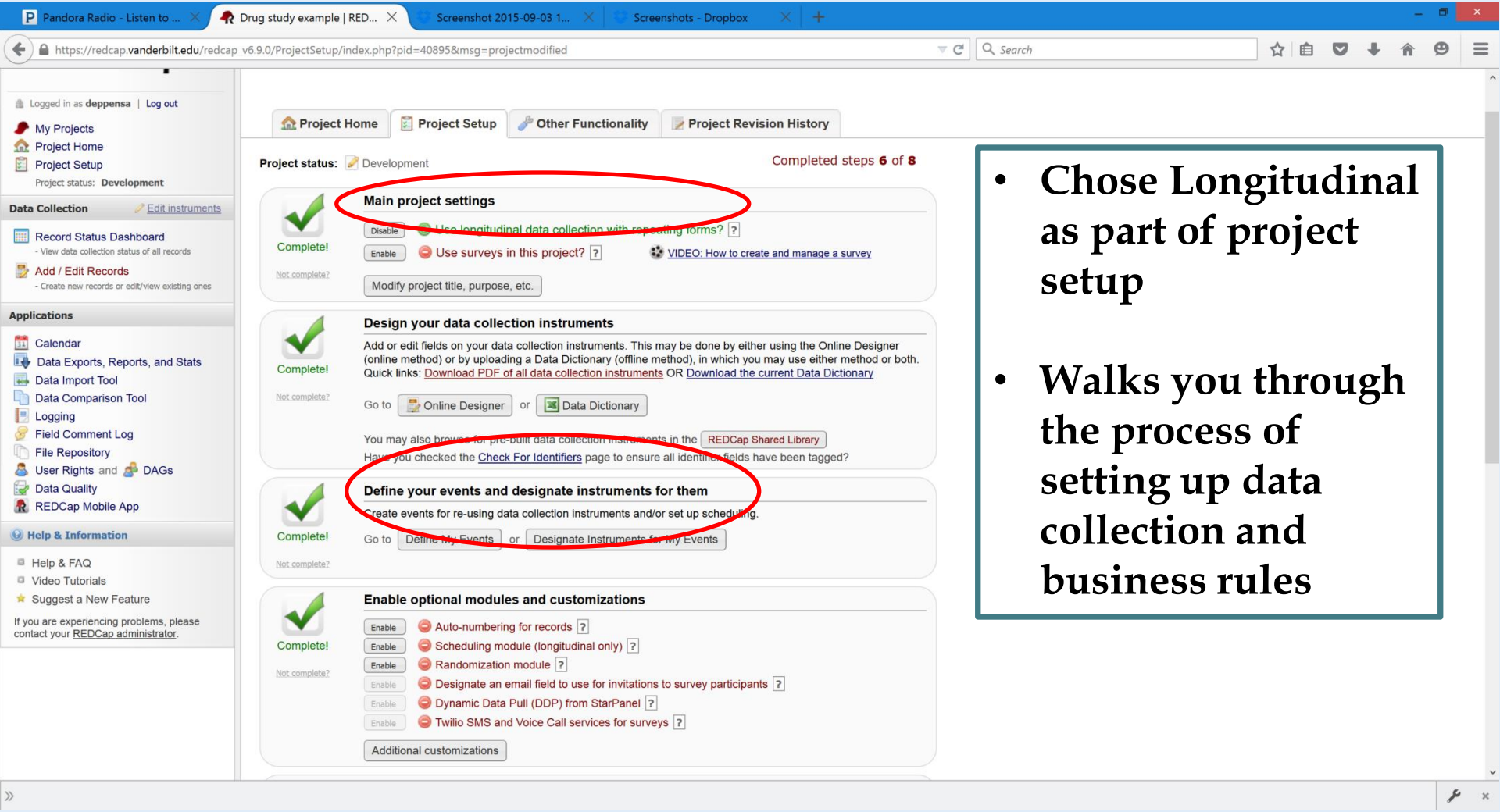
LONGITUDINAL STUDY

Longitudinal Multi-visit Study Unique Design/Elements

- One participant can have multiple encounters or the project can have a multi-arm study
  - One form can be used multiple times
  - Multiple forms for one encounter

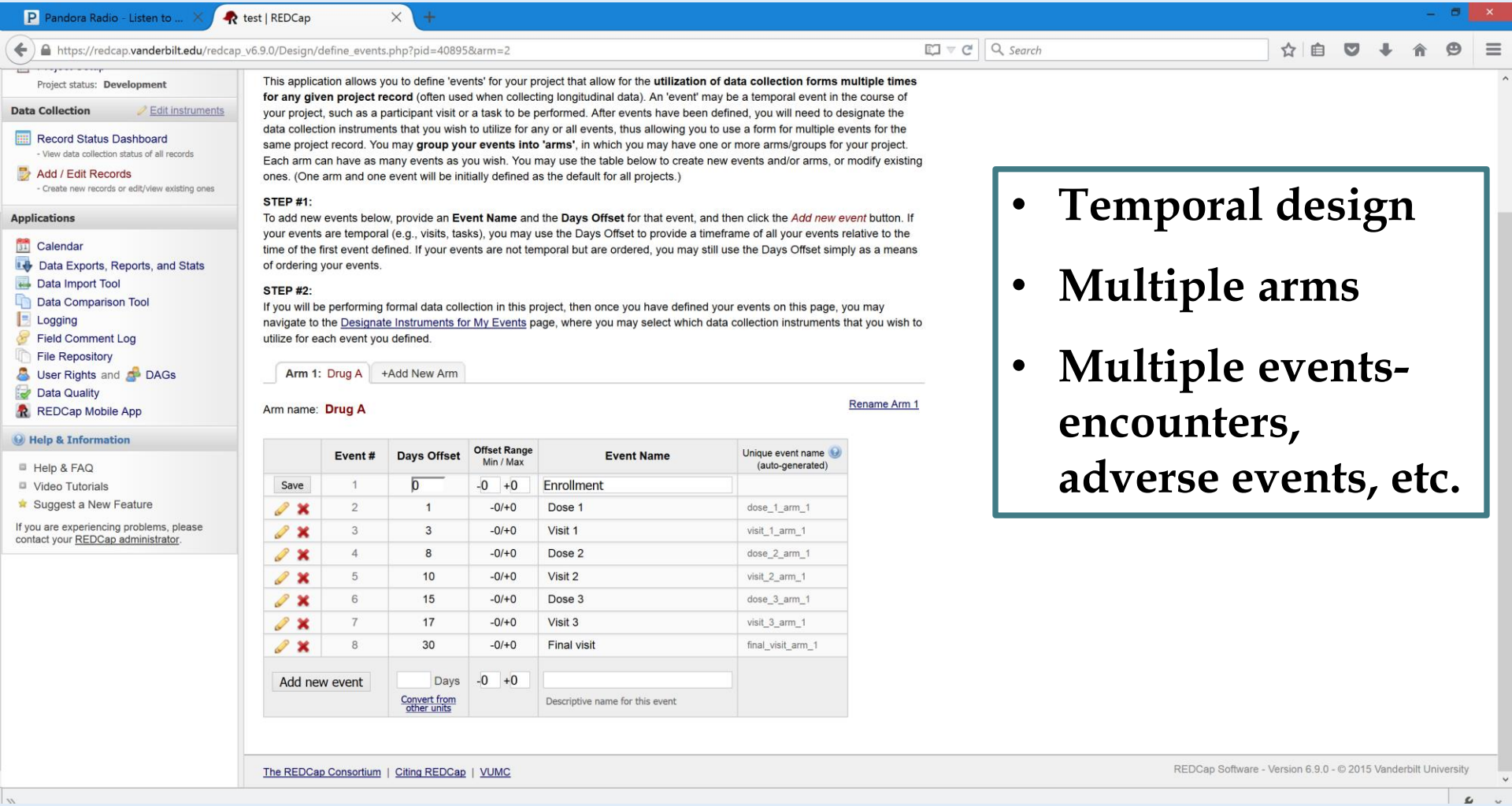
- Classic epidemiological cohort study or drug trial
  - National Neurosurgical Quality Outcomes Database
  - Right from the Start
  - STS Thoracic Surgical national quality database***

Longitudinal Multi-visit Study



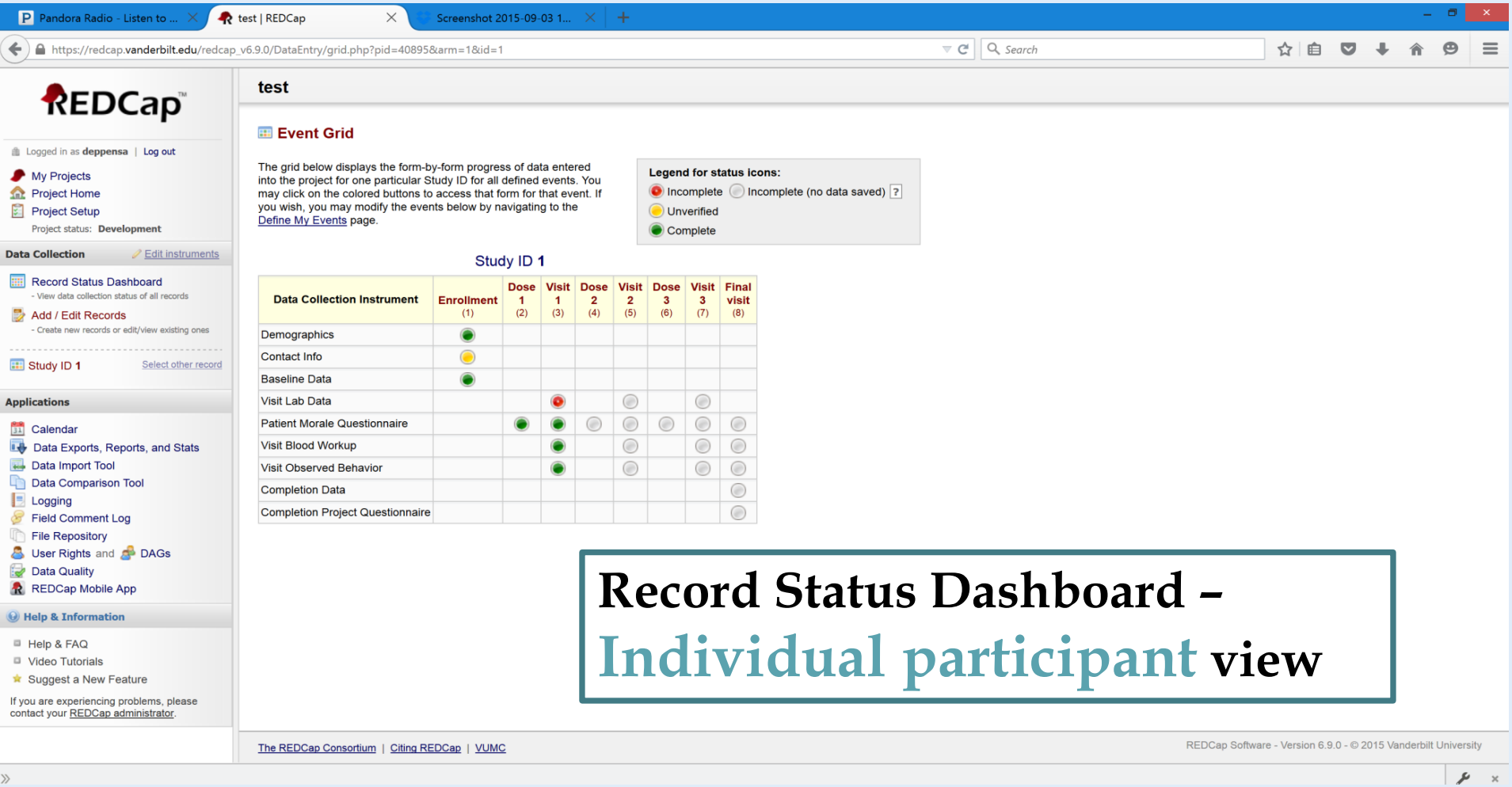
- **Chose Longitudinal as part of project setup**
- **Walks you through the process of setting up data collection and business rules**

Longitudinal Multi-visit Study "Event" Creation



- **Temporal design**
- **Multiple arms**
- **Multiple events-encounters, adverse events, etc.**

Longitudinal Multi-visit Study Form Assignment



Record Status Dashboard – Individual participant view

Longitudinal Multi-visit Study
Record Review-Data entry

Pandora Radio - Listen to ... | test | REDCap | Screenshot 2015-09-03 1... | Screenshots - Dropbox

https://redcap.vanderbilt.edu/redcap_v6.9.0/DataEntry/record_status_dashboard.php?pid=40895

test

Record Status Dashboard (all records)

Displayed below is a table listing all existing records/responses and their status for every data collection instrument (and if longitudinal, for every event). You may click any of the colored buttons in the table to open a new tab/window in your browser to view that record on that particular data collection instrument. Please note that if your form-level user privileges are restricted for certain data collection instruments, you will only be able to view those instruments, and if you belong to a Data Access Group, you will only be able to view records that belong to your group.

Legend for status icons:
- Incomplete
- Incomplete (no data saved) ?
- Unverified
- Complete

Displaying record "1" through "2" of **2** records

Displaying: Instrument status only | Lock status only | All status types

Study ID	Demographics Enrollment	Contact Info Enrollment	Baseline Data Enrollment	Patient Morale Questionnaire Dose 1	Visit Lab Data Visit 1	Patient Morale Questionnaire Visit 1	Visit Blood Workup Visit 1	Visit Observed Behavior Visit 1	Patient Morale Questionnaire Dose 2	Visit Lab Data Visit 2	Patient Morale Questionnaire Visit 2	Visit Blood Workup Visit 2	Visit Observed Behavior Visit 2	Patient Morale Questionnaire Dose 3	Visit Lab Data Visit 3	Patient Morale Questionnaire Visit 3	Visit Blood Workup Visit 3	Visit Observed Behavior Visit 3	Patient Morale Questionnaire Final visit	Visit Blood Workup Final visit	Visit Observed Behavior Final visit	Completion Data Final visit	Completion Project Questionnaire Final visit
1	Complete	Unverified	Complete	Complete	Incomplete	Complete	Complete	Complete	Incomplete (no data saved)	Incomplete (no data saved)	Incomplete (no data saved)	Incomplete (no data saved)	Incomplete (no data saved)	Incomplete (no data saved)	Incomplete (no data saved)	Incomplete (no data saved)	Incomplete (no data saved)	Incomplete (no data saved)	Incomplete (no data saved)	Incomplete (no data saved)	Incomplete (no data saved)	Incomplete (no data saved)	Incomplete (no data saved)
2	Complete	Complete	Complete	Complete	Complete	Complete	Complete	Complete	Complete	Complete	Complete	Complete	Complete	Incomplete	Incomplete (no data saved)	Incomplete (no data saved)	Incomplete (no data saved)	Incomplete (no data saved)	Complete	Complete	Complete	Complete	Unverified

Record Status Dashboard -All records view

Longitudinal Multi-visit Study Record Review-Data Entry

Vanderbilt University Med... | Pandora Radio - Listen to ... | Drug study example | RED...

https://redcap.vanderbilt.edu/redcap_v6.9.0/DataEntry/index.php?pid=40895&id=1&event_id=88614&page=patient_morale_questionnaire

REDCap

Logged in as deppensa | Log out

My Projects
Project Home
Project Setup
Project status: Development

Data Collection — Edit instruments

Record Status Dashboard
- View data collection status of all records

Add / Edit Records
- Create new records or edit/view existing re

Study ID 1 — Select other record
Event: Visit 1
Data Collection Instruments:
Visit Lab Data
Patient Morale Questionnaire
Visit Blood Workup
Visit Observed Behavior

Applications
Calendar
Data Exports, Reports, and Stats
Data Import Tool
Data Comparison Tool
Logging
Field Comment Log
File Repository
User Rights and DAGs
Data Quality
REDCap Mobile App

Help & Information
Help & FAQ
Video Tutorials

Drug study example

VIDEO: Basic data entry

Actions: Modify instrument | Download PDF of instrument(s)

Save Record
Save and Continue
Save and go to Next Form

Patient Morale Questionnaire

Editing existing Study ID 1

Event Name: Visit 1

Study ID	1
On average, how many pills did you take each day last week?	5-10
Using the handout, which level of dependence do you feel you are currently at?	1
Would you be willing to discuss your experiences with a psychiatrist?	No / Yes (reset)
How open are you to further testing?	very open
Form Status	
Complete?	Complete

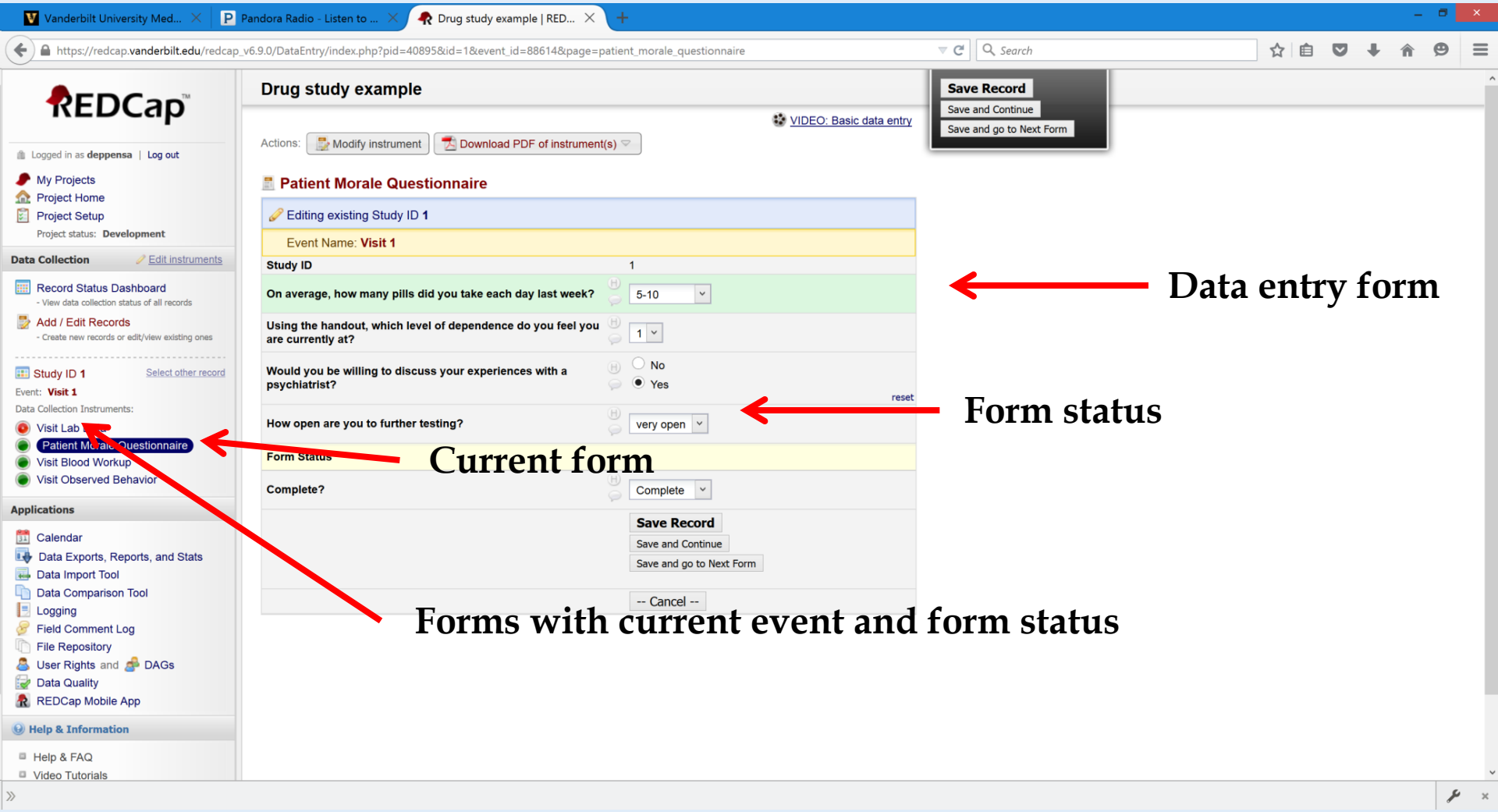
Save Record
Save and Continue
Save and go to Next Form
-- Cancel --

Participant

Event

- **Within a record, tags of where you are (event)**
- **Who you are updating** (participant/form)

Longitudinal Multi-visit Study
Record Review-Data entry



Longitudinal Multi-visit Study Missing Data Reporting

Vanderbilt University Med... | Pandora Radio - Listen to ... | TREAT model multi-institu...

https://redcap.vanderbilt.edu/redcap_v6.9.0/DataQuality/index.php?pid=40638

REDCap

Logged in as **deppensa** | Log out

- My Projects
- Project Home
- Project Setup

Project status: **Production**

Data Collection

- Record Status Dashboard
- Add / Edit Records

Data Collection Instruments:

Nodule Study

Applications

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

Reports Edit reports

1) Final diagnosis
2) Malignant
3) Benign
4) Exclusions
5) Missing H&P
6) Contain History and Physical
7) no pathological diagnosis
8) Missing documentation comments
9) Insufficient data for size
10) Spiculated
11) Cancer staging
12) Decreased

TREAT model multi-institutional verification

Data Quality

This module will allow you to execute data quality rules upon your project data to check for discrepancies in your data. Listed below are some pre-defined data rules that you may utilize and run. You may also create your own rules or edit, delete, or reorder the rules you have already created. To find discrepancies for a given rule, simply click the Execute button next to it, or click the Execute All Rules button to fire all the rules at once. It will provide you with a total number of discrepancies found for each rule and will allow you to view the details of those discrepancies by clicking the View link next to each. Read more detailed instructions.

Data Quality Rules — **Execute rules:** All | All except A&B | All custom | Clear

Apply to: -- All records --

	Rule #	Rule Name	Rule Logic (Show discrepancy only if...)	Real-time execution ?	Total Discrepancies	Delete rule?
	A	Missing values*	-		Execute	
	B	Missing values* (required fields only)	-		Execute	
	C	Field validation errors (incorrect data type)	-		Execute	
	D	Field validation errors (out of range)	-		Execute	
	E	Outliers for numerical fields (numbers, integers, sliders, calc fields)	-		Execute	
	F	Hidden fields that contain values**	-		Execute	
	G	Multiple choice fields with invalid values	-		Execute	
	H	Incorrect values for calculated fields	-		Execute	
	Add	Enter descriptive name for new rule (e.g., Participants below age 18)	Enter logic for new rule (e.g., [age] < 18) How do I use special functions?	Execute in real time on data entry forms ?		

* The Missing Values rules above automatically exclude fields hidden by branching logic when searching for missing values. If a field is hidden by branching logic on a data entry form or survey, then it is expected that such a field would not have a value. Thus for these cases, the values for those hidden fields will not be classified as missing. Additionally, checkbox fields are also excluded since an unchecked checkbox is itself often considered to be a real value.

** The term 'hidden fields' refers to any fields on a survey or data entry form that are not being displayed because branching logic is hiding them, which assumes that the field's value should be blank/null.

- Default **data quality reporting** – tabular and graphical
- Ability to filter and subset data within a report

Export to a variety of statistical packages

File Edit View Favorites Tools Help

My Projects
Project Home
Project Setup
Project status: **Development**

Data Collection Edit instruments

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

Record Status Dashboard
- View data collection status of all records

Add / Edit Records
- Create new records or edit/view existing ones

Data Collection Instruments:
START Study Demographic Information
START BASIS 24 Version 5-20-14
START Brief Addiction Monitor
START study SF 12
START Summary Sheet 6-24-14
START PDSQ version 5-20-14
START PTSD sx Checklist 7-17-15

Applications

Calendar
Data Exports, Reports, and Stats
Data Import Tool
Data Comparison Tool
Logging
Field Comment Log
File Repository
User Rights and DAGs
Record Locking Customization

https://vhacdwweb05.vha.med.va.gov/redcap_v6.0.27/Data

Create New Report | My Reports & Exports | PDF & Other Export Options

This module allows you to easily view reports of your data, inspect plots and descriptive statistics of your data, as well as export your data to Microsoft Excel, SAS, Stata, R, or SPSS for analysis (if you have such privileges). If you wish to export your *entire* data set or view it as a report, then Report A is the best and quickest way. However, if you want to view or export data from only specific instruments (or events) on the fly, then Report B is the best choice. You may also create your own custom reports below (if you have such privileges) in which you can filter the report to specific fields, records, or events using a vast array of filtering tools to make sure you get the exact data you want. Once you have created a report, you may view it as a webpage, export it out of REDCap in a specified format (Excel, SAS, Stata, SPSS, R), or view the plots and descriptive statistics for that report.

My Rep
A
B

Exporting "All data (all records and fields)"

Select your export settings, which includes the export format (Excel/CSV, SAS, SPSS, R, Stata) and whether or not to perform de-identification on the data set.

Choose export format

- CSV / Microsoft Excel (raw data)
- CSV / Microsoft Excel (labels)
- SPSS Statistical Software
- SAS Statistical Software
- R Statistical Software
- Stata Statistical Software

De-identification options (optional)

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

Known Identifiers:
- [ ] Remove all tagged Identifier fields (tagged in Data Dictionary)
- [ ] Hash the Record ID field (converts record name to an unrecognizable value)

Free-form text:
- [ ] Remove unvalidated Text fields (i.e. Text fields other than dates, numbers, etc.)
- [ ] Remove Notes/Essay box fields

Date and datetime fields:
- [ ] Remove all date and datetime fields

— OR —

- [ ] Shift all dates by value between 0 and 364 days (shifted amount determined by algorithm for each record) What is date shifting?

Deselect all options

Additional export options
- [x] Export survey identifier field and survey timestamp field(s)?

Export Data | Cancel

Session Overview

- Brief introduction to REDCap
- Examples of REDCap in research
  - Combining primary and secondary derived data
  - Complex studies-Longitudinal
- Reporting and reproducible research
- Other capabilities

Exporting

- Generates code for each statistical package for labels, redefinition of variables and transformation of dates into package specific code for each variable
- 147 lines of code for the TREAT database, mostly label definitions, in STATA export
- Greatly reduces biostatistics time
- Specific exports/reports for data review committees

REDCap Live Run

- Example from Meta-analysis and multicenter trial

Session Overview

- Brief introduction to REDCap
- Examples of REDCap in research
  - Combining primary and secondary derived data
  - Complex studies-Longitudinal
- Reporting and reproducible research
- Other capabilities

Other capabilities

- Randomization
- Multi-site study
- Dual data entry
- Survey
- Push activity/data collection needs to study coordinator

REDCap in the VA

- **Intranet** Web application
  - Surveys can only be administered to respondents via the VA INTRAnet

- VIReC REDCap **Resources**
  - REDCap Overview Webpage:
    - http://vaww.virec.research.va.gov/REDCap/Overview.htm
  - Resources for New Users:
    - VA REDCap FAQs
    - VA REDCap User Guidelines
  - Helpdesk: VIReC@va.gov

Other REDCap Resources

- http://project-redcap.org/
  - Survey Library
  - Training Videos
  - Searchable Help and FAQ (for current users)
- Large group of international users and potential collaborators
- Coming soon: API for scripted import of data or transfer to another program – TREAT website example
- Customer support provided by VIReC

Questions?

Thank you for your time.

Contact Information

- Stephen Deppen, MA, MS, PhD
  - Stephen.Deppen@va.gov
- VIReC HelpDesk
  - VIReC@va.gov

References

Deppen SA, Blume JD, Aldrich MC, et al. Predicting lung cancer prior to surgical resection in patients with lung nodules. J Thorac Oncol. 2014 Oct;9(10):1477-84

Deppen SA, Blume JD, Kensinger CD, et al. Accuracy of FDG-PET to Diagnose Lung Cancer in Areas With Infectious Lung Disease: A Meta-analysis. *JAMA*. 2014;312(12):1227-1236.