



Randomisation in REDCap

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Agenda

- What is randomisation?
 - Definitions
 - Why do we do it?
 - Study designs
- Methods of randomisation
- Randomisation in REDCap
 - Project configuration
 - Different allocation options
- Into Production: controlling the process
- Alternatives for "randomness"

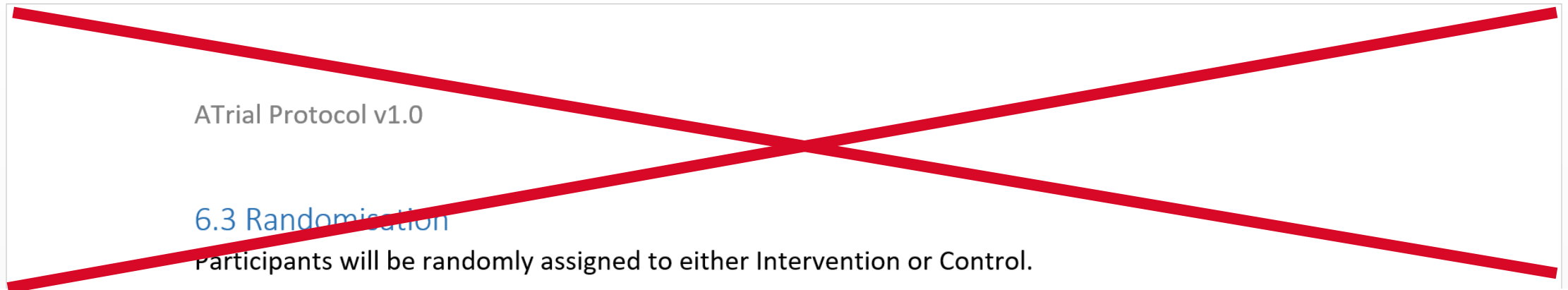
What is Randomisation?

ATrial Protocol v1.0

6.3 Randomisation

Participants will be randomly assigned to either Intervention or Control.

What is Randomisation?



- No! Allocation to group is not random!
- Aim to balance the number of participants allocated to each group, e.g. intervention vs. control.
 - "balance the number", or rather "control the potential imbalance".
 - Random process like coin flip does not protect against imbalance, e.g. 5 heads in a row.
- Allocate sequentially from a randomisation schedule generated in advance.

What is Randomisation?

- "Stratified permuted blocks"
 - **"blocks"**: Allocations are arranged in blocks according to the allocation ratio
e.g. for 1:1 blocks will be size
2 (1 of each), 4 (2 of each), 6 (3 of each) etc.
 - **"permuted"**: The sequence of allocations within each block varies. Each block contains allocations ordered according to one of the possible permutations, e.g. for block size 4: IICC ICIC CICI CCII
 - **"stratified"**: balance within subgroups by using a different schedules for each group of participants
e.g. female/site1, female/site2, male/site1, male/site2
- Maximal imbalance is the half the size of the largest block:
Schedule: **IIICCC CCCIII**
Count I : **123333 333**
Count C : **000123 456**
 ^ ^

sequence	site	sex	block	block_entry	allocation
1	site1	f	1	1	intervention
2	site1	f	1	2	control
3	site1	f	2	1	intervention
4	site1	f	2	2	control
5	site1	f	2	3	control
6	site1	f	2	4	intervention
7	site1	f	3	1	intervention
8	site1	f	3	2	intervention
9	site1	f	3	3	control
10	site1	f	3	4	control
11	site1	f	4	1	control
12	site1	f	4	2	intervention
13	site1	f	5	1	control
14	site1	f	5	2	control
15	site1	f	5	3	intervention
16	site1	f	5	4	intervention
17	site1	f	6	1	intervention
18	site1	f	6	2	control
19	site1	f	6	3	control
20	site1	f	6	4	intervention
21	site1	f	7	1	control
22	site1	f	7	2	intervention
23	site1	f	7	3	control
24	site1	f	7	4	intervention
25	site1	f	8	1	intervention
26	site1	f	8	2	control
27	site1	f	9	1	control
28	site1	f	9	2	control
29	site1	f	9	3	intervention
30	site1	f	9	4	intervention

What is Randomisation?

ATrial Protocol v2.0

6.3 Randomisation

Participants will be randomised to either the Intervention or Control group with an allocation ratio of 1:1, using a web-based randomisation procedure. The randomisation schedule and web-based service will be provided by the Clinical Epidemiology and Biostatistics Unit (CEBU) at the Murdoch Children's Research Institute. The randomisation will be in randomly permuted blocks of variable length, stratified by study centre, and by sex, that is, either male or female.

What is Randomisation?

Why We Do It

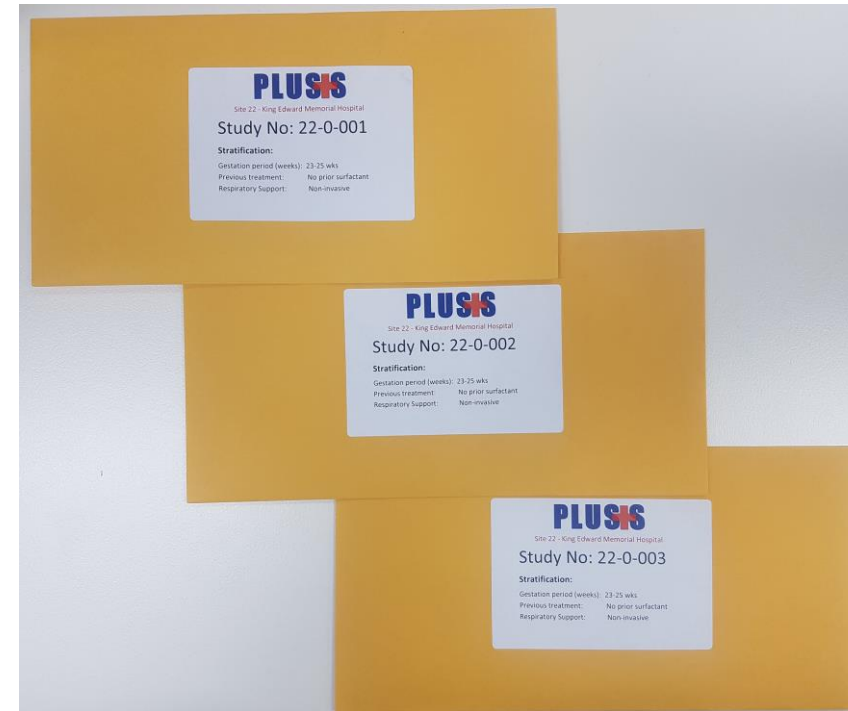
- Minimising imbalance in allocations.
- Minimise any potential for bias (or any potential for the appearance of bias)
- Stratification - balancing within subgroups - controls confounding enabling causal inference:
 - Can say:
"Exposure X is causally linked to outcome Y"
 - Not just:
"Exposure X is associated with outcome Y"

Study Designs

- Parallel group
- Cross-over ($I \rightarrow C$, $C \rightarrow I$)
- Cluster-randomised (randomise e.g. the site, school etc. not individuals)
- Open-label
 - Everyone is aware of the allocation
- Single-blind
 - Study team know allocation, participant does not
- Double-blind
 - Neither study team nor participant aware of allocation (e.g. active vs. placebo)

Randomisation Methods

- Traditional: secure envelopes
 - Tamper-proof envelopes
 - Open in sequence to reveal allocation
 - Still sometimes used, especially as emergency backup
- Electronic, centralised
 - IVR (telephone)
 - Web-based
 - Easier than preparing & managing envelopes
 - Less potential for (appearance of) bias
 - May still require backup, contingency process in the event of forgotten passwords, connectivity problems etc.



Randomisation in REDCap

- Set up fields for stratification and allocation (including Data Access Groups, if required).
- Enable "Randomization" on the Project Setup page.
- Set up the Randomization Model on the Randomisation page.
- Generate and upload a test randomisation schedule csv file
 - E.g. from the "5x all possible combos" example
- Enable the "Randomize" permission for the User Roles that require it.
- Test it!
- A new record can be created by randomising but only stratification and allocation values get saved.

Current instrument: **Randomisation** Preview instrument

Variable: record_id
Record ID

NOTE: The field above is the record ID field and thus cannot be deleted or moved. It can only be edited.

Variable: sex
Sex of participant
* must provide value

Variable: randalloc
Randomised allocation

STEP 1: Define your randomization model

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

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

Choose strata (criteria fields used for stratification; may specify up to 14 multiple choice fields)
sex (Sex of participant)
[Add another stratum](#)

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

☒ Use Data Access Groups to designate each group/site (2 groups currently exist)
☐ Use an existing field to designate each group/site
- select a field -

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

Enable ☒ Scheduling module (longitu
Disable ☒ Randomization module ?
Enable ☒ Designate an email field for

	A	B	C	D	E
1	randalloc	sex	redcap_data_access_group		
2	1	2	9951		
3	2	2	9951		
4	1	1	9951		
5	2	1	9951		
6	1	2	9952		
7	2	2	9952		
8	1	1	9952		
9	2	1	9952		
10	1	2	9951		

Randomisation Assign record to a Data Access Group? Site 1


Adding new Record ID 1

Record ID 1

Sex of participant Female
* must provide value

Randomised allocation Already randomized
Intervention

Randomizing Record ID "1"

 Record ID "1" was randomized for the field "Randomised allocation" and assigned the value "Intervention" (1).

Close

Controlling the Process

- Different version of randomisation schedule used for project in Production.
 - Administrators may add new records if required e.g. for
 - > Additional strata such as a new site
 - > Extending the number of records for existing strata
- Generate schedule using a reproducible process.
 - Stats package script, NOT just hacked together in Excel!
 - Stats group have SOP - independent statistician generates as per protocol wording, checked
- Mis-randomisations...
 - Mistakes can occur but allow them to stand.
 - You do not - cannot! - update stratification values in the database or delete/re-randomise.
 - Make corrections in data cleaning / analysis scripts.

```
RandList_ATrial_20190603.do
31 ralloc Block BlkSize Alloc, ///
32 ntreat(2) /// number of allocation groups
33 strata(4) /// number of strata
34 osize(2) /// number of different block sizes
35 nsubj(50) /// number of allocations per stratum
36 trtlab("Intervention" "Control") /// labels for allocations 1 and 2
37 seed(20190603) /// seed for random number generator, ensures reproducibility
38 saving("ATrial_rand")
39
40 sort StratID Block SeqInBlk
41 gen Seq=_n
42 bysort StratID (Seq): gen StratSeq=_n
43 drop if StratSeq>50 // drop unneeded entries (partial blocks remain)
44
45 * Stratification factor fields
46 gen site=""
47 replace site="Site 1" if StratID==1 | StratID==2
48 replace site="Site 2" if StratID==3 | StratID==4
49 assert site!=""
50 gen sexlbl=""
51 replace sexlbl="f" if StratID==1 | StratID==3
52 replace sexlbl="m" if StratID==2 | StratID==4
53 assert sexlbl!=""
54
55 * Process for REDCap upload
56 gen redcap_data_access_group=""
57 replace redcap_data_access_group="9951" if site=="Site 1"
58 replace redcap_data_access_group="9952" if site=="Site 2"
59 assert redcap_data_access_group=="9951" | redcap_data_access_group=="9952"
60
61 gen sex=""
62 replace sex="2" if sexlbl=="f"
63 replace sex="1" if sexlbl=="m"
64 assert sex=="1" | sex=="2"
65
66 gen randalloc=Alloc
67 assert randalloc==1 | randalloc==2
68
69 save "ATrial_rand.dta", replace
70
71 keep randalloc sex redcap_data_access_group
72 order randalloc sex redcap_data_access_group
73
74 export delimited "ATrial_rand.csv"
```

Alternative Randomised Assignments

- Display of the group allocation is not always desired e.g. for double blind randomisations.
- Allocate to a randomisation number.
 - Study team member takes number to Pharmacy, who have a code-break sheet and can dispense appropriate blinded treatment
 - May require emergency code-break mechanism
 - Set up allocation field with randomisation numbers as field choices.
- Display allocated number and group.
 - Not recommended!
 - Online Designer/Codebook access reveals allocation sequence!
 - Max length of data dictionary cell contents in Excel is 65k characters.
- Minimisation, dynamic randomisation algorithms...

Field Label

Randomisation number

Choices (one choice per line)

1001, 1001
1002, 1002
1003, 1003
1004, 1004

Randomisation Data Access Group: Site 1 ?

Editing existing Record ID 1

Record ID 1
To rename the record, see the record action drop-down at top of the [Record Home Page](#).

Participant sex * must provide value Male

Randomisation number Already randomized 1001

Field Label

Randomisation number and allocation

Choices (one choice per line) Copy

1001, 1001 Intervention
1002, 1002 Control
1003, 1003 Intervention
1004, 1004 Control

Randomisation Data Access Group: Site 1 ?

Editing existing Record ID 1

Record ID 1
To rename the record, see the record action drop-down at top of the [Record Home Page](#).

Participant sex * must provide value Male

Randomisation number and allocation Already randomized 1001 Intervention

Other (Uncontrolled!) Ways to "Randomise"

- Sometimes the randomisation module is not what you need, e.g. "randomising" questions in a survey or in the mobile app.

- Record ID in public survey, modulo 3 gives 0, 1 or 2 essentially "at random"
Use the result in branching logic.

```
[record_id] - (rounddown([record_id]/3, 0) * 3)
```

- Administrators may use JavaScript functions for on-form calculations.
Generate a random number and prevent it being reset once saved:

```
if([rnd]='', Math.random(), [rnd])
```

- Or use the datediff() function to calculate seconds between two times

```
if([secsince]='', datediff("01-06-2019 00:00:00", [now], "s", "dmy", false), [secsince])
```

- Example of Fizz Buzz for multiples of 3 and 5: https://is.gd/anzadminforum2019_fizzbuzz

Thank you. Any questions?

And thanks to the REDCap team at Vanderbilt University

Title: Research electronic data capture (REDCap)—A metadata-driven methodology and workflow process for providing translational research informatics support

Author: Paul A. Harris, Robert Taylor, Robert Thielke, Jonathon Payne, Nathaniel Gonzalez, Jose G. Conde

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