Clinical Trial Knowledge Graph (CTKG)

Clinical Trial Knowledge Graph (CTKG) is a comprehensive knowledge graph relating clinical studies, study groups, drugs, conditions, adverse events, outcome analyses and outcomes. CTKG represents information from the AACT database as a knowledge graph to capture the relations among nodes. CTKG includes 1,493,518 nodes belonging to 19 node-types; and 3,452,837 triplets belonging to 21 relation-types. These 21 relation-types show a type of interaction between one of the 19 node-type pairs as depicted in the figure below. In CTKG, we have two types of relations between the study and drug nodes. For the rest of the node-type pairs, we have at most one relation for each of them.

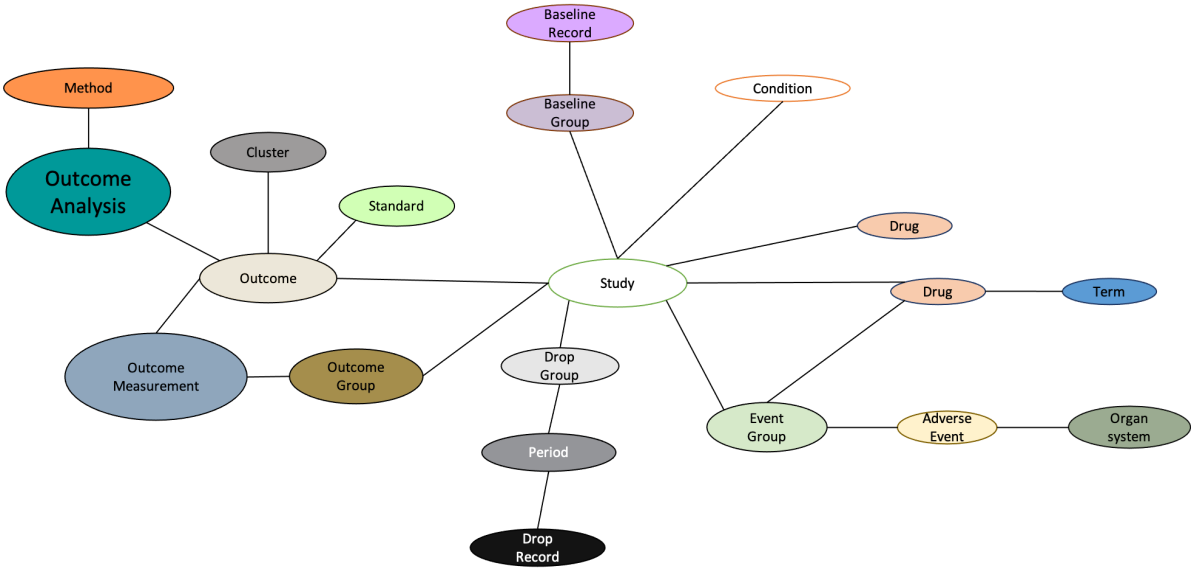


Figure: relations in the CTKG

Nodes

The following table shows the description and attributes for each node type. We list brief definition of attributes. Please refer to this link for detailed definitions.

Study

Each study node represents a clinical study. CTKG includes 8,210 study nodes. Each study has 49 attributes and an id "StudyID:NCTXXX".

Attributes:

1. **last_update_submitted_qc_date**

   Definition: the date that the last update was submitted

   Example: 2020-04-10

2. **last_update_posted_date**

   Definition: The estimated or actual date on which the last update was posted

   Example: 2020-04-21

3. **last_update_posted_date_type**: Actual/Estimate

   Definition: This attribute shows the last update posted date is actual or estimated.

> Statistics:
>
> 4,424 (53.9%) Actual
>
> 3,786 (46.1%) Estimate

4. **start_date_type**: Actual/""

   Definition: This attribute shows the start date is actual or estimated.

> Statistics:
>
> 5,774 (70.3%) ""
>
> 2,436 (29.7%) Actual

5. **start_date**

   Definition: The estimated date on which the clinical study will be open for recruitment of participants, or the actual date on which the first participant was enrolled.

   Example: 2017-07-01

6. **verification_month_year**

   Definition: The date on which the responsible party last verified the clinical study information in the entire ClinicalTrials.gov record for the clinical study, even if no additional or updated information is being submitted.

   Example: April 2020

7. **verification_date**

   Example: 2020-04-30

8. **primary_completion_date_type**: Actual/Anticipated/""

   Definition: This attribute shows the primary completion date is actual or estimated.

> Statistics:
>
> 8,188 (99.7%) Actual
>
> 19 ""
>
> 3 Anticipated

9. **primary_completion_date**

   Definition: The date that the final participant was examined or received an intervention for the purposes of final collection of data for the primary outcome, whether the clinical study concluded according to the pre-specified protocol or was terminated. In the case of clinical studies with more than one primary outcome measure with different completion dates, this term refers to the date on which data collection is completed for all of the primary outcomes.

   Example: 2018-07-15

10. **target_duration**

    Definition: For Patient Registries, the anticipated time period over which each participant is to be followed. Provide a number and select a Unit of Time (years, months, weeks, days).

> Statistics:
>
> 8,209 (99.9%) ""
>
> 1 7 Days

11. **study_type**

Definition: The nature of the investigation or investigational use for which clinical study information is being submitted.

> Statistics:
>
> 8,078 (98.4%) Interventional
> 131 (1.6%) Observational
> 1 (0.0%) Observational [Patient Registry]

12. **brief_title**

    Definition: A short title of the clinical study written in language intended for the lay public.

    Example: "Study of Naltrexone-Induced Blockade of Antidepressant Effects"

13. **official_title**

    Definition: The title of the clinical study, corresponding to the title of the protocol.

    Example: "Naltrexone-induced Blockade of Neural Responses Induced by Fast-Acting Antidepressant Effects"

14. **overall_status**: Completed/Terminated/Active, not recruiting/Unknown status/Recruiting

    Definition: The recruitment status for the clinical study as a whole, based upon the status of the individual sites. If at least one facility in a multi-site clinical study has an Individual Site Status of "Recruiting," then the Overall Recruitment Status for the study must be "Recruiting."

> Statistics:
>
> 7,325 (89.2%) Completed
> 560 (6.8%) Terminated
> 311 (3.8%) Active, not recruiting
> 12 Unknown status
> 2 Recruiting

15. **phase**

    Definition: For a clinical trial of a drug product (including a biological product), the numerical phase of such clinical trial, consistent with terminology in 21 CFR 312.21 and in 21 CFR 312.85 for phase 4 studies.

    Example: Phase 3

> Statistics:
>
> 3,507 (42.7%) Phase 3
> 1,984 (24.2%) Phase 2
> 1,409 (17.2%) Phase 4
> 424 (5.2%) N/A
> 345 (4.2%) Phase 1
> 218 (2.7%) Phase 1/Phase 2
> 175 (2.1%) Phase 2/Phase 3
> 132 (1.6%) ""
> 16 (0.2%) Early Phase 1

16. **enrollment**

    Definition: The estimated total number of participants to be enrolled (target number) or the actual total number of participants that are enrolled in the clinical study.

Example: 60

17. **enrollment_type**: Actual/Anticipated

    Definition: This attribute shows the total number of participants to be enrolled is estimated or actual.

    > Statistics:
    >
    > 8,209 (99.9%) Actual
    >
    > 1 Anticipated

18. **source**

    Definition: This attribute shows the institute which conducts the clinical study.

    Example: University of Pittsburgh

    > Statistics:
    >
    > 956 unique institutes in total
    >
    > 218 of them are in more than 5 institutes

19. **number_of_arms**

    Definition: The number of arms in the clinical trial. For a trial with multiple periods or phases that have different numbers of arms, the maximum number of arms during all periods or phases. "Arm" means a pre-specified group or subgroup of participant(s) in a clinical trial assigned to receive specific intervention(s) (or no intervention) according to a protocol.

    Example: 2

20. **number_of_groups**

    Definition: Number of study groups/cohorts. Enter "1" for a single-group study. Many observational studies have one group/cohort; case control studies typically have two.

    Example: 2

    > Statistics: 8,081(98.4%) ""

21. **why_stoped**

    Definition: A brief explanation of the reason(s) why such clinical study was stopped (for a clinical study that is "Suspended," "Terminated," or "Withdrawn" prior to its planned completion as anticipated by the protocol).

    Example: "Lack of efficacy"

    > Statistics: 7,729 (94.1%) ""

22. **allocation**

    Definition: The method by which participants are assigned to arms in a clinical trial.

    Example: "Randomized"

    > Statistics:
    >
    > 7,019 (85.5%) Randomized
    > 602 (7.3%) N/A
    > 406 (4.9%) Non-Randomized (i.e., Participants may choose which group they want to be in, or they may be assigned to the groups by the researchers.)
    > 183 (2.2%) ""

23. **intervention_model**

    Definition: The strategy for assigning interventions to participants.

    Example: "Parallel Assignment"

    > Statistics:
    >
    > 6,308 (76.8%) Parallel Assignment (i.e., participants are assigned to one of two or more groups in parallel for the duration of the study)
    > 879 (10.7%) Single Group Assignment (i.e., clinical trials with a single arm)
    > 742 (9.0%) Crossover Assignment (i.e., groups of participants receive two or more interventions in a specific order.)
    > 167 (2.0%) ""
    > 93 (1.1%) Factorial Assignment (i.e., groups of participants receive one of several combinations of interventions)
    > 21 (0.2%) Sequential Assignment

24. **primary_purpose**

    Definition: The main objective of the intervention(s) being evaluated by the clinical trial.

    Example: "Treatment"

    > Statistics:
    >
    > 7,069 (86.1%) Treatment
    > 453 (5.5%) Prevention
    > 221 (2.7%) ""
    > 145 (1.8%) Basic Science
    > 138 (1.7%) Supportive Care
    > 93 (1.1%) Other
    > 71 (0.9%) Diagnostic
    > 16 (0.2%) Health Services Research
    > 4 (0.0%) Screening

25. **time_perspective**: Prospective/Retrospective/Cross-Sectional

    Definition: Temporal relationship of observation period to time of participant enrollment.

    > Statistics: 8,080 (98.4%) ""

26. **masking**

    Definition: The party or parties involved in the clinical trial who are prevented from having knowledge of the interventions assigned to individual participants.

    Example: Double

    > Statistics:
    >
    > 2,771 (33.8%) None (Open Label)
    > 1,986 (24.2%) Double
    > 1,982 (24.2%) Quadruple
    > 990 (12.1%) Triple
    > 310 (3.8%) Single
    > 171 (2.1%) ""

27. **masking_description**

    Definition: Provide information about other parties who may be masked in the clinical trial, if any.

Example: "This is a phase 4 double blind study, which will use a triple dummy design for dosing."

> Statistics: 8,074 (98.3%) ""

28. **intervention_model_description**

    Definition: Provide details about the Interventional Study Model.

    Example: "Phase I clinical trial, controlled, of parallel groups, double blind, randomized, exploratory."

    > Statistics: 8,080 (98.4%) ""

29. **subject_masked**: t/""

    Definition: True if participants are prevented from having knowledge of the interventions assigned to individual participants.

    > Statistics: 4,844 (59.0%) t and 3,366 (41.0%) ""

30. **caregiver_masked**: t/""

    Definition: True if caregivers are prevented from having knowledge of the interventions assigned to individual participants.

    > Statistics: 2,614 (31.8%) t and 5,596 (68.2%) ""

31. **investigator_masked**: t/""

    Definition: True if investigators are prevented from having knowledge of the interventions assigned to individual participants.

    > Statistics: 4,718 (57.5%) t and 3,492 (42.5%) ""

32. **outcomes_assessor_masked**: t/""

    Definition: True if outcomes assessors are prevented from having knowledge of the interventions assigned to individual participants.

    > Statistics: 2,613 (31.8%) t and 5,597 (68.2%) ""

33. **sampling_method**: Probability Sample/Non-Probability Sample

    Definition: Indicate the method used for the sampling approach and explain in the Detailed Description.

    > Statistics: 8,078 (98.4%) ""

34. **gender**: All/Female/Male

    Definition: This attribute shows the acceptable gender for the clinical study.

    > Statistics:
    >
    > 7,256 (88.4%) All
    >
    > 654   (8.0%) Female
    >
    > 300   (3.7%) Male

35. **minimum_age**

    Definition: This attribute shows the minimum acceptable age of participants for the clinical study.

Example: 18 Years

36. **maximum_age**

    Definition: This attribute shows the maximum acceptable age of participants for the clinical study

    Example: 65 Years

37. **healthy_volunteers**: No/"Accepts Healthy Volunteers"

    Definition: Indication that participants who do not have a disease or condition, or related conditions or symptoms, under study in the clinical study are permitted to participate in the clinical study.

    > Statistics:
    >
    > 7,462 (90.9%) No
    >
    > 732 (8.9%) "Accepts Healthy Volunteers"
    >
    > 16 ""

38. **population**

    Definition: A description of the population from which the groups or cohorts will be selected (for example, primary care clinic, community sample, residents of a certain town).

    Example: "Korean patients with T2DM"

    > Statistics: 8,078 (98.4%) ""

39. **criteria**

    Definition: A limited list of criteria for selection of participants in the clinical study, provided in terms of inclusion and exclusion criteria and suitable for assisting potential participants in identifying clinical studies of interest.

    Example: "~ Inclusion Criteria: A subject must be 12 years of age or older, ..." (inclusion and exclusion criterion)

40. **gender_description**

    Definition: If eligibility is based on gender, provide descriptive information about Gender criteria.

    Example: "Androgenetic Alopecia in Males"

    > Statistics: 8,198 (99.9%) ""

41. **gender_based**: t/"" (True of "")

    Definition: If applicable, indicate whether participant eligibility is based on gender.

    > Statistics: 29 t and 8,181 (99.6%) ""

42. **description**

    Definition: a description of the clinical study

    Example: "The primary objective of the study is to determine whether armodafinil treatment..."

43. **id_type**: org_study_id/secondary_id/nct_alias

    Definition: This attribute indicates if the corresponding id value is the organization's Unique Protocol Identification Number or a number assigned by other publicly available clinical trial registries.

> Statistics:
>
> 8,210 (100%) studies have org_study_id
>
> 4,078 (49.7%) studies have secondary_id
>
> 202 (2.5%) studies have nct_alias

44. **id_value**

    Example: "0000-072;2007_650"

45. **pmid**

    Definition: PubMed Unique Identifier

    Example: "15292498;11025867;16670414;1003364"

46. **reference_type**: reference/results_reference

    Definition: This attribute indicates if the reference is a bibliographic reference or a reference provided reports on results from this clinical study.

    Definition:

> Statistics:
>
> 2,295 studies have 8,297 references (i.e., reference+results_reference).
>
> 5,683 reference and 2,614 results_reference
>
> Each study has 3.6 references on average.

Drug

Each drug node represents a drug name extracted from the intervention or group title/description of clinical studies. CTKG includes 4,617 drug nodes. Each drug node has an id "DrugID:XXX" and 1 attribute.

Attributes:

1. **name**

   Definition: the drug name extracted from the intervention or group title/description of clinical studies.

   Example: "bicalutamide"

Term

Each term node represents a normalized or standard drug name. CTKG includes 2,751 term nodes. Each term node has an id "TermID:XXX" and 1 attribute.

Attributes:

1. **name**

   Definition: the normalized or standard drug name

   Example: "Bicalutamide"

Condition

Each condition node represents a condition/disease studied in clinical studies. CTKG includes 1,394 condition nodes. Each condition node has an id "ConditionID:XXX" and 1 attribute.

Attributes:

1. **name**

   Definition: the name of the condition/disease studied in the clinical study

   Example: "Fever"

OutcomeGroup

32,499 outcome groups with 3 attributes

id: The format is "OutcomeGroupID:xxx".

label: OutcomeGroup

Attributes:

1. **ctgov_group**
2. **title**

   Example: "fMRI BOLD Responses in the rACC Cortex (Naltrexone vs Placebo)"

3. **description**

   Example: "We examined naltrexone-induced changes in brain signal during the processing of contextual cues by extracting brain responses in the rACC and comparing then during the baseline (placebo only) and the naltrexone session using paired-t test statistical analysis."

Outcome

88,386 outcomes with 5 attributes

id: The format is "OutcomeID:xxx".

label: Outcome

Attributes:

1. **type**

   > Statistics:
   > 70,171 (79.4%) Secondary
   > 15,534 (17.6%) Primary
   > 2,830 (3.2%) Other Pre-specified Outcomes
   > 289 (0.3%) Post-Hoc

2. **title**

   Example: "Naltrexone-induced Changes in BOLD Responses in the rACC Cortex During the Processing of Contextual Cues"

3. **description**

   Example: "In order to identify naltrexone-induced changes in the neural correlates of contextual processing, ..."

4. **time_frame**

   Definition: Time point(s) at which the measurement is assessed for the specific metric used.

Example: "[Approximately at day 1, 7]"

StandardOutcome

492 standard outcomes with 1 attribute.

These standard outcomes are extracted from the abbreviations in the outcome titles and descriptions. Those unrelated outcomes have been manually filtered and those similar outcomes (e.g., "visual analog pain score" and "visual analogue pain scales") have been manually merged.

id: The format is "StandardOutcomeID:XXX".

label: StandardOutcome

Attributes:

1. **name**

   Example: "blood oxygen level dependent"

ClusterOutcome

200 cluster outcomes with 5 attributes.

We first extracted from the outcome titles a set of words including noun, adv, verb and adj. Then, each outcome title is represented as the TF-IDF vector calculated from the extracted words. These TF-IDF vectors are further clustered into 200 clusters using the repeated bisection clustering algorithm in CLUTO.

Among 88,386 outcome titles, 142 (0.16%) outcome titles with only abbreviations (e.g., "GAD-7" or "IL-6") cannot be clustered.

id: The format is "ClusterOutcomeID:XXX".

label: ClusterOutcome

Attributes:

1. **size**

   The size of clusters range from 86 to 1,493.

2. **ISim**

   Definition: The average similarity between the objects of each cluster (i.e., internal similarities)

3. **ESim**

   Definition: The average similarity of the objects of each cluster and the rest of the objects (i.e., external similarities).

4. **discriptive**

   Definition: The set of five descriptive features is determined by selecting the columns that contribute the most to the average similarity between the objects of each cluster.

   Example:

   "circumference~56.4%,waist~43.0%,head~0.1%,abdominal~0.1%,change~0.1%"

5. **discriminating**

Definition: The set of five discriminating features is determined by selecting the columns that are more prevalent in the cluster compared to the rest of the objects.

Example:

"circumference~28.6%,waist~21.7%,survival~1.5%,response~1.4%,event~1.1%"

OutcomeMeasure

690,626 outcome measurements with 9 attributes.

id: The format is "OutcomeMeasureID:XXX" in which the "XXX" is from the AACT database.

label: OutcomeMeasure

Attributes:

1. **classification**

   Example: "At week 24", "Interproximal analysis at week 24"

   Statistics: 142,515 (20.6%) ""

2. **category**

   Definition: "Name of distinct category or row for an outcome measure, if any."

   Example: "Yes"/"No","No flare up"/"Flare up", "Abnormal CS"/"Abnormal NCS".

   Statistics: 674,127 (97.6%) ""

3. **param_type**

   Definition: "The type of data for the outcome measure"

   > Statistics:
   > 253,446 (36.7%) Number
   > 249,245 (36.1%) Mean
   > 76,099 (11.0%) Least Squares Mean
   > 64,858 (9.4%) Count of Participants
   > 31,243 (4.5%) Median
   > 14,703 (2.1%) Geometric Mean
   > 665 (0.1%) Geometric Least Squares Mean
   > 261 Count of Units
   > 45 ""
   > 39 Log mean
   > 22 Other including "age normed" (6), "age & education normed" (6), "g/dL" (5), "ng/mL" (3), "age" (2).

4. **param_value**
5. **type_dispersion**

   > Statistics:
   > 297,612 (43.1%) "" (may means not applicable)
   > 207,039 (30.0%) Standard Deviation
   > 98,956 (14.3%) Standard Error

54,922	(8.0%)	95% Confidence Interval
11,984	(1.7%)	Full Range
8,837	(1.3%)	Inter-Quartile Range
8,620	(1.2%)	Geometric Coefficient of Variation
1,844	(0.3%)	90% Confidence Interval
633	(0.1%)	80% Confidence Interval
120		97.5% Confidence Interval

Note that the measure of dispersion is not applicable only if Measure Type is "Number," "Count of Participants," or "Count of Units".

6. **dispersion_value**
7. **dispersion_lower_limit**
8. **dispersion_upper_limit**
9. **explanation_na**

   Definition: Explain why outcome measure data are not available, if "NA" is reported for Outcome Measure Data.

OutcomeAnalysis

107,314 outcome analyses with 15 attributes.

id: The format is "OutcomeAnalysisID:XXX" in which the "XXX" is from the AACT database.

label: OutcomeAnalysis

Attributes:

1. **non_inferiority_type**

   Definition: Identifies the type of analysis.

   Statistics:

73,743	(68.7%)	Superiority or Other
16,127	(15.0%)	Superiority
8,969	(8.4%)	Other
4,686	(4.4%)	Superiority or Other (legacy)
2,534	(2.4%)	Non-Inferiority or Equivalence
780	(0.7%)	Non-Inferiority
415	(0.4%)	Equivalence
60	(0.1%)	Non-Inferiority or Equivalence (legacy)

2. **non_inferiority_type_description**
3. **param_type**

   Example: "Mechanistic hypothesis: naltrexone will block contextual processing."

   Statistics:

> 33,286 (31.0%) ""
> 18,792 (17.5%) Mean Difference (Final Values)
> 7,580 (7.1%) LS Mean Difference
> 5,812 (5.4%) Odds Ratio (OR)
> 5,429 (5.1%) Mean Difference (Net)
> 5,054 (4.7%) Hazard Ratio (HR)
>
> 31,361 other types

4. **param_value**

> Statistics:
> 33,286 (31.0%) ""

5. **dispersion_type**

> Statistics:
> 85,491 (79.7%) ""
> 20,547 (19.1%) Standard Error of the Mean
> 1,276 (1.2%) Standard Deviation

6. **dispersion_value**

> Statistics:
> 85,491 (79.7%) ""

7. **p_value_modifier**

> Statistics:
> 74,799 (69.7%) ""
> 30,444 (28.4%) <
> 1,027 (1.0%) =
> 980 (0.9%) >
> 64 "<=" (58); "p<" (3); ">=" (2); "NS" (1)

8. **p_value**

> Statistics:
> 15,837 (14.8%) ""

9. **p_value_description**

   Example:

10. **confidence_interval_sides**

    Definition: Select 1-sided or 2-sided.

> Statistics:
> 62,041 (57.8%) 2-Sided
> 44,984 (41.9%) ""

> 289 (0.3%) 1-Sided

11. **confidence_interval_percent**

> Statistics:
>
> 65,209 (60.8%) 95.0
>
> 35,614 (33.2%) ""
>
> 4,748 (4.4%) 90.0
>
> 726 (0.7%) 80.0
>
> 1,017 other numbers

12. **confidence_interval_lower_limit**

    Definition: Required if confidence interval is "2-sided" or if confidence interval is "1-sided" and no Upper Limit is entered.

13. **confidence_interval_upper_limit**

    Definition: Required if confidence interval is "2-sided" or if confidence interval is "1-sided" and no Lower Limit is entered.

14. **estimate_description**

    Definition: Any other relevant estimation information, including the direction of the comparison (for example, describe which arm or comparison group represents the numerator and denominator for relative risk).

    Example: "Difference is first named treatment (experimental) minus second named treatment (control)."

15. **group_description**

    Example: "Changes in BOLD fMRI signal from the Placebo vs. the Naltrexone session."

16. **other_description**

    Example: "The primary analysis was based on concentration-QTc modeling of the relationship ..."

Statistical Method

933 statistical methods with 1 attribute

id: The format is "MethodID:XX"

label: Method

Attributes:

1. **name**

   Example: ancova

BaseSubgraph

BaseGroup

27,068 outcome groups with 3 attributes

id: BaselineGroupID: ;

label: BaselineGroup

Attributes:

1. **ctgov_group**
2. **title**

   Example: "Placebo, Then Naltrexone"
3. **description**

   Example: ""In the placebo and then naltrexone arm, participants receive one-dose of placebo pill one hour before a first fMRI scanning session on visit 1 followed by a one-dose naltrexone 50mg one hour before a second fMRI scanning session on …."

BaselineRecord

315,533 baseline records with 12 attributes.

id: The format is "BaselineRecordID:XXX“ in which "XXX" is the ID from AACT database.

label: BaselineRecord

Attributes:

1. **classification**

   Example: "United States"; "Male"; "Female"

   > Statistics:
   >
   > 192,923 (61.1%) ""
2. **category**

   Definition: Name of distinct category or row for a baseline measure, if any.

   Example: "Unknown or Not Reported"; "Not Hispanic or Latino", "Hispanic or Latino","Male"

   > Statistics:
   >
   > 172,555 (54.7%) ""
3. **units**

   Example: "participants", "years", "units on a scale"

   > Statistics:
   >
   > 256,681 (81.3%) participants
   >
   > 26,116 (8.3%) years
   >
   > 5,463 (1.7%) units on a scale
   >
   > 2,075 (0.7%) mg/dl
   >
   > 25,198 other
4. **param_type**

> Statistics:
>
> 163,729 (51.9%) count of participants
>
> 96,329 (30.5%) number
>
> 50,326 (15.9%) mean
>
> 4,940 (1.6%) median
>
> 98 count of units
>
> 64 geometric mean
>
> 41 least squares mean
>
> 6 log mean

5. **param_value**
6. **dispersion_type**

> Statistics:
>
> 260,156 (82.4%) ""
>
> 49,188 (15.6%) Standard deviation
>
> 3,751 (1.2%) Full range
>
> 2,438 (0.8%) Inter-quartile range

7. **dispersion_value**

> Statistics:
>
> 266,061 (84.3%) ""

8. **dispersion_lower_limit**

   Definition: Used for reporting the lower limit of the interquartile range or full range.
9. **dispersion_upper_limit**

   Definition: Used for reporting the upper limit of the interquartile range or full range.
10. **explanation_of_na**

EventSubgraph

EventGroup

20,599 event groups with 3 attributes

id: The format is "EventGroupID:XXX" in which "XXX" is the ID from AACT database.

label: EventGroup

Attributes:

1. **ctgov_group**

   Example: E2
2. **title**

   Example: "Naltrexone"
3. **time_frame**

Definition: The specific period of time over which adverse event data were collected.

Example: "[Approximately at day 1, 7]"

4. **description**

   Example: "Naltrexone 50 Mg Oral Tablet: Naltrexone hydrochloride (ReVia. Toronto, ON: Teva Canada Limited; 2015)..."

5. **num_participants**

   Example: 24

6. **num_serious**

   Definition: Number of participants with serious adverse events.

   Example: 0

7. **num_other**

   Definition: Number of participants with other adverse events.

   Example: 14

8. **num_mortality**

   Definition: Number of all anticipated and unanticipated deaths due to any cause.

   Example: 0

AdverseEvent

12,640 adverse events with 5 attributes.

Note that instead of directly using the terms in the dataset, we tried to normalize them so that these terms can match with the **Medical Dictionary for Regulatory Activities (MedDRA) Terminology**. Please see https://www.meddra.org/ for details.

> The structure of MedDRA is very logical. There are five levels to the MedDRA hierarchy, arranged from very specific to very general. At the most specific level, called “Lowest Level Terms” (LLTs), there are more than 70,000 terms which parallel **how information is communicated.** These LLTs reflect how an observation might be reported in practice. This level directly supports assigning MedDRA terms within a user database.
>
> Each member of the next level, “Preferred Terms” (PTs), is a distinct descriptor **(single medical concept)** for a symptom, sign, disease diagnosis, therapeutic indication, investigation, surgical or medical procedure, and medical social or family history characteristic. Each LLT is linked to only one PT. Each PT has at least one LLT (itself) as well as synonyms and lexical variants (e.g., abbreviations, different word order).
>
> from https://www.meddra.org/how-to-use/basics/hierarchy

Before normalization, the original database contains 42,435 unique adverse event terms. In addition, for those terms with level "LLT", we mapped them to their corresponding preferred terms.

id: the format is "AdverseEventID:XXX"

label: AdverseEvent

Attributes:

1. **term_name**

   Example: "nodule, pulmonary"; "diarrhea-no colostom"

2. **medDRA_code**

   Definition: The corresponding MedDRA code of the term.

   Example: "10003205", "0"

   > Statistics:
   >
   > 10,176 (80.5%) 0 (terms cannot be normalized to match with the MedDRA terms)
   >
   > 2,464 (19.5%) MedDRA code

3. **term_type**

   Definition: The corresponding MedDRA level of the term.

   > Statistics:
   >
   > 10,176 (80.5%) None
   >
   > 2,309 (18.3%) PT
   >
   > 134 (1.1%) HLT
   >
   > 21 (0.1%) HLGT

4. **high_level_term**

   Definition: The corresponding high level term of the adverse event term (from MedDRA dictionary)

5. **high_group_level_term**

   Definition: The corresponding high group level term of the adverse event term (from MedDRA dictionary)

Organ

27 outcomes with 1 attribute.

Definition: High-level categories used to group adverse event terms by body or organ system.

id: The format is "OrganID:XXX"

label: Organ

Attributes:

1. **name**

   Example: "Ear and labyrinth disorders", "Vascular disorders"

DropSubgraph

DropGroup

22,272 drop groups with 3 attributes

id: The format is "DropGroupID:XXX" in which "XXX" is the ID from AACT database.

label: DropGroup

Attributes:

1. **ctgov_group**

   Example: P2

2. **title**

   Example: "Placebo, Then Naltrexone"

3. **description**

   Example: "In the placebo and then naltrexone arm, participants receive one-dose of placebo pill one hour before a first fMRI scanning session..."

Period

34,330 Periods with 10 attributes.

Definition: Discrete stages of a clinical study during which numbers of participants at specific significant events or points of time are reported.

There is no limit to the number of periods that may be used to describe a single study. Each subsequent period represents a study stage following the previous period. That is, participants "flow" from earlier to later periods.

> Among 34,330 periods,
>
> Number of periods, Count
>
> 27,578 (80.3%), 3 (STARTED/NOT COMPLETED/COMPLETED)
>
> 4,662 (13.6%), 4
>
> 1,168 (3.4%), 5
>
> 553 (1.6%), 6

id: The format is "PeriodID:XXX".

label: Period

Attributes:

1. **period**

   Definition: period title.

   Example: "Second Intervention (1day)"; "Washout (1 Week)"

   > Statistics:
   >
   > 2,992 unique period titles.
   >
   > Top 5 most frequent period titles:
   >
   > Number of periods, Number of drop records, name

> 16,151 (47.0%) 65,468 (53.0%) Overall Study
> 427 (1.2%) 755 (0.7%) Period 2
> 396 (1.1%) 827 (0.6%) Period 1
> 260 (0.8%) 1,868 (1.5%) Treatment Period
> 217 (0.6%) 616 (0.5%) Treatment Period 1

2. **num_started**

   Definition: Number of participants initiating the period. In the first period, it is the number of participants assigned to each arm or group.

3. **started_description**

   Definition: Additional information about the Started milestone or Milestone Data.

   Example: "All participants received all of the 4 interventions"

> Statistics:
> 30,877 (89.9%) ""
> 3,453 (10.1%) any description

4. **num_not_completed**

   Definition: Number of participants (and units, if applicable) that did not complete the study or period. This is calculated automatically by subtracting Completed from Started.

   This calculated number doesn't have the associated description.

5. **num_completed**

   Definition: Number of participants at the end of the period.

6. **completed_description**

   Example: "Postoperative day one pain score not available for one patient"

> Statistics:
> 32,417 (94.4%) ""
> 1,913 (5.6%) any description

7. **additional_count**

   Definition: Any specific events or time points in the study when the numbers of participants (and units, if applicable) are reported.

   Note that we combined all the additional count of participants into one entry. The format of that entry is "name~count~name~count....".

   Example: "Switched to Pembrolizumab~4~Treated~15~"

> Statistics:
> 27,665 (80.6%) ""
> 6,665 (19.4%) any additional count

8. **additional_description**

   Example: "~~" or "Row represents Ixekizumab data only.~Row represents Ixekizumab data only."

> Statistics:

> 33,430 (97.4%) "" (no additional counts) or "~~~" (have additional counts but no additional description)
>
> 900 (2.6%)

DropRecord

123,627 drop records with 2 attributes.

id: The format is "DropRecordID:XXX".

label: DropRecord

Attributes:

1. **reason**

   Definition: Additional information about participants who did not complete the study or period.

   Example: "Lost to Follow-up", "Withdrawal by Subject"

   > 6,424 unique dropout reasons
   >
   > Top 5 most frequent dropout reasons:
   >
   > 17,262 (13.96%) Withdrawal by Subject
   >
   > 16,782 (13.57%) Adverse Event
   >
   > 14,287 (11.55%) Lost to Follow-up
   >
   > 8,794 (7.11%) Protocol Violation
   >
   > 7,213 (5.83%) Lack of Efficacy

2. **count**

Relations

Study-UsedDrug relation

This relation indicates which drugs are used in which studies. For example, the triplet (NCT00000378, study-usedDrug, bicalutamide) indicates that the drug "bicalutamide" has been used in the study with id "NCT00000378". There are 29,428 edges of this relation type between study nodes and drug nodes. Each edge of this relation type has an id "Study::UsedDrug::XXX", and we don't have any attributes on this relation.

Study-StudiedDrug relation

This relation indicates which drugs are studied in which studied. For example, the triplet (NCT00000378, study-studiedDrug, bicalutamide) indicates that the drug "bicalutamide" is studied in the study with id "NCT00000378". In CTKG, for a certain clinical study, the studied drugs are the drugs extracted from the title/description of study groups of this study. There are 23,308 edges of this relation type between study nodes and drug nodes. Each edge of this relation type has an id "Study::StudiedDrug::XXX", and we don't have any attributes on this relation.

Study-Condition relation

This relation indicates which conditions are studied in which studies. For example, the triplet (NCT00000378, study-condition, Fever) indicates that the study "NCT00000378" studies how to mitigate the condition "Fever". There are 17,259 edges of this relation type between study nodes and condition nodes. Each edge of this relation type has an id "Study::Condition::XXX", and we don't have any attributes on this relation.

Drug-Term relation

This relation indicates which drugs could be normalized to which standard terms. For example, the triplet (dmards, drug-term, Antirheumatic Agents) indicates the drug "dmards" could be normalized to the standard term "Antirheumatic Agents". There are 4,617 edges of this relation between drug nodes and term nodes. Each edge of this relation type has an id "Drug::Term:XXX", and we don't have any attributes on this relation.

Study and OutcomeGroup

There are 22,272 edges between study and outcomegroup.

id: The format is "study::outcomegroup:XXX".

label: study::outcomegroup

from: StudyID:XXX

to: OutcomeGroupID:XXX

Study and Outcome

There are 88,386 edges between study and outcomegroup.

id: The format is "study::outcome:XXX".

label: study::outcome

from: StudyID:XXX

to: OutcomeID:XXX

Outcome and ClusterOutcome

There are 88,244 edges between outcome and clusteroutcome.

id: The format is "outcome::clusteroutcome:XXX".

label: outcome::clusteroutcome

from: OutcomeID:XXX

to: ClusterOutcomeID:XXX

Outcome and StandardOutcome

There are 57,910 edges between 37,735 unique outcomes and 492 standard outcomes.

id: The format is "outcome::standardoutcome:XXX".

label: outcome::standardoutcome

from: OutcomeID:XXX

to: StandardOutcomeID:XXX

Outcome and OutcomeAnalysis

There are 107,314 edges between 45,707 unique outcomes and 107,314 outcome analyses.

id: The format is "outcome::outcomeanalysis:XXX".

label: outcome::outcomeanalysis

from: OutcomeID:XXX

to: OutcomeAnalysisID:XXX

OutcomeAnalysis and Method

There are 107,314 edges between 45,707 unique outcomes and 107,314 outcome analyses.

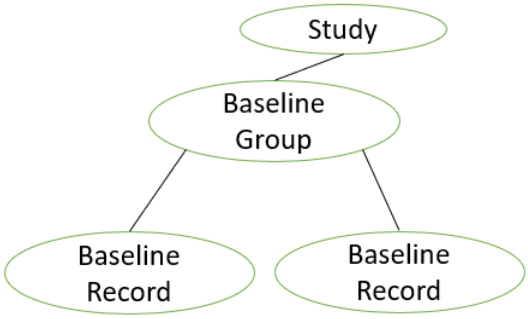
Outcome and OutcomeMeasurement

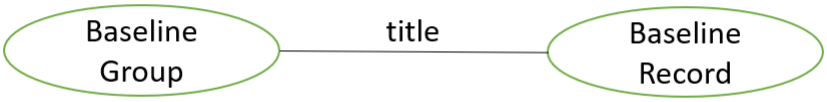
Outcome and OutcomeGroup

OutcomeMeasurement and OutcomeGroup

###

Baseline Subgraph

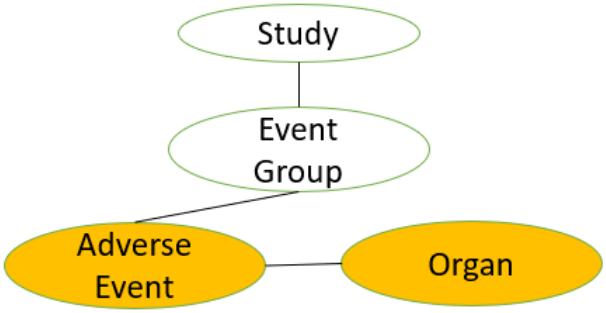




Study and BaselineGroup

There are 22,272 edges between study and baselinegroup.

Event Subgraph



Drop Subgraph