

cBioPortal Tutorial #4: Virtual Studies

Create and save your own custom study comprised
of samples from existing studies

Tutorial Objectives

- Explain what virtual studies are and how to create them
- Delineate the different features available when a user is or is not logged in
- Show how to log in

Virtual Study Overview

What is a Virtual Study?

A virtual study is a custom study comprised of samples from one or more existing studies.

Why is a virtual study useful?

The virtual study feature allows you to define a custom cohort of samples that fit your specific genomic or clinical criteria of interest. These samples can be a subset of the data available in an existing study, or result from the combination of multiple existing studies. This cohort of samples can then be queried or explored just like a traditional study, and can be returned to at a later date or shared with a collaborator.

In this tutorial, we will create a virtual study comprised of a subset of samples from two existing TCGA glioma studies.

We begin by selecting the studies of interest and viewing them in the Study Summary page.

Creating a virtual study: Selecting studies

The screenshot shows a web interface for selecting studies. At the top, there are tabs for 'Query', 'Quick Search Beta!', and 'Download'. A search bar contains the text 'glioma pancan'. Below the search bar, a section titled 'Select Studies for Visualization & Analysis:' shows '2 studies selected (1106 samples)'. On the left, a sidebar lists 'CNS/Brain' with a count of 2 and 'Soft Tissue' with a count of 1. The main area displays a list of studies under the 'CNS/Brain' filter. The first study is 'Diffuse Glioma', which includes 'Brain Lower Grade Glioma (TCGA, PanCancer Atlas)' (514 samples) and 'GLIOBLASTOMA' (592 samples). The 'GLIOBLASTOMA' sub-category is expanded, showing 'Glioblastoma Multiforme (TCGA, PanCancer Atlas)' (592 samples). Under the 'Soft Tissue' filter, 'Pheochromocytoma and Paraganglioma (TCGA, PanCancer Atlas)' (178 samples) is listed. At the bottom, there are two buttons: 'Query By Gene' and 'Explore Selected Studies'. Three numbered callouts are present: 1. Points to the search bar with the text '1. Use the search box to find the studies of interest'. 2. Points to the 'GLIOBLASTOMA' sub-category with the text '2. Select the studies of interest'. 3. Points to the 'Explore Selected Studies' button with the text '3. Click "Explore Selected Studies"'.

Query Quick Search Beta! Download Please cite: Cerami et al., 2012 & Gao et al., 2012

Select Studies for Visualization & Analysis: 2 studies selected (1106 samples) Deselect all glioma pancan

CNS/Brain 2

Soft Tissue 1

Select all listed studies matching filter (3)

CNS/Brain

Diffuse Glioma

☒ Brain Lower Grade Glioma (TCGA, PanCancer Atlas) 514 samples

→ GLIOBLASTOMA

☒ Glioblastoma Multiforme (TCGA, PanCancer Atlas) 592 samples

Soft Tissue

☐ Pheochromocytoma and Paraganglioma (TCGA, PanCancer Atlas) 178 samples

2 studies selected (1106 samples) Deselect all

Query By Gene OR Explore Selected Studies

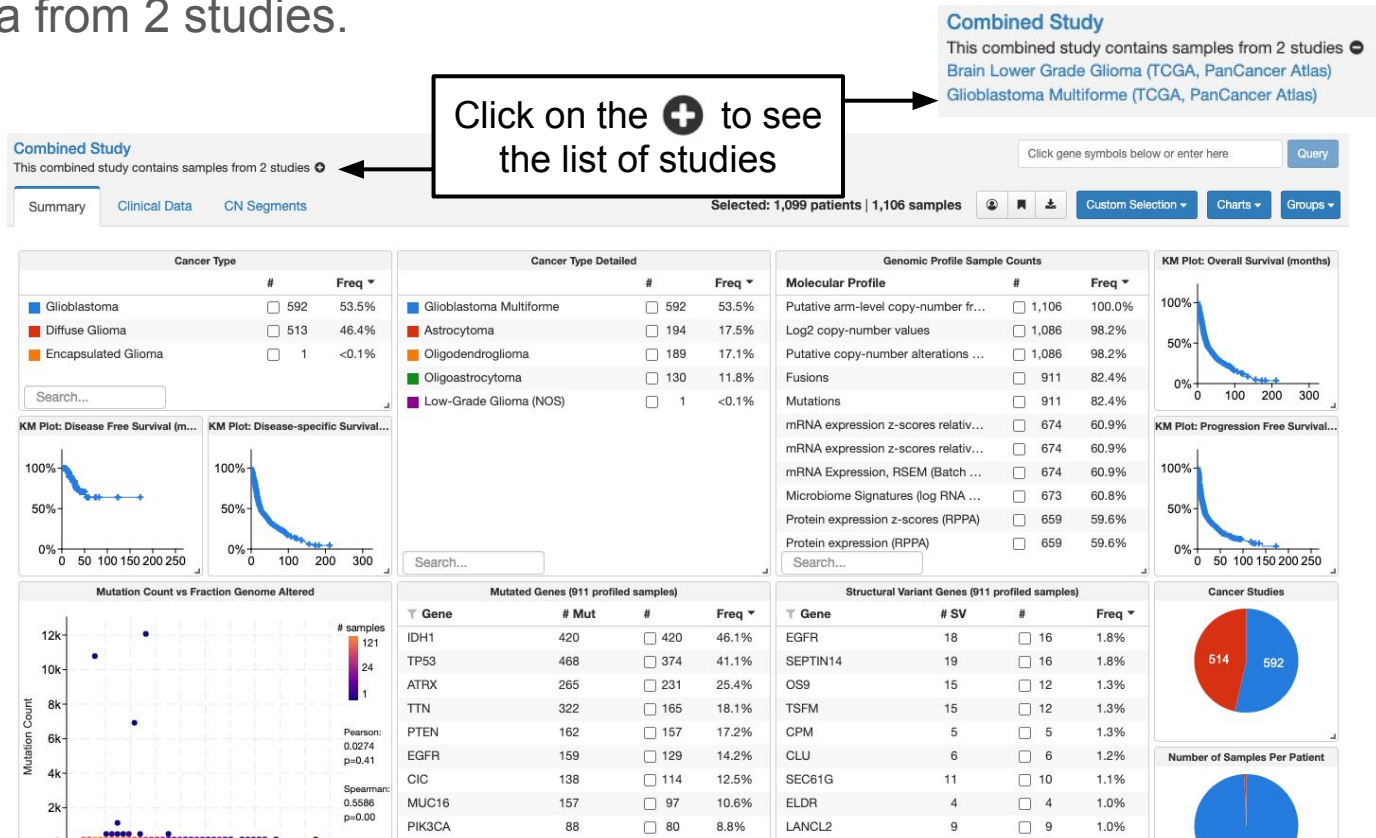
1. Use the search box to find the studies of interest

2. Select the studies of interest

3. Click "Explore Selected Studies"

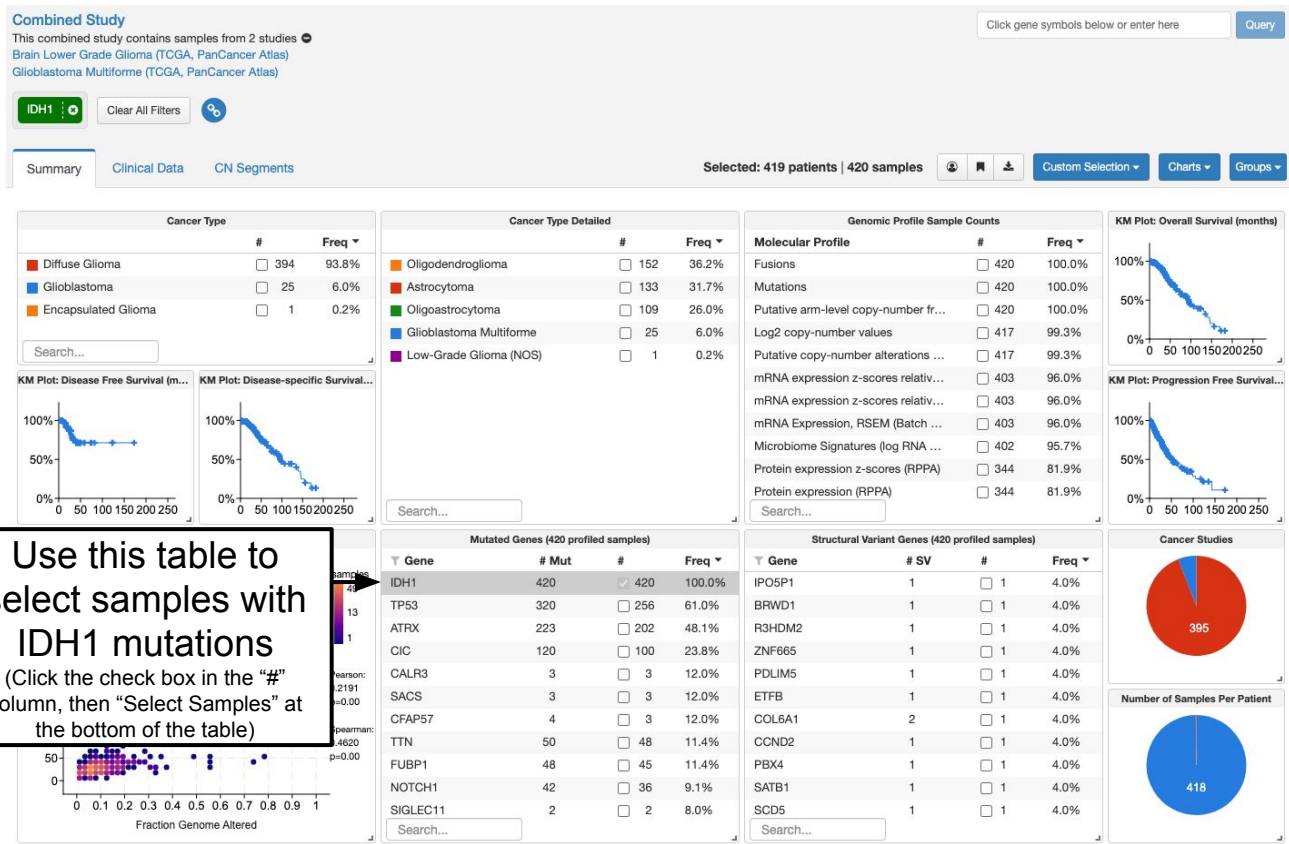
Creating a virtual study: Study summary page

This is the same Study Summary page that you see for a single study, but now with data from 2 studies.



Creating a virtual study: Study summary page

In this example, we will additionally filter to samples with mutations in IDH1.



We are now ready to create our virtual study.

What you see will differ slightly depending on if you are logged in or not. The next two slides show what the virtual study button looks like in each scenario.

Virtual study button (not logged in)

Click here to create and share your virtual study

Enter a name for your virtual study (optional)

Text box pre-filled with a description of the studies contributing samples and filters applied to the samples. You can edit this text.

List of studies contributing to samples with links to the study summary for each

Click on the link to open your virtual study, or click "Copy" to copy the URL to your clipboard.

Combined Study
This combined study contains samples from 2 studies
Brain Lower Grade Glioma (TCGA, PanCancer Atlas)
Glioblastoma Multiforme (TCGA, PanCancer Atlas)

IDH1 Clear All Filters

Summary Clinical Data CN Segments

Cancer Type

- Diffuse Glioma 394
- Glioblastoma 25
- Encapsulated Glioma 1

Search...

KM Plot: Disease Free Survival (months)

KM Plot: Disease-Free Survival (months)

Selected: 419 patients | 420 samples

Share Virtual Study

Custom Selection Charts Groups

Selected samples (2021-12-23)

Share

420 samples from 2 studies:

- Brain Lower Grade Glioma (TCGA, PanCancer Atlas) (395 samples)
- Glioblastoma Multiforme (TCGA, PanCancer Atlas) (25 samples)

Filters:

- Mutated Genes:
- IDH1

This virtual study was derived from:

- Brain Lower Grade Glioma (TCGA, PanCancer Atlas)
- Glioblastoma Multiforme (TCGA, PanCancer Atlas)

My Virtual Study - GBM LGG IDH1 mut

Share

420 samples from 2 studies:

- Brain Lower Grade Glioma (TCGA, PanCancer Atlas) (395 samples)
- Glioblastoma Multiforme (TCGA, PanCancer Atlas) (25 samples)

Filters:

- Mutated Genes:
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This virtual study was derived from:

- Brain Lower Grade Glioma (TCGA, PanCancer Atlas)
- Glioblastoma Multiforme (TCGA, PanCancer Atlas)

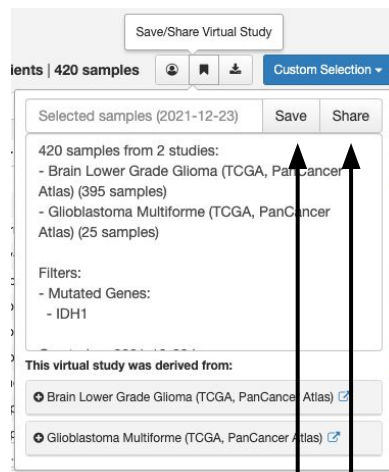
Patients | 420 samples

Custom Selection

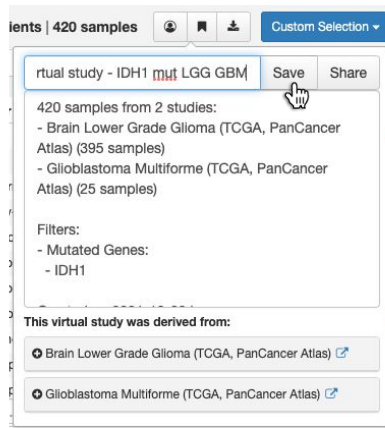
<https://www.cbioportal.org/study?id=61c4aaba8f71021ce5800d0>

Copy View

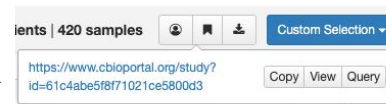
Virtual study button (logged in)



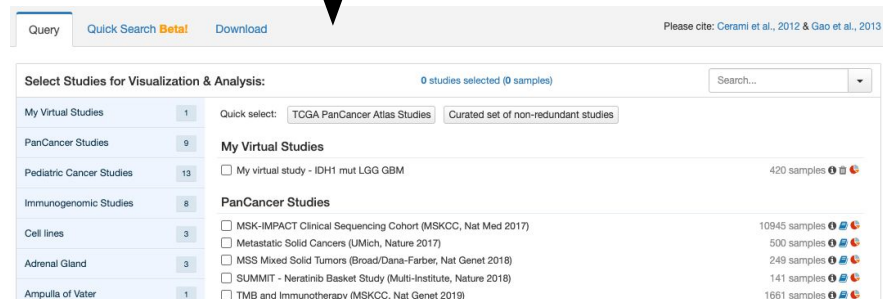
The “Save” button only appears when you are logged in.



The “Share” button works exactly the same as when not logged in



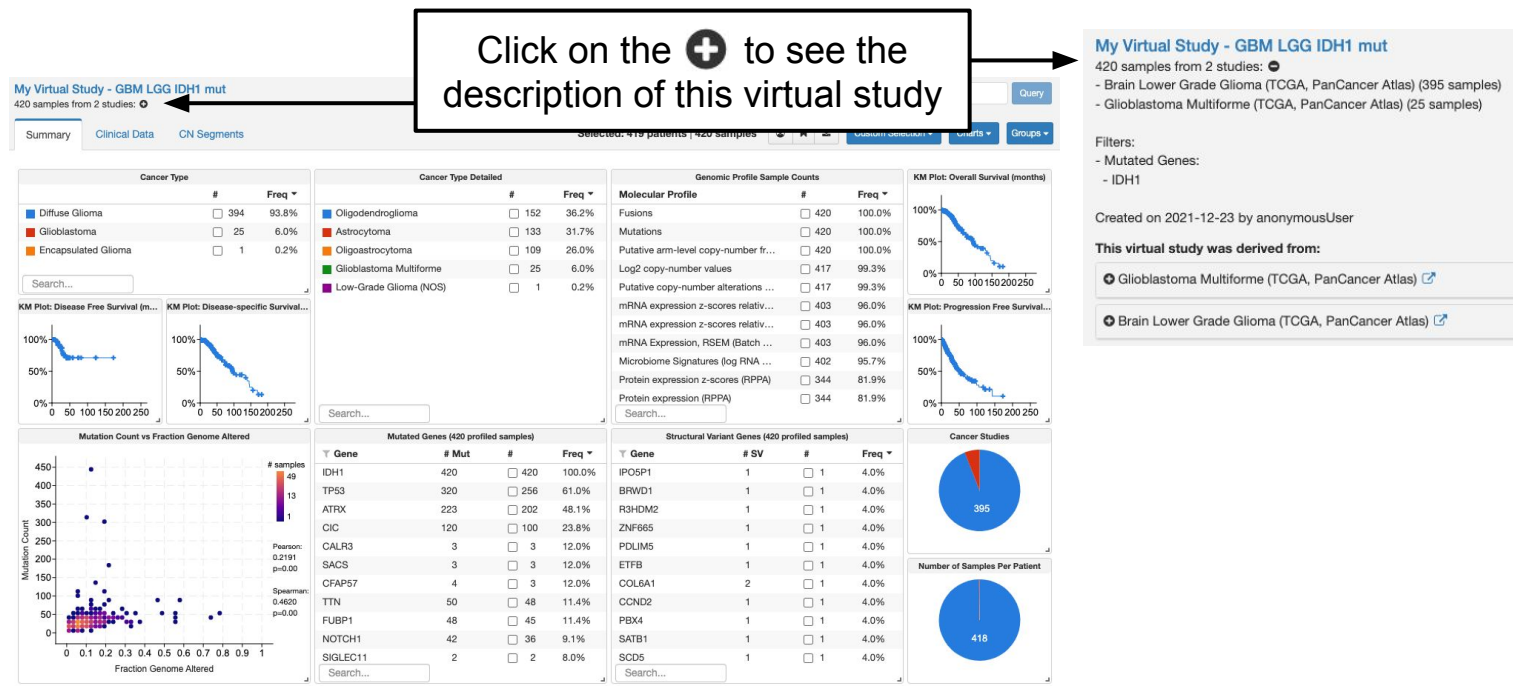
When you save a study, it is added to the homepage, at the top of the study list under “My Virtual Studies”. Clicking “Query” brings you to the query selector with your new virtual study pre-selected.



Whether or not you are logged in, let's continue on to view this new virtual study.

Virtual study: Study summary page

We can now see the study summary page for our newly created virtual study. You can now explore these samples or run a query, just like with a traditional study. Remember that while making this study we filtered down to IDH1 mutant samples, but the non-mutant samples were still present. Now, those samples without mutations are completely gone.




Logging in to cBioPortal:

If you use a private instance of cBioPortal, you might already go through an authentication process (through your university, for example). If so, there is nothing else you need to do.

But if you don't normally log in, then let's go through how this works.

Logging in



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Query

Quick Search **Beta!**

Download

Please cite: [Cerami et al., 2012](#) & [Gao et al., 2013](#)

Select Studies for Visualization & Analysis:

0 studies selected (0 samples)

Search...

PanCancer Studies	9
Pediatric Cancer Studies	13
Immunogenomic Studies	8
Cell lines	3
Adrenal Gland	3
Ampulla of Vater	1
Biliary Tract	13
Bladder/Urinary Tract	17
Bone	2
Bowel	12
Breast	23
CNS/Brain	23
Cervix	2
Esophagus/Stomach	17

Quick select:

TCGA PanCancer Atlas Studies

Curated set of non-redundant studies

PanCancer Studies

☐ MSK-IMPACT Clinical Sequencing Cohort (MSKCC, Nat Med 2017)

10945 samples

☐ Metastatic Solid Cancers (UMich, Nature 2017)

500 samples

☐ MSS Mixed Solid Tumors (Broad/Dana-Farber, Nat Genet 2018)

249 samples

☐ SUMMIT - Neratinib Basket Study (Multi-Institute, Nature 2018)

141 samples

☐ TMB and Immunotherapy (MSKCC, Nat Genet 2019)

1661 samples

☐ Tumors with TRK fusions (MSK, Clin Cancer Res 2020)

106 samples

☐ Cancer Therapy and Clonal Hematopoiesis (MSK, Nat Genet 2020)

24146 samples

☐ China Pan-cancer (Origimed2020)

10194 samples

☐ Pan-cancer analysis of whole genomes (ICGC/TCGA, Nature 2020)

2922 samples

Pediatric Cancer Studies

☐ Pediatric Preclinical Testing Consortium (CHOP, Cell Rep 2019)

261 samples

☐ Pediatric Acute Lymphoid Leukemia - Phase II (TARGET, 2018)

1978 samples

☐ Pediatric Rhabdoid Tumor (TARGET, 2018)

72 samples

☐ Pediatric Wilms' Tumor (TARGET, 2018)

657 samples

☐ Pediatric Acute Myeloid Leukemia (TARGET, 2018)

1025 samples

☐ Pediatric Neuroblastoma (TARGET, 2018)

1089 samples

☐ Pediatric Pan-Cancer (DKFZ, Nature 2017)

961 samples

☐ Pediatric Pan-cancer (Columbia U, Genome Med 2016)

103 samples

☐ Acute Lymphoblastic Leukemia (St Jude, Nat Genet 2016)

73 samples

0 studies selected (0 samples)

Query By Gene

OR

Explore Selected Studies

Login

@cbioportal

Click here

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how to use patient view to explore the longitudinal evolution of patients, for patients with multiple profiled samples or available clinical histories.
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Example Queries

- Primary vs. metastatic prostate cancer
- RAS/RAF alterations in colorectal cancer
- BRCA1 and BRCA2 mutations in ovarian cancer
- POLE hotspot mutations in endometrial cancer
- TP53 and MDM2/4 alterations in GBM
- PTEN mutations in GBM in text format
- Patient view of an endometrial cancer case
- All TCGA Pan-Cancer
- MSK-IMPACT clinical cohort, Zehir et al. 2017
- Histone mutations across cancer types

Local Installations

Host your own



[Link to this page](#)

Logging in

We use Google and Microsoft for authentication. Sign in with any Google or Microsoft account.



Welcome to cBioPortal - sign in with your Google or Microsoft account to store your [virtual studies](#) and [groups](#). This will allow you to access your studies and groups from any computer, and cBioPortal will also remember your study view charts preferences for each study (i.e. order of the charts, type of charts and visibility). Login is optional and not required to access any of the other features of cBioPortal.



Logging in

cBioPortal
FOR CANCER GENOMICS

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Logged in as

Query Quick Search **Beta!** Download

Please cite: Cerami et al., 2012 & Gao et al., 2013

What's New @cbportal

Select Studies for Visualization & Analysis: 0 studies selected (0 samples) Search...

My Virtual Studies	1	Quick select:	TCGA PanCancer Atlas Studies	Curated set of non-redundant studies
PanCancer Studies	9	My Virtual Studies		
Pediatric Cancer Studies	13	<input type="checkbox"/> My virtual study - IDH1 mut LGG GBM 420 samples		
Immunogenomic Studies	8	PanCancer Studies		
Cell lines	3	<input type="checkbox"/> MSK-IMPACT Clinical Sequencing Cohort (MSKCC, Nat Med 2017) 10945 samples		
Adrenal Gland	3	<input type="checkbox"/> Metastatic Solid Cancers (UMich, Nature 2017) 500 samples		
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Biliary Tract	13	<input type="checkbox"/> SUMMIT - Neratinib Basket Study (Multi-Institute, Nature 2018) 141 samples		
Bladder/Urinary Tract	17	<input type="checkbox"/> TMB and Immunotherapy (MSKCC, Nat Genet 2019) 1661 samples		
Bone	2	<input type="checkbox"/> Tumors with TRK fusions (MSK, Clin Cancer Res 2020) 106 samples		
Bowel	12	<input type="checkbox"/> Cancer Therapy and Clonal Hematopoiesis (MSK, Nat Genet 2020) 24146 samples		
Breast	23	<input type="checkbox"/> China Pan-cancer (Origimed2020) 10194 samples		
CNS/Brain	23	<input type="checkbox"/> Pan-cancer analysis of whole genomes (ICGC/TCGA, Nature 2020) 2922 samples		
Cervix	2	Pediatric Cancer Studies		
		<input type="checkbox"/> Pediatric Preclinical Testing Consortium (CHOP, Cell Rep 2019) 261 samples		
		<input type="checkbox"/> Pediatric Acute Lymphoid Leukemia - Phase II (TARGET, 2018) 1978 samples		
		<input type="checkbox"/> Pediatric Rhabdoid Tumor (TARGET, 2018) 72 samples		
		<input type="checkbox"/> Pediatric Wilms' Tumor (TARGET, 2018) 657 samples		
		<input type="checkbox"/> Pediatric Acute Myeloid Leukemia (TARGET, 2018) 1025 samples		
		<input type="checkbox"/> Pediatric Neuroblastoma (TARGET, 2018) 1089 samples		

0 studies selected (0 samples) Query By Gene OR Explore Selected Studies

This is what you see when you log in

Here's the virtual study I made

profiled samples or available clinical histories.

Subscribe

Example Queries

- Primary vs. metastatic prostate cancer
- RAS/RAF alterations in colorectal cancer
- BRCA1 and BRCA2 mutations in ovarian cancer
- POLE hotspot mutations in endometrial cancer
- TP53 and MDM2/4 alterations in GBM
- PTEN mutations in GBM in text format
- Patient view of an endometrial cancer case
- All TCGA Pan-Cancer
- MSK-IMPACT clinical cohort, Zehir et al. 2017
- Histone mutations across cancer types

Local Installations Host your own

Virtual Study Authentication Questions

Is it necessary to log in to use virtual studies?

No. A user that has not logged in can create virtual studies and run queries in those studies (by using the query box on the study summary page). Links to virtual studies are permanent, so you can save the link on your computer and come back to it anytime, or share it with others.

If I do log in, what additional functionality do I gain?

If you log in, you gain the ability to save your virtual study to the list of existing studies on the homepage. This makes a virtual study functionally the same as any other study: you can access your virtual studies in the query builder and you can combine an existing virtual study with any other study to create a new virtual study.

Questions?

Check out our other tutorials
or email us at:

cbioportal@googlegroups.com