

Supporting Researchers with Electronic Patient Data

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Director, Research Informatics**

12.5.19



Overview

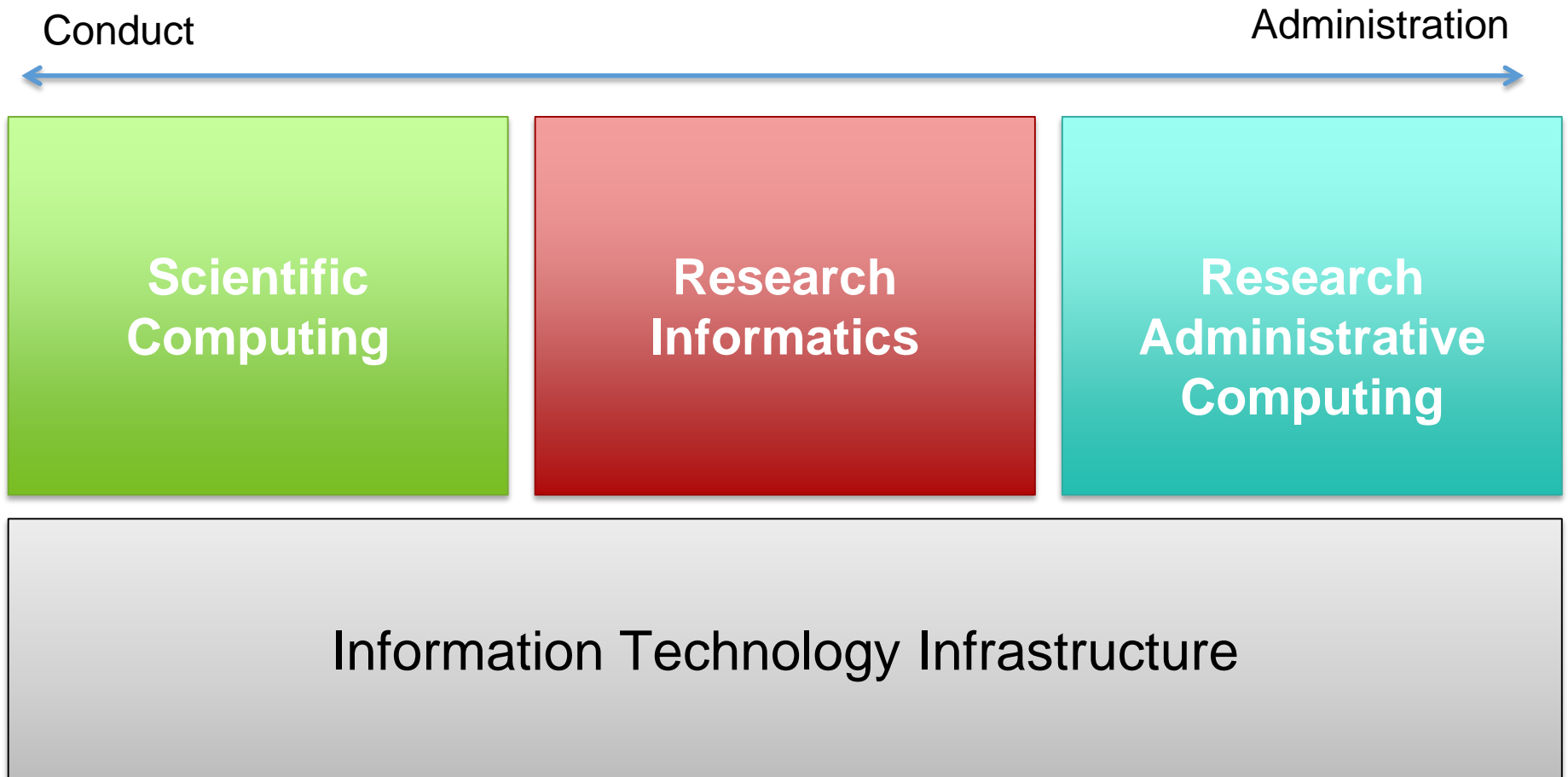
- Problem
- Approach
 - Research Computing at Weill Cornell Medicine
 - Architecture for Research Computing in Health (ARCH)
- Discussion



Problem

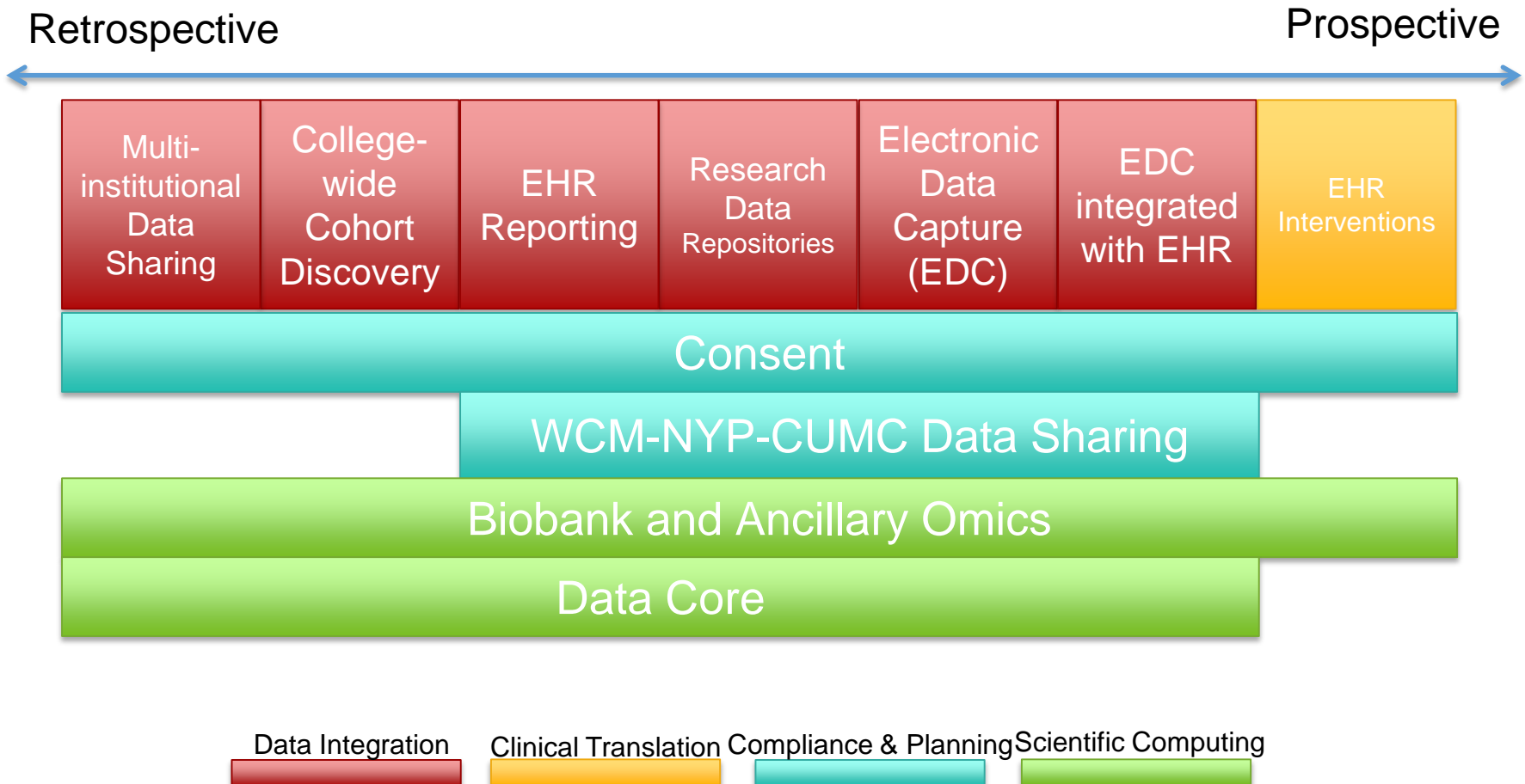
- Obtaining electronic health record (EHR) data for clinical and translational research is difficult
 - Repurpose transactions for research
 - Use one or more tools
 - Understand strengths and limitations
 - Obtain approval
- Optimal approaches are unknown
- Research Informatics can help investigators
 - Obtain EHR data
 - Collect novel measures
 - Integrate data

Approach: Research Computing at WCM



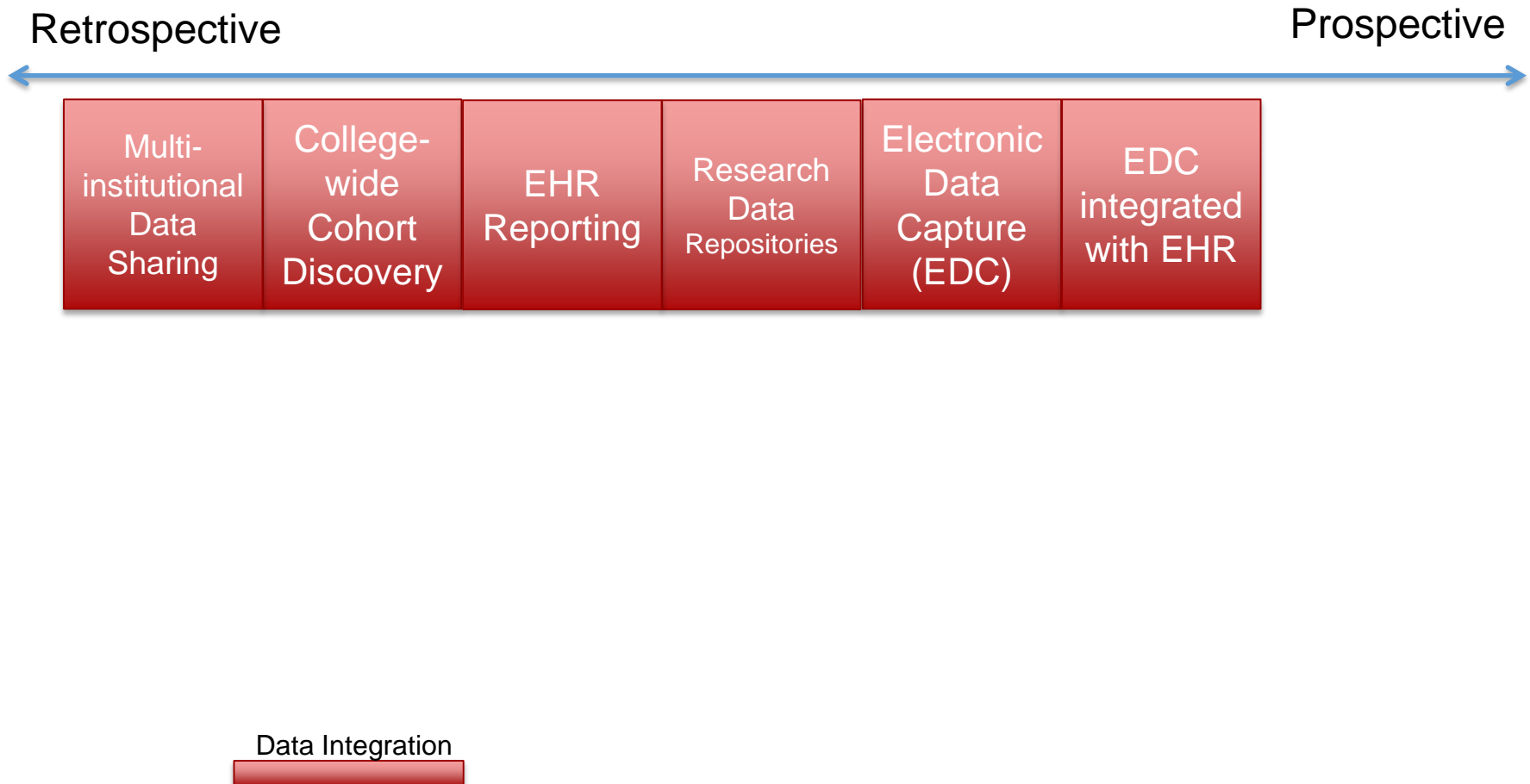


Architecture for Research Computing in Health (ARCH)



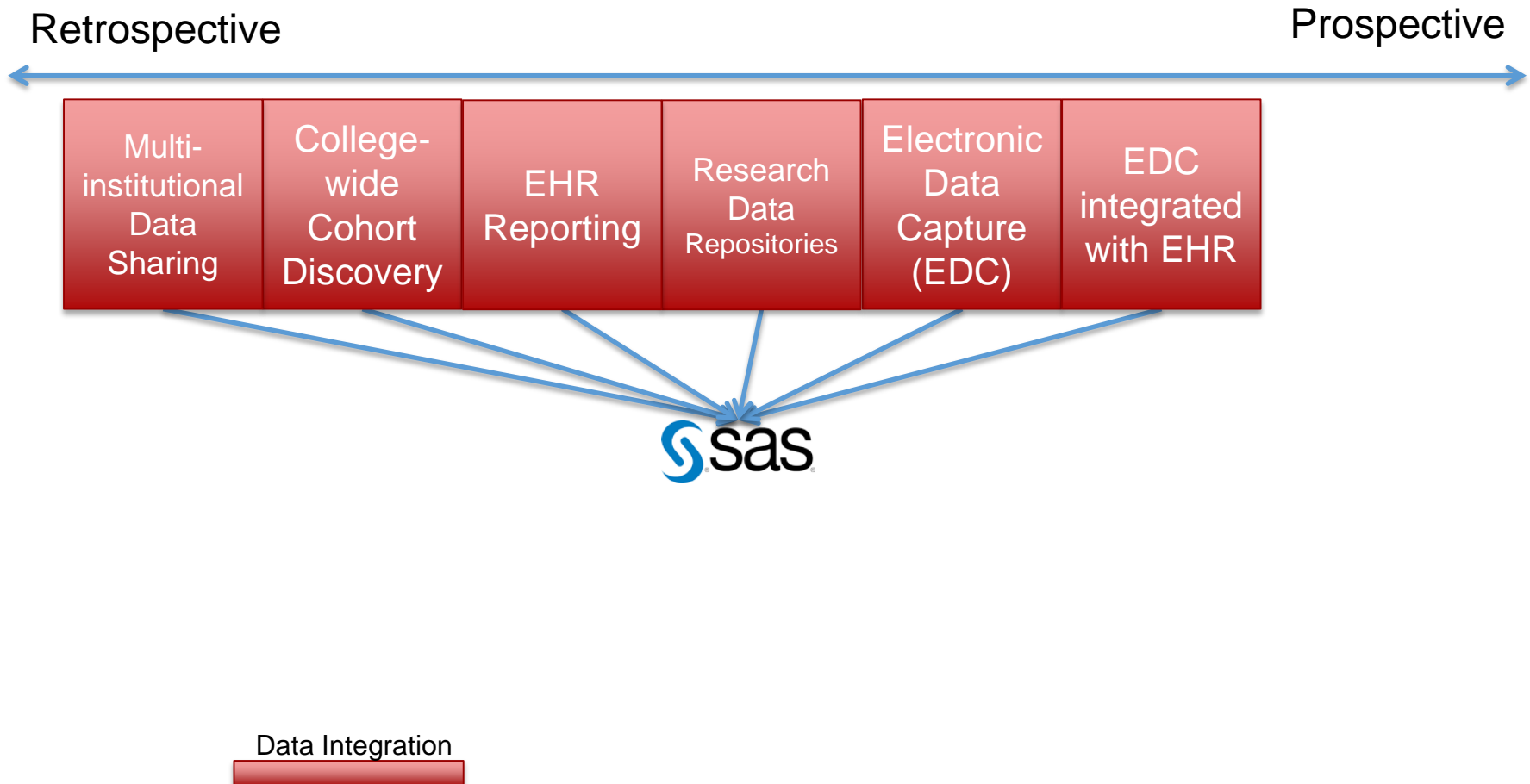


Architecture for Research Computing in Health (ARCH)

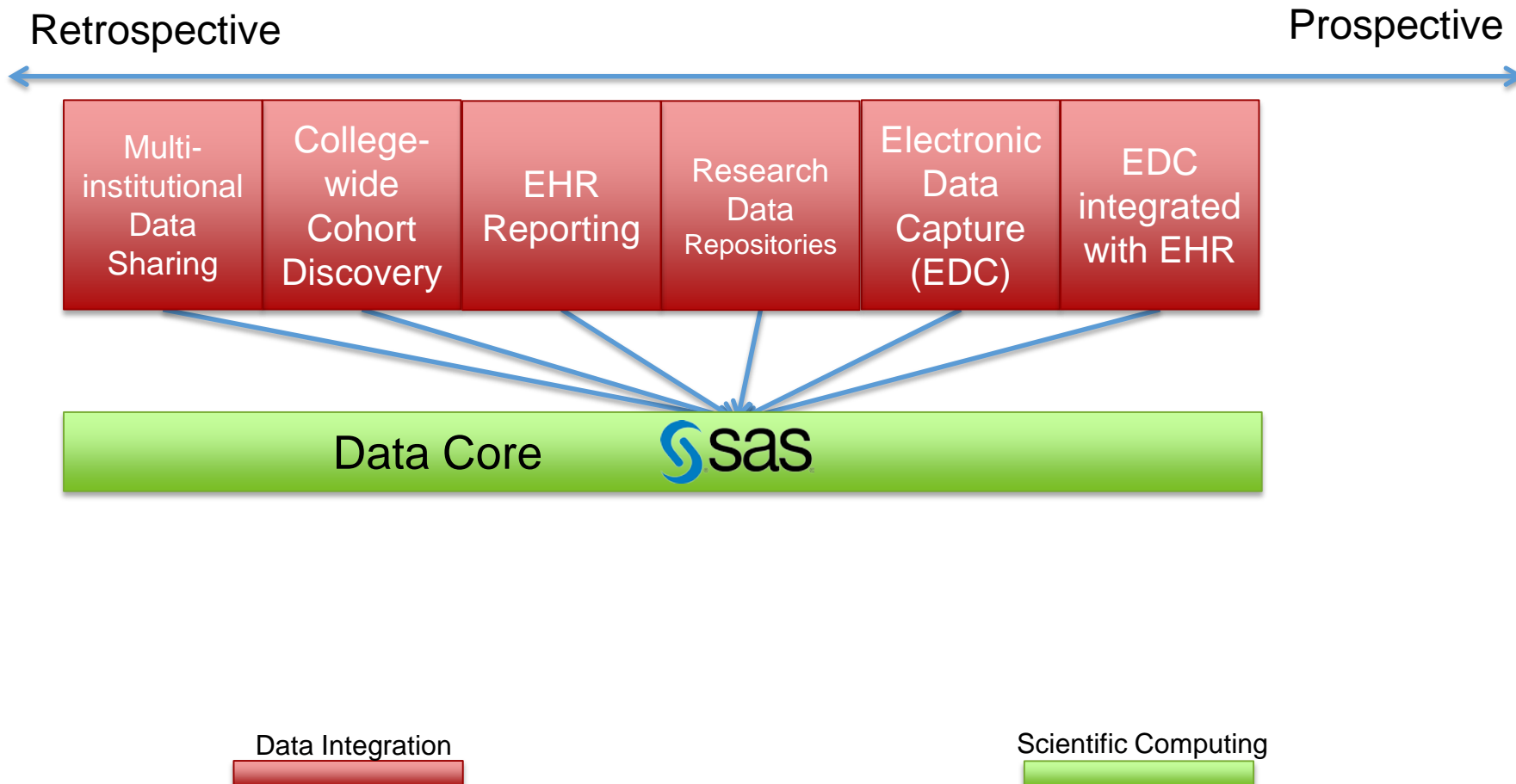




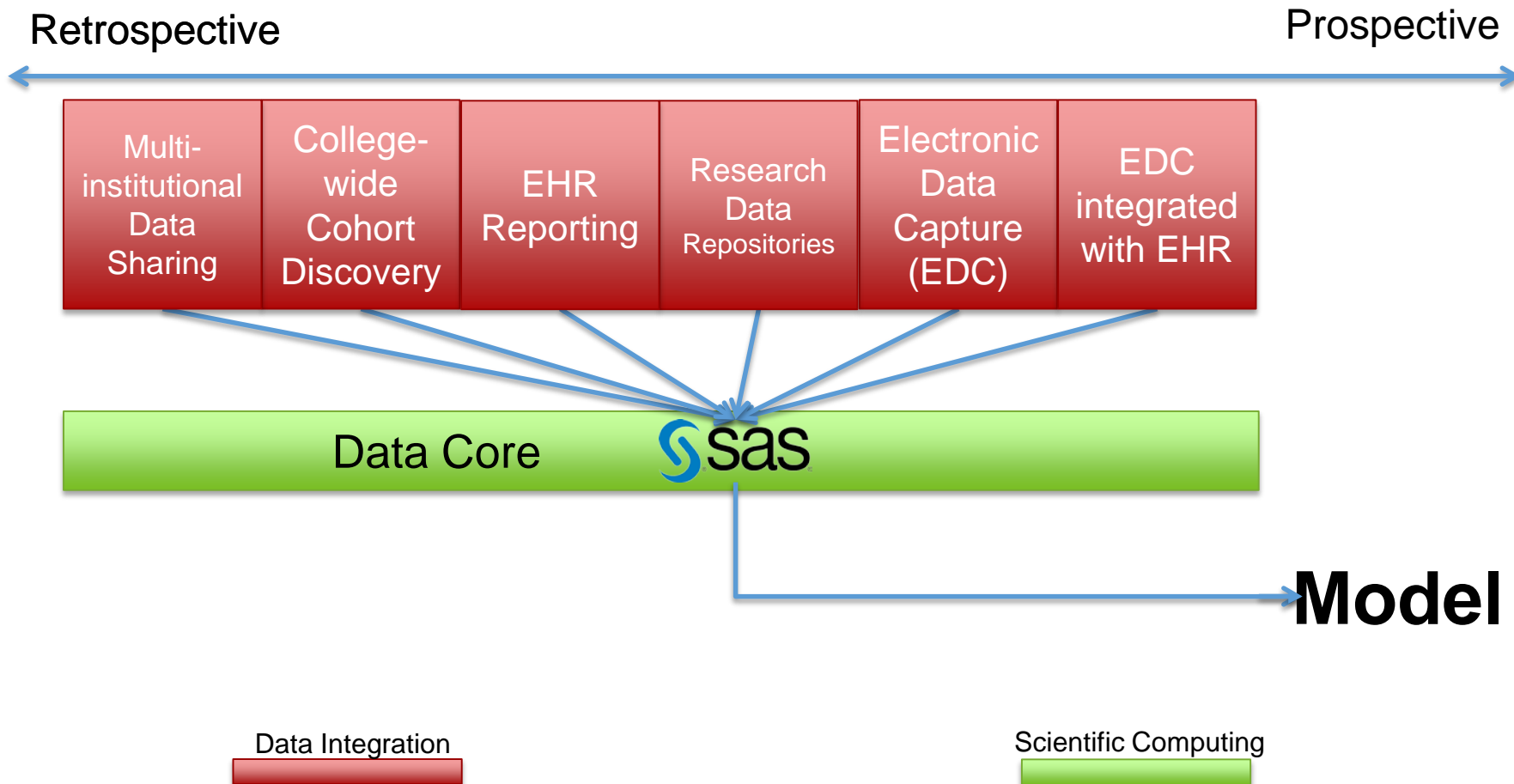
Architecture for Research Computing in Health (ARCH)



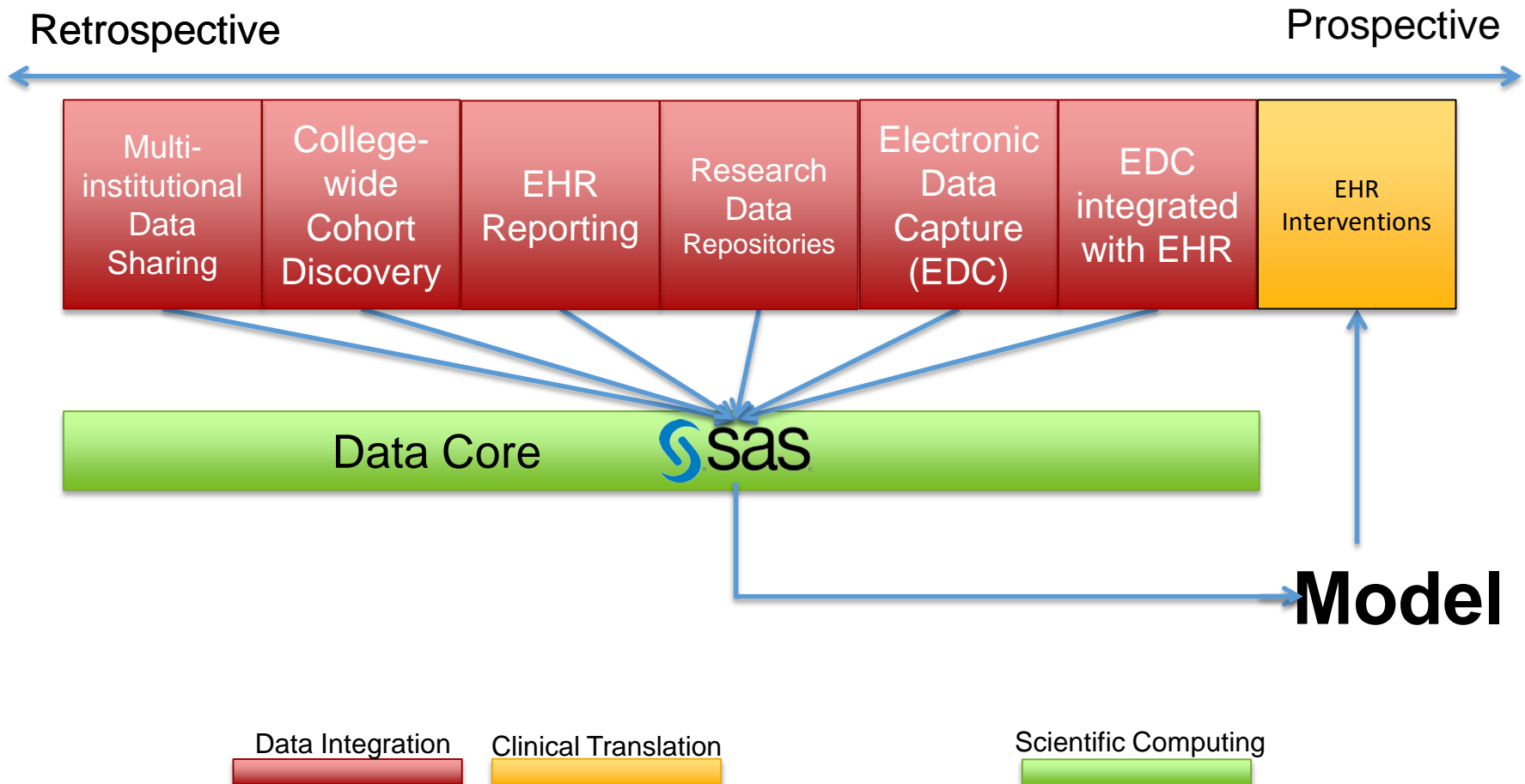
Architecture for Research Computing in Health (ARCH)



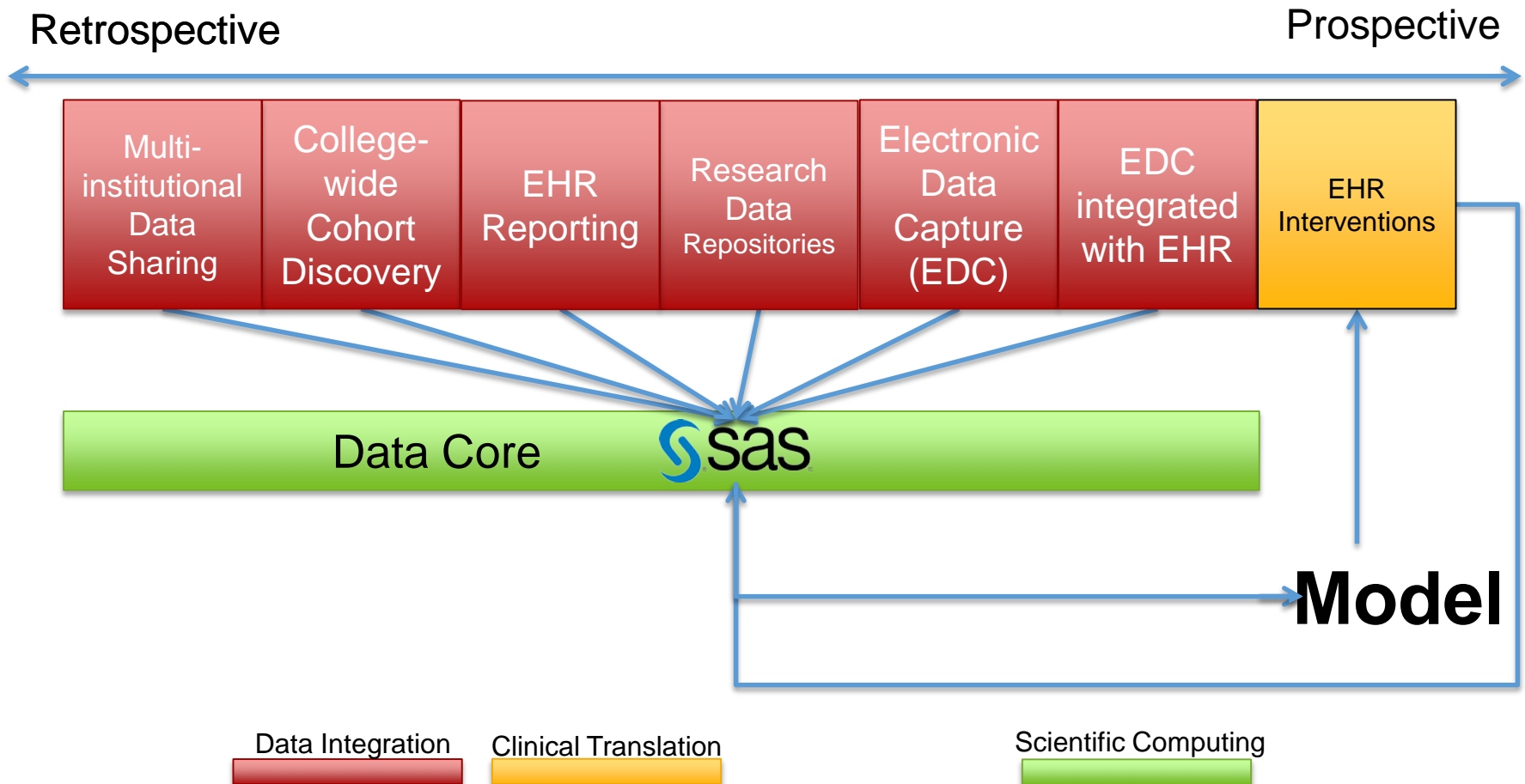
Architecture for Research Computing in Health (ARCH)



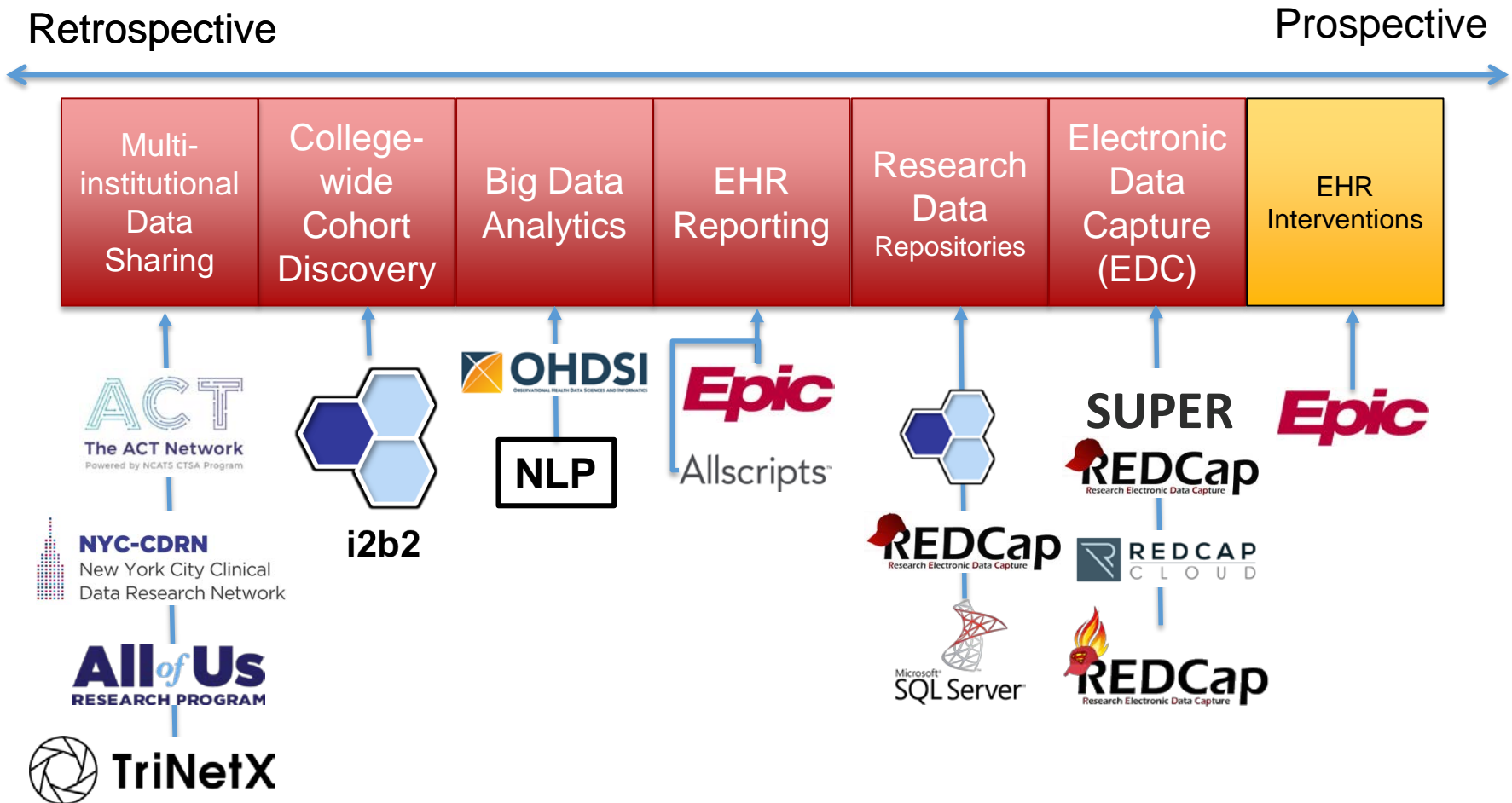
Architecture for Research Computing in Health (ARCH)



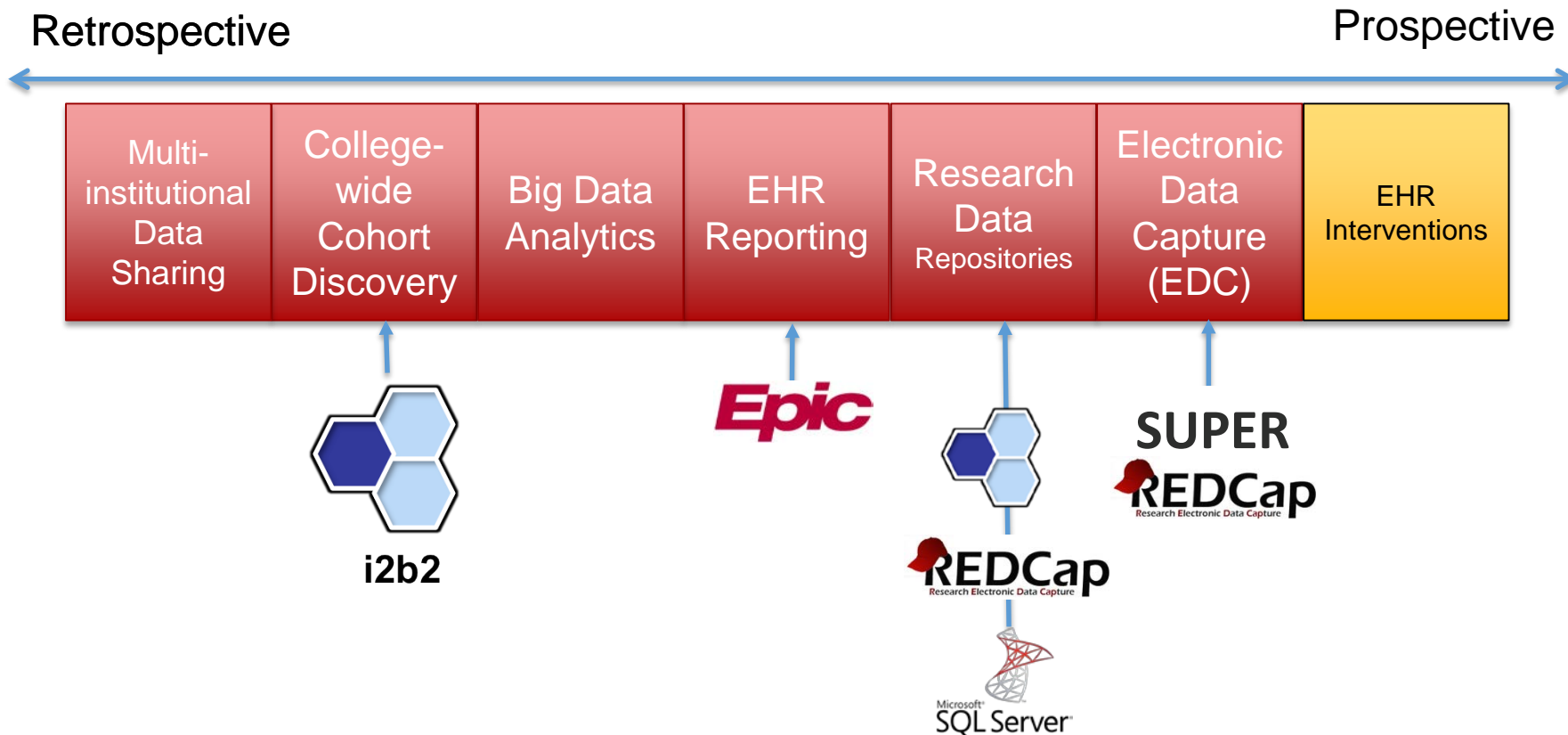
Architecture for Research Computing in Health (ARCH)



Architecture for Research Computing in Health (ARCH)

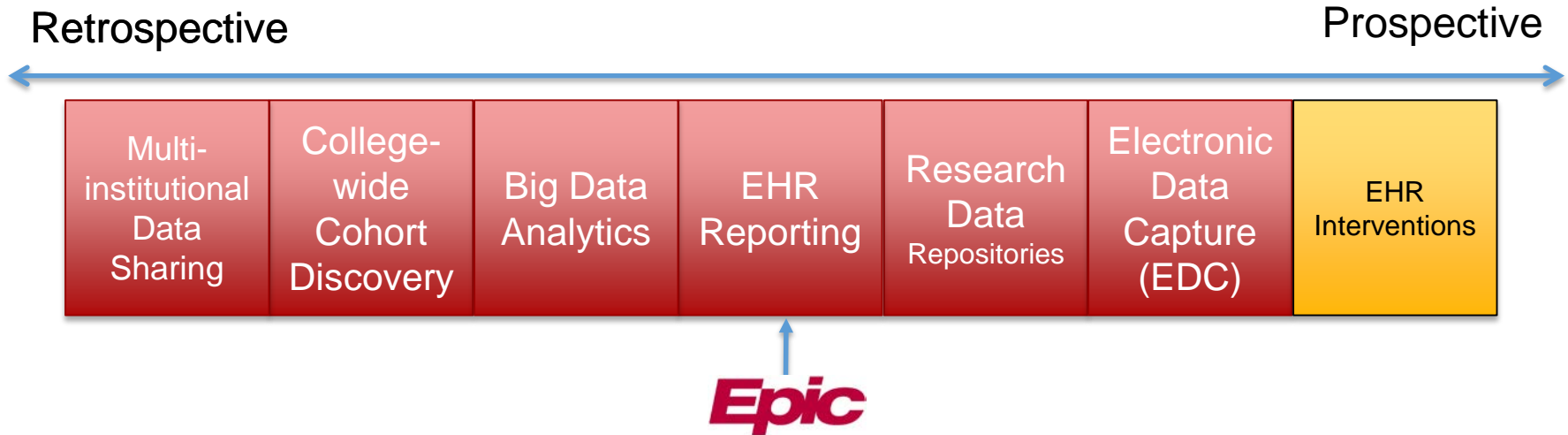


Architecture for Research Computing in Health (ARCH)





Architecture for Research Computing in Health (ARCH)





ARCH: EHR Reporting

Step 1: obtain raw EHR data describing diagnoses assigned in patients encounters

	patient_n...	enc_num	line	dx_id	primary_dx...	comme...	dx_chronic...	dx_unique	dx_ed_yn
828	30147	1644452	3	935415	N	NULL	N	4	N
829	69154	1644417	1	12866	Y	NULL	N	1	N
830	42675	1644384	1	56131	N	NULL	N	2	N
831	42675	1644384	2	135365	N	NULL	N	3	N
832	63397	1644381	1	813625	N	NULL	N	1	N
833	63397	1644381	2	807290	Y	NULL	N	2	N
834	42839	1644380	1	15598	Y	NULL	N	1	N
835	105950	1644350	1	8059885	Y	NULL	N	1	N
836	44243	1644293	1	24458	Y	NULL	N	1	N
837	13016	1644287	1	8028848	Y	NULL	N	1	N
838	32482	1644244	1	1005381	Y	NULL	N	1	N
839	79305	1644243	1	8078416	N	NULL	N	2	N
840	79305	1644243	2	6111	N	NULL	N	3	N
841	79305	1644243	3	8005450	N	NULL	N	4	N
842	79305	1644243	4	9834	N	NULL	N	5	N
843	79305	1644243	5	8059219	N	NULL	N	6	N
844	79305	1644243	6	8082109	N	NULL	N	7	N
845	79305	1644243	7	8091886	N	NULL	N	8	N



ARCH: EHR Reporting

Step 2: match raw EHR data describing diagnoses to ICD-9 codes

	patient_num	enc_num	line	dx_id	enc_icd_code	primary_dx_...	comme...	dx_chronic_yn	dx_uniq...	dx_ed_yn
828	30147	1644452	3	935415	250.60	N	NULL	N	4	N
829	69154	1644417	1	12866	996.82	Y	NULL	N	1	N
830	42675	1644384	1	56131	389.18	N	NULL	N	2	N
831	42675	1644384	2	135365	388.30	N	NULL	N	3	N
832	63397	1644381	1	813625	555.1	N	NULL	N	1	N
833	63397	1644381	2	807290	NULL	Y	NULL	N	2	N
834	42839	1644380	1	15598	239.6	Y	NULL	N	1	N
835	105950	1644350	1	8059885	782.1	Y	NULL	N	1	N
836	44243	1644293	1	24458	281.1	Y	NULL	N	1	N
837	13016	1644287	1	8028848	415.19	Y	NULL	N	1	N
838	32482	1644244	1	1005381	715.96	Y	NULL	N	1	N
839	79305	1644243	1	8078416	185	N	NULL	N	2	N
840	79305	1644243	2	6111	581.9	N	NULL	N	3	N
841	79305	1644243	3	8005450	198.5	N	NULL	N	4	N
842	79305	1644243	4	9834	787.91	N	NULL	N	5	N
843	79305	1644243	5	8059219	780.79	N	NULL	N	6	N
844	79305	1644243	6	8082109	279.00	N	NULL	N	7	N
845	79305	1644243	7	8091886	593.9	N	NULL	N	8	N

ARCH: EHR Reporting

Step 3: transform raw EHR data describing ICD-9 codes into dichotomous scientific variable

	Race	Height	Weight	BMI	Diabetes	Hypertension	Obesity	NSAID	Antidiabetic	Current_Cigarette_Smoker
1	WHITE	5' 4"	2096	22.84	N	N	N	N	N	N
2	OTHER COMBINATIONS NOT DESCRIBED	6' 0"	4704	39.47	Y	Y	Y	N	Y	N
3	WHITE	5' 5"	3168	34.72	N	N	Y	N	N	Y
4	WHITE	5' 4.5"	2352	24.85	N	N	N	N	N	N
5	ASIAN	5' 9"	2656	25.60	N	Y	N	N	N	N
6	DECLINED	6' 0"	3648	30.92	N	N	N	N	N	N
7	DECLINED	5' 6"	1827.2	18.44	N	N	N	N	N	N
8	OTHER COMBINATIONS NOT DESCRIBED	4' 9.5"	1872	25.11	N	N	N	N	N	N
9	OTHER COMBINATIONS NOT DESCRIBED	5' 2"	2448	28.92	N	N	N	N	N	N
10	ASIAN	5' 9"	3072	28.34	N	N	N	N	N	N
11	NULL	5' 0"	3609.6	44.06	N	N	N	N	N	N
12	DECLINED	5' 1.024"	2704	31.95	Y	N	Y	Y	Y	N
13	WHITE	6' 1"	3056	26.08	N	Y	N	Y	N	N
14	NULL	6' 0"	3408	3827.82	Y	Y	N	N	Y	Y
15	NULL	6' 2"	3284.8	25.99	N	N	N	N	N	N
16	DECLINED	5' 8"	2560	26.63	N	N	N	N	N	N
17	DECLINED	5' 8"	2640	25.09	N	N	N	N	N	Y
18	NULL	5' 1"	2769.6	32.72	N	N	Y	N	N	N

ARCH: EHR Reporting

Step 4: repeat process to define additional diagnosis dichotomous variables

	Race	Height	Weight	BMI	Diabetes	Hypertension	Obesity	NSAID	Antidiabetic	Current_Cigarette_Smoker
1	WHITE	5' 4"	2096	22.84	N	N	N	N	N	N
2	OTHER COMBINATIONS NOT DESCRIBED	6' 0"	4704	39.47	Y	Y	Y	N	Y	N
3	WHITE	5' 5"	3168	34.72	N	N	Y	N	N	Y
4	WHITE	5' 4.5"	2352	24.85	N	N	N	N	N	N
5	ASIAN	5' 9"	2656	25.60	N	Y	N	N	N	N
6	DECLINED	6' 0"	3648	30.92	N	N	N	N	N	N
7	DECLINED	5' 6"	1827.2	18.44	N	N	N	N	N	N
8	OTHER COMBINATIONS NOT DESCRIBED	4' 9.5"	1872	25.11	N	N	N	N	N	N
9	OTHER COMBINATIONS NOT DESCRIBED	5' 2"	2448	28.92	N	N	N	N	N	N
10	ASIAN	5' 9"	3072	28.34	N	N	N	N	N	N
11	NULL	5' 0"	3609.6	44.06	N	N	N	N	N	N
12	DECLINED	5' 1.024"	2704	31.95	Y	N	Y	Y	Y	N
13	WHITE	6' 1"	3056	26.08	N	Y	N	Y	N	N
14	NULL	6' 0"	3408	3827.82	Y	Y	N	N	Y	Y
15	NULL	6' 2"	3284.8	25.99	N	N	N	N	N	N
16	DECLINED	5' 8"	2560	26.63	N	N	N	N	N	N
17	DECLINED	5' 8"	2640	25.09	N	N	N	N	N	Y
18	NULL	5' 1"	2769.6	32.72	N	N	Y	N	N	N

ARCH: EHR Reporting

Step 4: repeat process to transform raw EHR data for medications and other domains (raw data for medications and other domains not pictured)

	Race	Height	Weight	BMI	Diabetes	Hypertension	Obesity	NSAID	Antidiabetic	Current_Cigarette_Smoker
1	WHITE	5' 4"	2096	22.84	N	N	N	N	N	N
2	OTHER COMBINATIONS NOT DESCRIBED	6' 0"	4704	39.47	Y	Y	Y	N	Y	N
3	WHITE	5' 5"	3168	34.72	N	N	Y	N	N	Y
4	WHITE	5' 4.5"	2352	24.85	N	N	N	N	N	N
5	ASIAN	5' 9"	2656	25.60	N	Y	N	N	N	N
6	DECLINED	6' 0"	3648	30.92	N	N	N	N	N	N
7	DECLINED	5' 6"	1827.2	18.44	N	N	N	N	N	N
8	OTHER COMBINATIONS NOT DESCRIBED	4' 9.5"	1872	25.11	N	N	N	N	N	N
9	OTHER COMBINATIONS NOT DESCRIBED	5' 2"	2448	28.92	N	N	N	N	N	N
10	ASIAN	5' 9"	3072	28.34	N	N	N	N	N	N
11	NULL	5' 0"	3609.6	44.06	N	N	N	N	N	N
12	DECLINED	5' 1.024"	2704	31.95	Y	N	Y	Y	Y	N
13	WHITE	6' 1"	3056	26.08	N	Y	N	Y	N	N
14	NULL	6' 0"	3408	3827.82	Y	Y	N	N	Y	Y
15	NULL	6' 2"	3284.8	25.99	N	N	N	N	N	N
16	DECLINED	5' 8"	2560	26.63	N	N	N	N	N	N
17	DECLINED	5' 8"	2640	25.09	N	N	N	N	N	Y
18	NULL	5' 1"	2769.6	32.72	N	N	Y	N	N	N

Architecture for Research Computing in Health (ARCH)





ARCH: i2b2

i2b2 Query & Analysis Tool

Project: i2b2

User: Thomas Campion

[Find Patients](#) | [Analysis Tools](#) | [Message Log](#) | [Help](#) | [Change Password](#) | [Logout](#)

Navigate Terms

Find Terms

- Allergy
- Demographics
- Diagnoses (ICD-10)
- Diagnoses (ICD-9)
- Encounters
- History
- Lab Results
- Medications
- Procedures

Query Tool

Query Name:

Temporal Constraint:

Treat all groups independently

Group 1			Group 2			Group 3		
Dates	Occurs > 0x	Exclude	Dates	Occurs > 0x	Exclude	Dates	Occurs > 0x	Exclude
Treat Independently ▾			Treat Independently ▾			Treat Independently ▾		

drop a
term
on here

Run Query

Clear

Print Query

0 Groups

[New Group](#)

Query Status

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Internet access



ARCH: i2b2

i2b2 Query & Analysis Tool

Project: i2b2

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Navigate Terms

Find Terms

- Allergy
- Demographics
- Diagnoses (ICD-10)
- Diagnoses (ICD-9)
 - [Outpatient] Encounter Diagnosis
 - [Outpatient] Medical History
 - [Outpatient] Problem List
- 001-139: infectious and parasitic diseases
- 140-239: neoplasms
- 240-279: endocrine, nutritional and metabolic diseases, and immunity
- 280-289: diseases of the blood and blood-forming organs
- 290-319: mental disorders
- 320-359: diseases of the nervous system
- 360-389: diseases of the sense organs
- 390-459: diseases of the circulatory system
- 460-519: diseases of the respiratory system
- 520-579: diseases of the digestive system
- 580-629: diseases of the genitourinary system
- 630-679: complications of pregnancy, childbirth, and the puerperium
- 680-709: diseases of the skin and subcutaneous tissue
- 710-739: diseases of the musculoskeletal system and connective tissue
- 740-759: congenital anomalies
- 760-779: certain conditions originating in the perinatal period
- 780-799: symptoms, signs, and ill-defined conditions
- 800-999: injury and poisoning
- E and V codes: external causes of injury and supplemental classification
- Encounters
- History
- Lab Results

Query Tool

Query Name:

Temporal Constraint:

Treat all groups independently

Group 1			Group 2			Group 3		
Dates	Occurs > 0x	Exclude	Dates	Occurs > 0x	Exclude	Dates	Occurs > 0x	Exclude
Treat Independently			Treat Independently			Treat Independently		

drop a
term
on here

Run Query

Clear

Print Query

0 Groups

New Group

Query Status

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Internet access



ARCH: i2b2

i2b2 Query & Analysis Tool Project: i2b2 User: Thomas Campion Find Patients | Analysis Tools | Message Log | Help | Change Password | Logout

Navigate Terms

Find Terms

- Allergy
- Demographics
- Diagnoses (ICD-10)
- Diagnoses (ICD-9)
 - [Outpatient] Encounter Diagnosis
 - [Outpatient] Medical History
 - [Outpatient] Problem List
- 001-139: infectious and parasitic diseases
- 140-239: neoplasms
- 240-279: endocrine, nutritional and metabolic diseases, and immunity
 - [Outpatient] Encounter Diagnosis
 - [Outpatient] Medical History
 - [Outpatient] Problem List
- 240-246: Disorders of thyroid gland
- 249-259: Diseases of other endocrine glands
- 260-269: Nutritional deficiencies
- 270-279: Other metabolic and immunity disorders
- 280-289: diseases of the blood and blood-forming organs
- 290-319: mental disorders
- 320-359: diseases of the nervous system
- 360-389: diseases of the sense organs
- 390-459: diseases of the circulatory system
- 460-519: diseases of the respiratory system
- 520-579: diseases of the digestive system
- 580-629: diseases of the genitourinary system
- 630-679: complications of pregnancy, childbirth, and the puerperium
- 680-709: diseases of the skin and subcutaneous tissue
- 710-739: diseases of the musculoskeletal system and connective tissue
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Group 1			Group 2			Group 3		
Dates	Occurs > 0x	Exclude	Dates	Occurs > 0x	Exclude	Dates	Occurs > 0x	Exclude
Treat Independently ▾			Treat Independently ▾			Treat Independently ▾		

drop a
term
on here

Run Query

Clear

Print Query

0 Groups



New Group



Query Status



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Navigate Terms

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 - [Outpatient] Medical History
 - [Outpatient] Problem List
- 240-246: Disorders of thyroid gland
- 249-259: Diseases of other endocrine glands
 - [Outpatient] Encounter Diagnosis
 - [Outpatient] Medical History
 - [Outpatient] Problem List
- 249: Secondary diabetes mellitus
- 250: Diabetes mellitus
- 251: Other disorders of pancreatic internal secretion
- 252: Disorders of parathyroid gland
- 253: Disorders of the pituitary gland and its hypothalamic cont
- 254: Diseases of thymus gland
- 255: Disorders of adrenal glands
- 256: Ovarian dysfunction
- 257: Testicular dysfunction
- 258: Polyglandular dysfunction and related disorders
- 259: Other endocrine disorders

Query Tool

Query Name:

Temporal Constraint:

Treat all groups independently

Group 1			Group 2			Group 3		
Dates	Occurs > 0x	Exclude	Dates	Occurs > 0x	Exclude	Dates	Occurs > 0x	Exclude
Treat Independently			Treat Independently			Treat Independently		

drop a
term
on here

Run Query

Clear

Print Query

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Query Status



ARCH: i2b2

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- 249-259: Diseases of other endocrine glands
 - [Outpatient] Encounter Diagnosis
 - [Outpatient] Medical History
 - [Outpatient] Problem List
- 249: Secondary diabetes mellitus
- 250: Diabetes mellitus
 - [Outpatient] Encounter Diagnosis
 - [Outpatient] Medical History
 - [Outpatient] Problem List
- 250.0: Diabetes mellitus without mention of complication
- 250.1: Diabetes with ketoacidosis
- 250.2: Hyperosmolar (nonketotic) coma
- 250.3: Diabetes with other coma
- 250.4: Diabetes with renal manifestations
- 250.5: Diabetes with ophthalmic manifestations

Query Tool

Query Name:

Temporal Constraint:

Group 1			Group 2			Group 3		
Dates	Occurs > 0x	Exclude	Dates	Occurs > 0x	Exclude	Dates	Occurs > 0x	Exclude
Treat Independently			Treat Independently			Treat Independently		
<div>drop a term on here</div>								

Run QueryClearPrint Query

0 Groups

New Group

Query Status

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Internet access



ARCH: i2b2

i2b2 Query & Analysis Tool Project: i2b2 User: Thomas Campion Find Patients | Analysis Tools | Message Log | Help | Change Password | Logout

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- 250.5: Diabetes with ophthalmic manifestations

Query Tool

Query Name:

Temporal Constraint:

Group 1			Group 2			Group 3		
Dates	Occurs > 0x	Exclude	Dates	Occurs > 0x	Exclude	Dates	Occurs > 0x	Exclude
Treat Independently ▼			Treat Independently ▼			Treat Independently ▼		
250: Diabetes mellitus								
one or more of these			AND			drop a term on here		

Run Query Clear Print Query 1 Group New Group

Query Status

wcmc-ad.net
Internet access



ARCH: i2b2

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Navigate TermsFind Terms

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 - 250.1: Diabetes with ketoacidosis
 - 250.2: Hyperosmolar (nonketotic) coma
 - 250.3: Diabetes with other coma
 - 250.4: Diabetes with renal manifestations
 - 250.5: Diabetes with ophthalmic manifestations

Query Tool

Query Name: 250: Diabetes m@18:43:05

Temporal Constraint: Treat all groups independently

Group 1			Group 2			Group 3		
Dates	Occurs > 0x	Exclude	Dates	Occurs > 0x	Exclude	Dates	Occurs > 0x	Exclude
Treat Independently			Treat Independently			Treat Independently		
250: Diabetes mellitus								

one or more of theseANDdrop a term on here

Run QueryClearPrint Query1 GroupNew Group

Query Status

Finished Query: "250: Diabetes m@18:43:05" [4.0 secs]
Compute Time: 2.2 secs
Number of patients for "250: Diabetes m@18:43:05"
patient_count: 70434

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Internet access

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ARCH: i2b2

i2b2 Query & Analysis Tool Project: i2b2 User: Thomas Campion Find Patients | Analysis Tools | Message Log | Help | Change Password | Logout

Navigate Terms Find Terms

- Lab Results
 - ANATOMIC PATHOLOGY
 - ANCILLARY
 - CARDIOLOGY
 - GENERAL OBSERVATION
 - LABORATORY
 - CHEMISTRY
 - ACID/BASE AND RESPIRATION
 - ANTIBIOTICS & ANTI-INFECTION DRUG LEVELS
 - CARDIOVASCULAR MARKERS
 - CRYSTALS AND CALCULI
 - DRUGS OF ABUSE
 - ELECTROLYTES: BLOOD
 - ELECTROLYTES: OTHER
 - ELECTROLYTES: URINE
 - ENDOCRINE: ADRENAL
 - ENDOCRINE: CNS
 - ENDOCRINE: GI
 - ENDOCRINE: GONADS & FERTILITY
 - ENDOCRINE: PARATHYROID & BONE
 - ENDOCRINE: PITUITARY
 - ENDOCRINE: THYROID
 - ENVIRONMENTAL TOXINS AND POISONS
 - FETAL AND NEWBORN SCREENING
 - HEMOGLOBIN A1C
 - 17856-6 - Hemoglobin A1c/Hemoglobin.total in Blood b
 - 41995-2 - Hemoglobin A1c (Mass/volume) in Blood
 - 4548-4 - Hemoglobin A1c/Hemoglobin.total in Blood

Query Tool

Query Name: 250: Diabetes m@18:43:05

Temporal Constraint: Treat all groups independently

Group 1			Group 2			Group 3		
Dates	Occurs > 0x	Exclude	Dates	Occurs > 0x	Exclude	Dates	Occurs > 0x	Exclude
Treat Independently			Treat Independently			Treat Independently		
250: Diabetes mellitus								

one or more of these AND drop a term on here

Run Query Clear Print Query 1 Group New Group

Query Status

Finished Query: "250: Diabetes m@18:43:05" [4.0 secs]
Compute Time: 2.2 secs

Number of patients for "250: Diabetes m@18:43:05"
patient_count: 70434

wcmc-ad.net
Internet access



ARCH: i2b2

i2b2 Query & Analysis Tool

Project: i2b2

User: Thomas Campion

[Find Patients](#) | [Analysis Tools](#) | [Message Log](#) | [Help](#) | [Change Password](#) | [Logout](#)

Navigate Terms

Find Terms

- Lab Results
 - ANATOMIC PATHOLOGY
 - ANCILLARY
 - CARDIOLOGY
 - GENERAL OBSERVATION
 - LABORATORY
 - CHEMISTRY
 - ACID/BASE AND RESPIRATION
 - ANTIBIOTICS & ANTI-INFECTION DRUG LEVELS
 - CARDIOVASCULAR MARKERS
 - CRYSTALS AND CALCULI
 - DRUGS OF ABUSE
 - ELECTROLYTES: BLOOD
 - ELECTROLYTES: OTHER
 - ELECTROLYTES: URINE
 - ENDOCRINE: ADRENAL
 - ENDOCRINE: CNS
 - ENDOCRINE: GI
 - ENDOCRINE: GONADS & FERTILITY
 - ENDOCRINE: PARATHYROID & BONE
 - ENDOCRINE: PITUITARY
 - ENDOCRINE: THYROID
 - ENVIRONMENTAL TOXINS AND POISONS
 - FETAL AND NEWBORN SCREENING
 - HEMOGLOBIN A1C
 - HEMOGLOBIN A1C
 - 17856-6 - Hemoglobin A1c/Hemoglobin.total in Blood b
 - 41995-2 - Hemoglobin A1c (Mass/volume) in Blood
 - 4548-4 - Hemoglobin A1c/Hemoglobin.total in Blood

Query Tool

Query Name:

Temporal Constraint:

Treat all groups independently

Group 1			Group 2			Group 3		
Dates	Occurs > 0x	Exclude	Dates	Occurs > 0x	Exclude	Dates	Occurs > 0x	Exclude
Treat Independently			Treat Independently			Treat Independently		
250: Diabetes mellitus			17856-6 - Hemoglobin A1c/Hemoglobin.tot					
one or more of these			AND			one or more of these		
			AND			drop a term on here		

Run Query

Clear

Print Query

2 Groups

New Group

Query Status



ARCH: i2b2

i2b2 Query & Analysis Tool Project: i2b2 User: Thomas Campion Find Patients | Analysis Tools | Message Log | Help | Change Password | Logout

Navigate Terms Find Terms

- Lab Results
 - ANATOMIC PATHOLOGY
 - ANCILLARY
 - CARDIOLOGY
 - GENERAL OBSERVATION
 - LABORATORY
 - CHEMISTRY
 - ACID/BASE AND RESPIRATION
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 - ELECTROLYTES: BLOOD
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 - ENDOCRINE: ADRENAL
 - ENDOCRINE: CNS
 - ENDOCRINE: GI
 - ENDOCRINE: GONADS & FERTILITY
 - ENDOCRINE: PARATHYROID & BONE
 - ENDOCRINE: PITUITARY
 - ENDOCRINE: THYROID
 - ENVIRONMENTAL TOXINS AND POISONS
 - FETAL AND NEWBORN SCREENING
 - HEMOGLOBIN A1C
 - 17856-6 - Hemoglobin A1c/Hemoglobin.total in Blood b
 - 41995-2 - Hemoglobin A1c (Mass/volume) in Blood
 - 4548-4 - Hemoglobin A1c/Hemoglobin.total in Blood

Query Tool

Query Name:

Temporal Constraint:

Group 1			Group 2			Group 3		
Dates	Occurs > 0x	Exclude	Dates	Occurs > 0x	Exclude	Dates	Occurs > 0x	Exclude
treat independently			treat independently			treat independently		
250: Diabetes mellitus			17856-6 - Hemoglobin A1c/Hemoglobin.total					

Choose value of Hemoglobin A1c/Hemoglobin.total in Blood by HPLC (Test:LAB:17856)

Searches by Lab values can be constrained by the high/low flag set by the performing laboratory, or by the values themselves.

☐ No Value Please select operator:

☐ By Flag

☒ By Value Please enter a value:

Units =

Query Status

AND

drop a term on here

New Group

wcmc-ad.net
Internet access



ARCH: i2b2

i2b2 Query & Analysis Tool Project: i2b2 User: Thomas Campion Find Patients | Analysis Tools | Message Log | Help | Change Password | Logout

Navigate Terms

Find Terms

- Lab Results
 - ANATOMIC PATHOLOGY
 - ANCILLARY
 - CARDIOLOGY
 - GENERAL OBSERVATION
 - LABORATORY
 - CHEMISTRY
 - ACID/BASE AND RESPIRATION
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 - ELECTROLYTES: BLOOD
 - ELECTROLYTES: OTHER
 - ELECTROLYTES: URINE
 - ENDOCRINE: ADRENAL
 - ENDOCRINE: CNS
 - ENDOCRINE: GI
 - ENDOCRINE: GONADS & FERTILITY
 - ENDOCRINE: PARATHYROID & BONE
 - ENDOCRINE: PITUITARY
 - ENDOCRINE: THYROID
 - ENVIRONMENTAL TOXINS AND POISONS
 - FETAL AND NEWBORN SCREENING
 - HEMOGLOBIN A1C
 - 17856-6 - Hemoglobin A1c/Hemoglobin.total in Blood b
 - 41995-2 - Hemoglobin A1c (Mass/volume) in Blood
 - 4548-4 - Hemoglobin A1c/Hemoglobin.total in Blood

Query Tool

Query Name: 250: Di-17856-6@18:52:40

Temporal Constraint: Treat all groups independently

Group 1			Group 2			Group 3		
Dates	Occurs > 0x	Exclude	Dates	Occurs > 0x	Exclude	Dates	Occurs > 0x	Exclude
Treat Independently ▾			Treat Independently ▾			Treat Independently ▾		
250: Diabetes mellitus			17856-6 - Hemoglobin A1c/Hemoglobin.tot					
one or more of these			AND			one or more of these		
			AND			drop a term on here		

Run Query

Clear

Print Query

2 Groups

New Group

Query Status

Finished Query: "250: Di-17856-6@18:52:40"

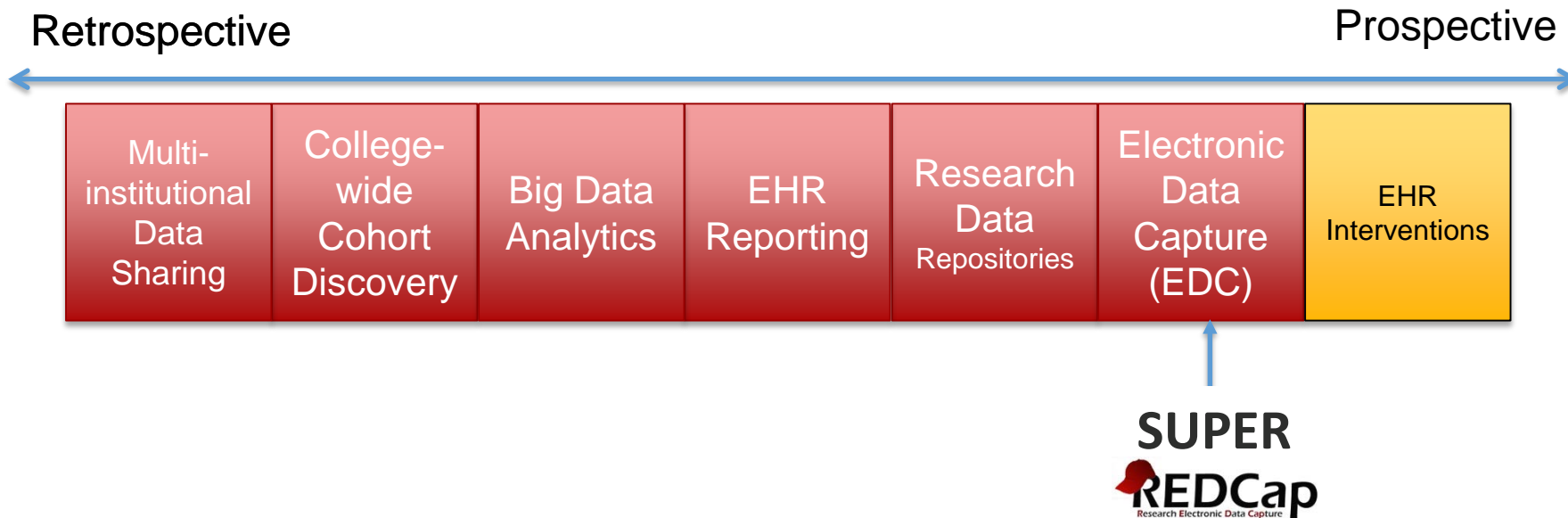
Compute Time: 6 secs

[7.7 secs]

Number of patients for "250: Di-17856-6@18:52:40"

patient_count: 29826

Architecture for Research Computing in Health (ARCH)





ARCH: SUPER REDCap



Logged in as **thc2015** | Log out

- 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

Record ID 29 [Select other record](#)

Data Collection Instruments:

[Consent Form](#)
[Demographics And Enrollment](#)
[Laboratory Results](#)

Applications

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



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Hunter Center for Study of Gene Structure and Function / Memorial Sloan-Kettering Cancer Center / NewYork-
Presbyterian Hospital/Weill Cornell Medical Center / Weill Cornell Graduate School of Medical Sciences

Save Record

Save and Continue

Save and go to Next

De-ID SUPER REDCap Project

Actions: [Modify instrument](#) [Download PDF of instrument\(s\)](#)

[VIDEO: Basic data entry](#)

Demographics And Enrollment

Adding new Record ID 29

Record ID 29

Demographics for _____

MRN

First name

Last name

Date of birth

Enrollment

Cohorts ☐ Breast
☐ Leukemia
☐ Lymphoma

Form Status



ARCH: SUPER REDCap



Logged in as **thc2015** | Log out

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

Data Collection [Edit instruments](#)

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Consent Form
Demographics And Enrollment
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Save Record

Save and Continue

Save and go to Next

De-ID SUPER REDCap Project

Actions: Modify instrument Download PDF of instrument(s)

[VIDEO: Basic data entry](#)

Demographics And Enrollment

Adding new Record ID 29

Record ID 29

Demographics for _____

MRN

First name

Last name

Date of birth

Enrollment

Cohorts ☐ Breast
☐ Leukemia
☐ Lymphoma

Form Status



ARCH: SUPER REDCap

Logged in as **thc2015** | Log out

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Project status: **Development**

Data Collection

Edit instruments

Manage Survey Participants

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

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Add / Edit Records

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Record ID **29** [Select other record](#)

Data Collection Instruments:

Consent Form

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Laboratory Results

Applications

Calendar

Data Exports, Reports, and Stats

Data Import Tool

Logging

Field Comment Log

File Repository

User Rights and DAGs

Record Locking Customization

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De-ID SUPER REDCap Project

Actions:

Modify instrument

Download PDF of instrument(s)

[VIDEO: Basic data entry](#)

Demographics

Adding new Record

Record ID

Demographics form

MRN

First name

Last name

Date of birth

Enrollment

Cohorts

Form Status

☐ Breast

☐ Leukemia

☐ Lymphoma

Save Record

Save and Continue

Save and go to Next

Save record and fetch data

Now that you have entered a value for the Source Identifier Field, click the Save button below to save the value and automatically begin fetching data from the source system.

Save record and fetch data

Cancel



ARCH: SUPER REDCap



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Presbyterian Hospital/Weill Cornell Medical Center / Weill Cornell Graduate School of Medical Sciences

Save Record

Save and Continue

Save and go to Next

Adjudicate data from ARCH WZ Data

Displayed below is the data fetched from the external source system. It will display all the mapped REDCap fields that have source data returned. To import the source data values into REDCap, select the source value by clicking the radio button for the desired value in the row. Some fields may have multiple values returned, so you must choose the best or most correct value. Once you made all your selections, press the Save button below to save the source values into REDCap.

Fetching data for Record ID "29"

Refresh data from ARCH WZ Data

New items: 3

Time of last data fetch: less than a minute ago

☒ Display all items (all forms)

☐ Display only this form's items

REDCap Field	REDCap Date/Time	ARCH WZ Data Source Date/Time	REDCap Current Value	ARCH WZ Data Source Value	Import?
first_name "First name"	-	-		A	<input checked="" type="radio"/> reset
last_name "Last name"	-	-		Ztest	<input checked="" type="radio"/> reset
date_of_birth "Date of birth"	-	-		1955-12-16	<input checked="" type="radio"/> reset

Save

Cancel



ARCH: SUPER REDCap



Logged in as **thc2015** | Log out

- 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

Record ID 29 [Select other record](#)

Data Collection Instruments:

- ☐ Consent Form
- ☒ **Demographics And Enrollment**
- ☐ Laboratory Results

Applications

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



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Presbyterian Hospital/Weill Cornell Medical Center / Weill Cornell Graduate School of Medical Sciences

De-ID SUPER REDCap Project

Actions: Modify instrument Download PDF of instrument(s)

[VIDEO: Basic data entry](#)

Demographics And Enrollment

Editing existing Record ID 29

0 new items from source system [View](#)

Record ID 29

Demographics for _____

MRN	<input type="text" value="601987"/>
First name	<input type="text" value="A"/>
Last name	<input type="text" value="Ztest"/>
Date of birth	<input type="text" value="1955-12-16"/>

Enrollment

Cohorts

- ☐ Breast
- ☐ Leukemia
- ☐ Lymphoma

Save Record

Save and Continue

Save and go to Next



ARCH: SUPER REDCap



Logged in as **thc2015** | Log out

- 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

Record ID 29 [Select other record](#)

Data Collection Instruments:

- Consent Form
- Demographics And Enrollment
- Laboratory Results**

Applications

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- Data Exports, Reports, and Stats
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- Logging
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Hunter Center for Study of Gene Structure and Function / Memorial Sloan-Kettering Cancer Center / NewYork-Presbyterian Hospital/Weill Cornell Medical Center / Weill Cornell Graduate School of Medical Sciences

Save Record

Save and Continue

De-ID SUPER REDCap Project

Actions: [Modify instrument](#) [Download PDF of instrument\(s\)](#)

[VIDEO: Basic data entry](#)

Laboratory Results

Editing existing Record ID 29

No new items from source system ([View](#))

Record ID	29
Visit date	<input type="text"/> Today M-D-Y
1 K/uL = 1000 cells per micro liter 1 M/uL = 1000000 cells per micro liter % = Percentage	
Platelets (K/uL)	<input type="text"/>
Neutrophils (K/uL)	<input type="text"/>
Monocytes (K/uL)	<input type="text"/>
Lymphocytes (K/uL)	<input type="text"/>
Leukocytes (K/uL)	<input type="text"/>
Erythrocytes (M/uL)	<input type="text"/>



ARCH: SUPER REDCap



Logged in as **thc2015** | [Log out](#)

- 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

Record ID 29 [Select other record](#)

Data Collection Instruments:

- ☐ Consent Form
- ☐ Demographics And Enrollment
- ☒ **Laboratory Results**

Applications

- Calendar
- Data Exports, Reports, and Stats
- Data Import Tool
- Logging
- Field Comment Log
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- User Rights and DAGs
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Presbyterian Hospital/Weill Cornell Medical Center / Weill Cornell Graduate School of Medical Sciences

[Save Record](#)

[Save and Continue](#)

De-ID SUPER REDCap Project

Actions: [Modify instrument](#) [Download PDF of instrument\(s\)](#)

[VIDEO: Basic data entry](#)

Laboratory Results

Editing existing Record ID 29

8 new items from source system [View](#)

Record ID	29
Visit date	<input type="text" value="02-02-2010"/> <input type="button" value="Today"/> M-D-Y
1 K/uL = 1000 cells per micro liter 1 M/uL = 1000000 cells per micro liter % = Percentage	
Platelets (K/uL)	<input type="text"/>
Neutrophils (K/uL)	<input type="text"/>
Monocytes (K/uL)	<input type="text"/>
Lymphocytes (K/uL)	<input type="text"/>
Leukocytes (K/uL)	<input type="text"/>



ARCH: SUPER REDCap

Logged in as
My Project
Project H
Project S
Project sta

Data Collection
Manage
- Get a public
inviting res
Record S
- View data
Add / Edit
- Create new

Record ID 29
Data Collection
Consent
Demographic
Laboratory

Applications
Calendar
Data Export
Data Import
Logging
Field Collection
File Repository
User Rights
Record Locking Customization

Save Record

×

Adjudicate data from ARCH WZ Data

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Fetching data for Record ID "29" using ± 150 days

Refresh data from ARCH WZ Data using ± 150 days from date AND time
min: 0.01 days (15 minutes), max: 365 days

New items: 8 Time of last data fetch: just now
☒ Display all items (all forms)
☐ Display only this form's items View 3 hidden items (existing values)

REDCap Field	REDCap Date/Time	ARCH WZ Data Source Date/Time	REDCap Current Value	ARCH WZ Data Source Value	Import?
platelets "Platelets (K/uL)"	2010-02-02 (00:00)	2009-09-29 00:00		265	<input type="radio"/> reset
		2009-10-07 00:00		287	<input type="radio"/> reset
		2009-11-02 00:00		188	<input type="radio"/> reset
		2009-11-03 00:00		219	<input type="radio"/> reset
		2009-11-03 00:00		317	<input type="radio"/> reset
		2009-11-09 00:00		245	<input type="radio"/> reset
		2009-11-17 00:00		184	<input type="radio"/> reset
		2009-11-20 00:00		230	<input type="radio"/> reset
		2009-11-29 00:00		172	<input type="radio"/> reset
		2009-12-11 00:00		214	<input type="radio"/> reset

Save Cancel



ARCH: SUPER REDCap

Logged in as

My Project

Project H

Project S

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Data Collection

Manage

- Get a public

inviting res

Record S

- View data

Add / Edit

- Create new

Record ID 29

Data Collection

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Applications

Calendar

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Record Locking Customization

Adjudicate data from ARCH WZ Data

Displayed below is the data fetched from the external source system. It will display all the mapped REDCap fields that have source data returned. To import the source data values into REDCap, select the source value by clicking the radio button for the desired value in the row. Some fields may have multiple values returned, so you must choose the best or most correct value. Once you made all your selections, press the Save button below to save the source values into REDCap.

Fetching data for Record ID "29" using ± 150 days

Refresh data from ARCH WZ Data

using ± 150 days from date AND time

min: 0.01 days (15 minutes), max: 365 days

New items: 8

Time of last data fetch: just now

☒ Display all items (all forms)

☐ Display only this form's items

View 3 hidden items (existing values)

REDCap Field	REDCap Date/Time	ARCH WZ Data Source Date/Time	REDCap Current Value	ARCH WZ Data Source Value	Import?
platelets "Platelets (K/uL)"	2010-02-02 (00:00)	2009-09-29 00:00		265	<input type="radio"/> reset
		2009-10-07 00:00		287	<input type="radio"/> reset
		2009-11-02 00:00		188	<input type="radio"/> reset
		2009-11-03 00:00		219	<input type="radio"/> reset
		2009-11-03 00:00		317	<input type="radio"/> reset
		2009-11-09 00:00		245	<input type="radio"/> reset
		2009-11-17 00:00		184	<input checked="" type="radio"/> reset
		2009-11-20 00:00		230	<input type="radio"/> reset
		2009-11-29 00:00		172	<input type="radio"/> reset
		2009-12-11 00:00		214	<input type="radio"/> reset

Save Cancel



ARCH: SUPER REDCap

Logged in as **thc2015** | Log out

- 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

Record ID 29 [Select other record](#)

Data Collection Instruments:

- Consent Form
- Demographics And Enrollment
- Laboratory Results**

Applications

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

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De-ID SUPER REDCap Project

Actions: [Modify instrument](#) [Download PDF of instrument\(s\)](#) [VIDEO: Basic data entry](#)

Laboratory Results

[Editing existing Record ID 29](#) **0 new items from source system** [View](#)

Record ID	29
Visit date	<div>02-02-2010 Today M-D-Y</div>
1 K/uL = 1000 cells per micro liter 1 M/uL = 1000000 cells per micro liter % = Percentage	
Platelets (K/uL)	184
Neutrophils (K/uL)	2.4
Monocytes (K/uL)	0.5
Lymphocytes (K/uL)	2.2
Leukocytes (K/uL)	5.2

[Save Record](#)
[Save and Continue](#)



ARCH: SUPER REDCap on FHIR

Home

In Basket

Chart

Patient Lists

Phone Book

Links

Face Sheet

Test, A

Test, A

MRN: 1203322

Gender: Female, 77 year old, 01/25/1942, 🏠, 📅

FYI: None

GA: 578w1d

EDD: 12/10/2008

Grav/Para: G4P0003

OB Providers: NONE

Blood Type: NONE

Home: 646-962-7780

Work: 646-962-7780

Cell: 646-222-2222

Weill Cornell Connect: Inactive

Pt Comm Pref: None

PCP Name: None

Care Team: 🏠

Pharmacy: RITE AID-100 HWY 42 #07221 | 100 HIGH...

Primary Ins.: WORKMAN'S COMP - GENERIC

Aллергии: Other, Fish, Latex, Pcn [Penicillins], Aspir...

1.727 m (5' 8"), 86 kg (189 lb 9.5 oz)

Health Maintenance: Due

Research: None

Adv Dir: None

Outside Records: No

ACO Status: No

Print

Epic Help

Secure

Log Out

Epiccare

STEPHEN FLORES

Search

Guidelines

Snapshot

Demographics

Research

Care Teams

Chart Review

Results Review

Patient Files

Document List

MyChartAdmin...

Review Flows...

Problem List

Growth Chart

FYI

Care Teams

List Members...

BPAReview

Verify Pharmac...

Lifetime Dose...

Patient Summ...

Guidelines

Customize

More

REDCap

MRN 1203322 - Test, A (DOB 1942-01-25)

My Projects

Project: FHIR test

Save & Exit Form

Save & Stay

Cancel

Editing existing Record ID 1

new items from source system

View

Record ID

1

To rename the record, see the record action drop-down at top of the Record Home Page.

Demographics

MRN

1203322

Last name

Test

First Name

A

DOB

01-25-1942

Today

M-D-Y

Clinic Visit

Lab date

06-21-2004

Today

M-D-Y

International Normalized Ratio

6

Form Status

Complete?

Incomplete

Save & Exit Form

Save & Stay

Cancel

Delete data for THIS FORM only

NOTE: To delete the entire record (all forms/events), see the record action drop-down at top of the Record Home Page.

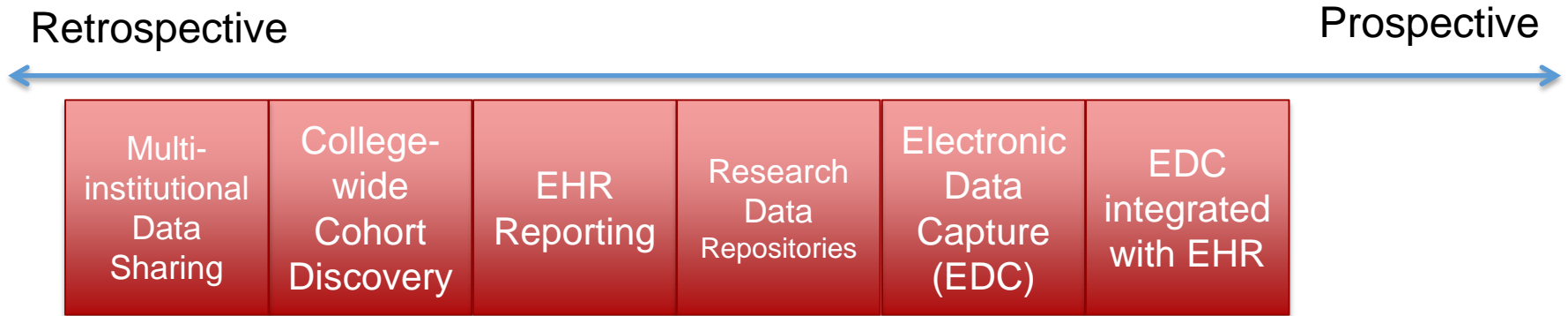
Logged in as STF2015 / stf2015

For full REDCap functionality, log in to REDCap in your web browser.

ARCH: Architecture for Research Computing in Health



ARCH: Architecture for Research Computing in Health



REDCap
Research Electronic Data Capture

ARCH: Architecture for Research Computing in Health



Epic

Allscripts™

REDCap
Research Electronic Data Capture

ARCH: Architecture for Research Computing in Health



Epic

REDCap
Research Electronic Data Capture

Allscripts™

CompuRecord



ARCH: Architecture for Research Computing in Health



Epic

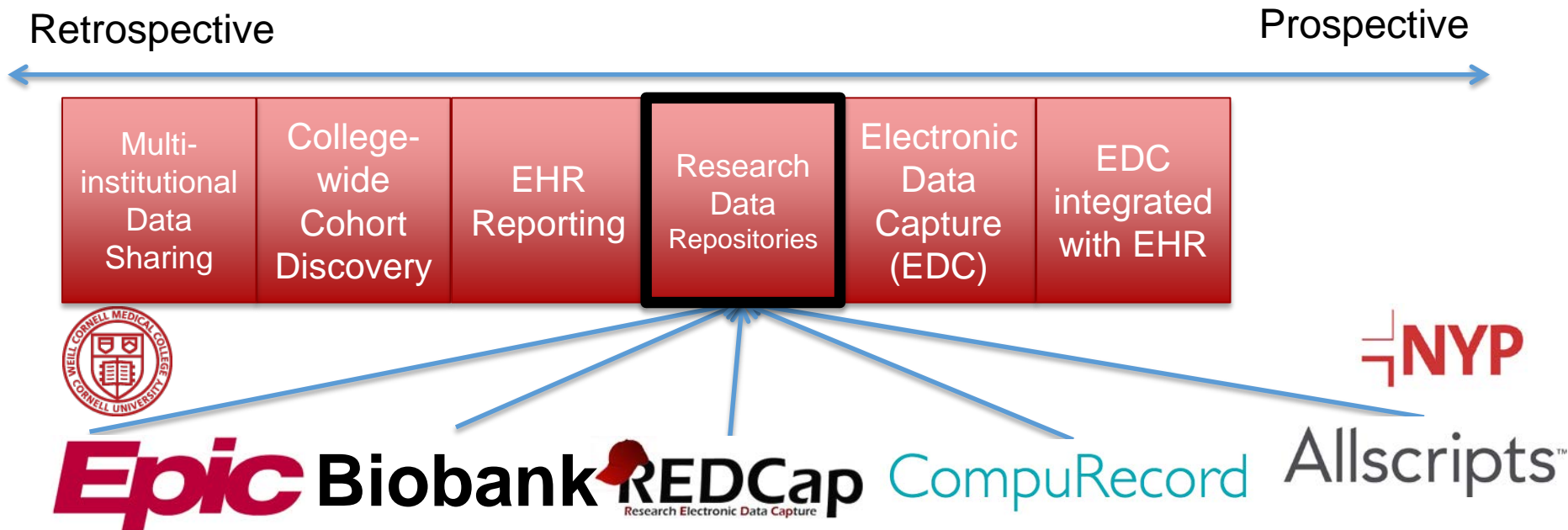
REDCap
Research Electronic Data Capture

Allscripts™

CompuRecord

Biobank

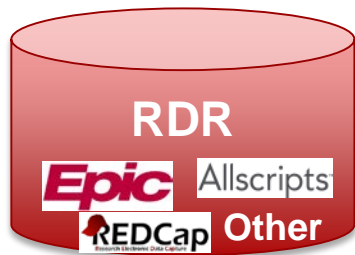
ARCH: Architecture for Research Computing in Health



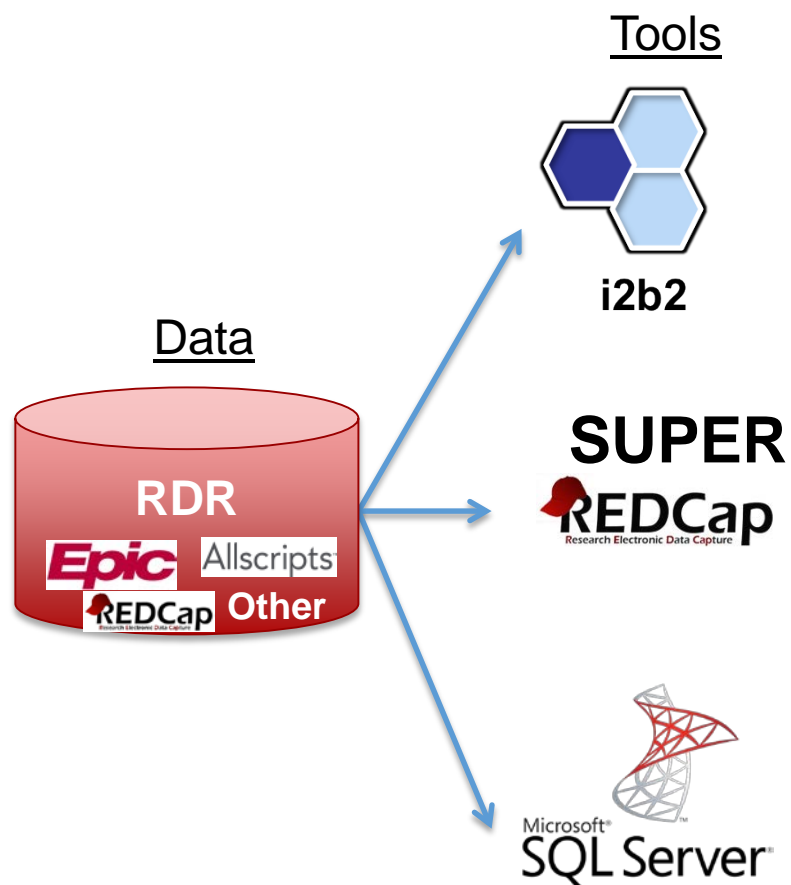


ARCH: Research Data Repository

Data

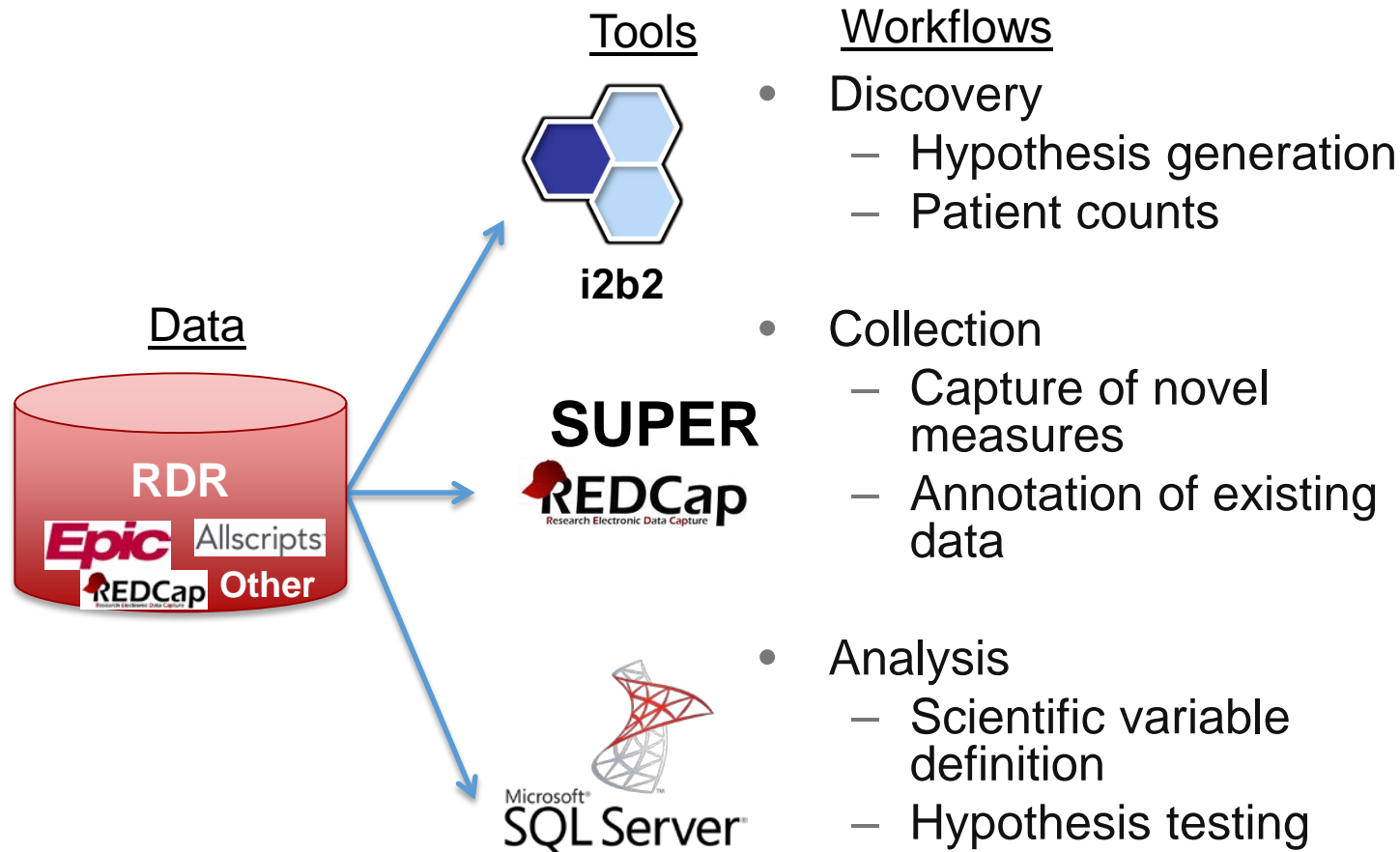


ARCH: Research Data Repository

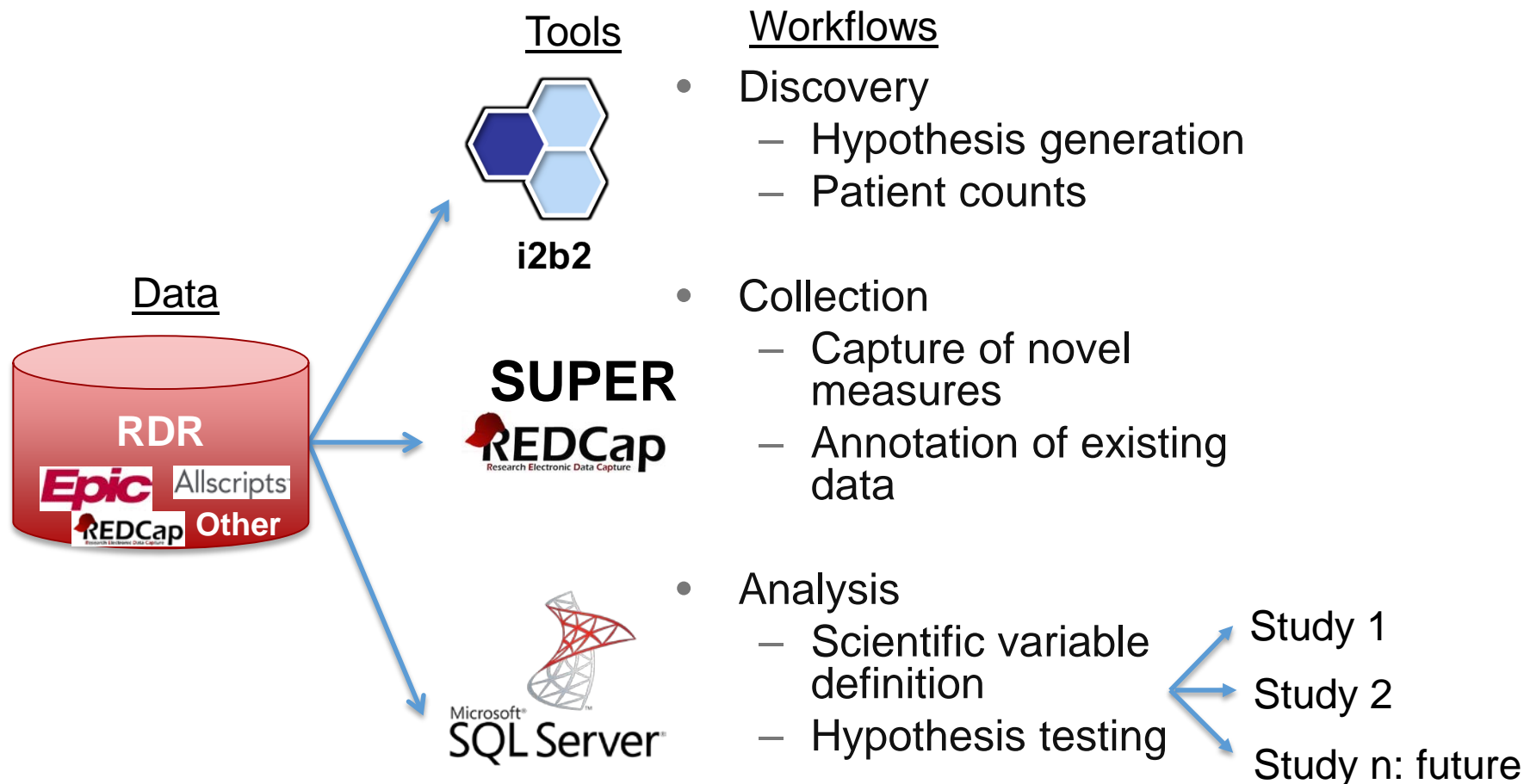




ARCH: Research Data Repository



ARCH: Research Data Repository





ARCH: Research Data Repositories

- All of Us Research Program (Kaushal)
- Anesthesiology (Turnbull)
- Center for Advanced Digestive Care (Shah)
- Clinical and Translational Neuroscience Unit (Kamel)
- Dalio Institute (Min)
- Health Informatics (Pathak/Zhang)
- Leukemia Program (Roboz)
- Myeloproliferative Neoplasms (Scandura)
- Neurological Surgery (Hoffman)
- Ophthalmology (D'Amico)
- Pediatric Epilepsy (Grinspan)
- Pediatric Pulmonology (Ono)
- Pulmonary and Critical Care (Schenck)
- Urology (Hu)
- Trauma and Surgical Critical Care (Winchell)



ARCH RDRs: Data Catalog

[Data Catalog \(Beta\)](#) [View Details](#) [thc2015](#) [Submit new...](#)

[View 21 datasets](#) [View 1 data providers](#) [View 0 data use agreements](#) [View 0 data access requirements](#) [View 4 keywords](#)

Dynamic Epilepsy Database (DED)

Data Provider: [Architecture for Research Computing in Health \(ARCH\)](#)

description

A data set aggregating both patient-level and procedure-level data for WCM patients with epilepsy (n = ~28,000). The patient-level DED view includes both basic demographic data and a quick view of each patient's most recent imaging and neuropsychological procedures, including excerpts from free text radiology reports. The procedure-level view contains detailed information about each imaging and neuropsychological procedure, including performing provider, CPT code, and other elements.

Record Period Start	Jan. 1, 2007
Record Period End	None
Keywords	ARCH RDR

Mitochondrial Biomarkers for the Onset and Severity of Sepsis (MBOSS)

Data Provider: [Architecture for Research Computing in Health \(ARCH\)](#)

description

A data mart designed to study early predictors of sepsis and the associated outcomes of different treatment approaches in a group of WCM patients presenting in the emergency department and consented to a specific protocol (n = ~300). Contains data from inpatient flowsheets, diagnoses, medications, microbiology lab results, blood bank systems, and others, including calculated critical care variables, such as Sequential Organ Failure (SOFA) score and others. Data can also be connected to banked specimens.

Discussion

- Research Informatics can help investigators
 - Obtain EHR data
 - Collect novel research data
 - Integrate data
- ARCH matches investigators with right tools and services with respect to
 - Study design
 - Data sources
 - Cost

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- Scott Turner
- Jacob Weiser

Questions

- Access and inquiries
 - ARCH inquiries: arch-support@med.cornell.edu
 - i2b2 access: i2b2-support@med.cornell.edu
- Web resources
 - ARCH: <http://arch.weill.cornell.edu>
 - TRAC: <https://webapps.nyp.org/trac>
 - Data Catalog: <http://datacatalog.weill.cornell.edu>
- Tom Campion
 - thc2015@med.cornell.edu
 - 646-962-2345
 - <http://vivo.med.cornell.edu/display/cwid-thc2015>