
AWS
re:Invent
NOV. 28 – DEC. 2, 2022 | LAS VEGAS, NV

HLC204

Advancing health equity with Amazon HealthLake

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AWS

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Rush University System For Health

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Creating easily accessible tools for supporting early disease detection and monitoring

IS MY WHY

Harvey Ruback
Senior Partner Solution Architect
Amazon Web Services



Patients today walk around with thousands of data points collected throughout their health journey

Hard to make data actionable

Data is **siloed**

Data is **unstructured**

Skills and resource **constraints**

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Healthcare priorities are evolving

Challenges we are hearing from healthcare customers

Demand for more **equitable access to care** as care moves from hospital-centric to locally delivered

Growing need for integrated diagnostics to deliver the **patient 360 view**

Demand for solutions that **shorten the cycle** between identification of clinical problems and implementation

Health systems under pressure to **capture more data, maintain level of services, and respond quickly** to patient needs under constant budget management

Undue time spent by healthcare professionals on **routine tasks that pull their attention away from the patient**

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Purpose-built and HIPAA-eligible services

AI/ML SERVICES AND USE CASES FOR HEALTHCARE AND LIFE SCIENCES



Amazon Transcribe Medical

Automatically convert medical speech to text



Amazon Rekognition

Automate medical image and video analysis



Amazon Comprehend Medical

Understand medical context with advanced text analytics



Amazon HealthLake

Store, transform, query, and analyze health data in minutes



Amazon SageMaker

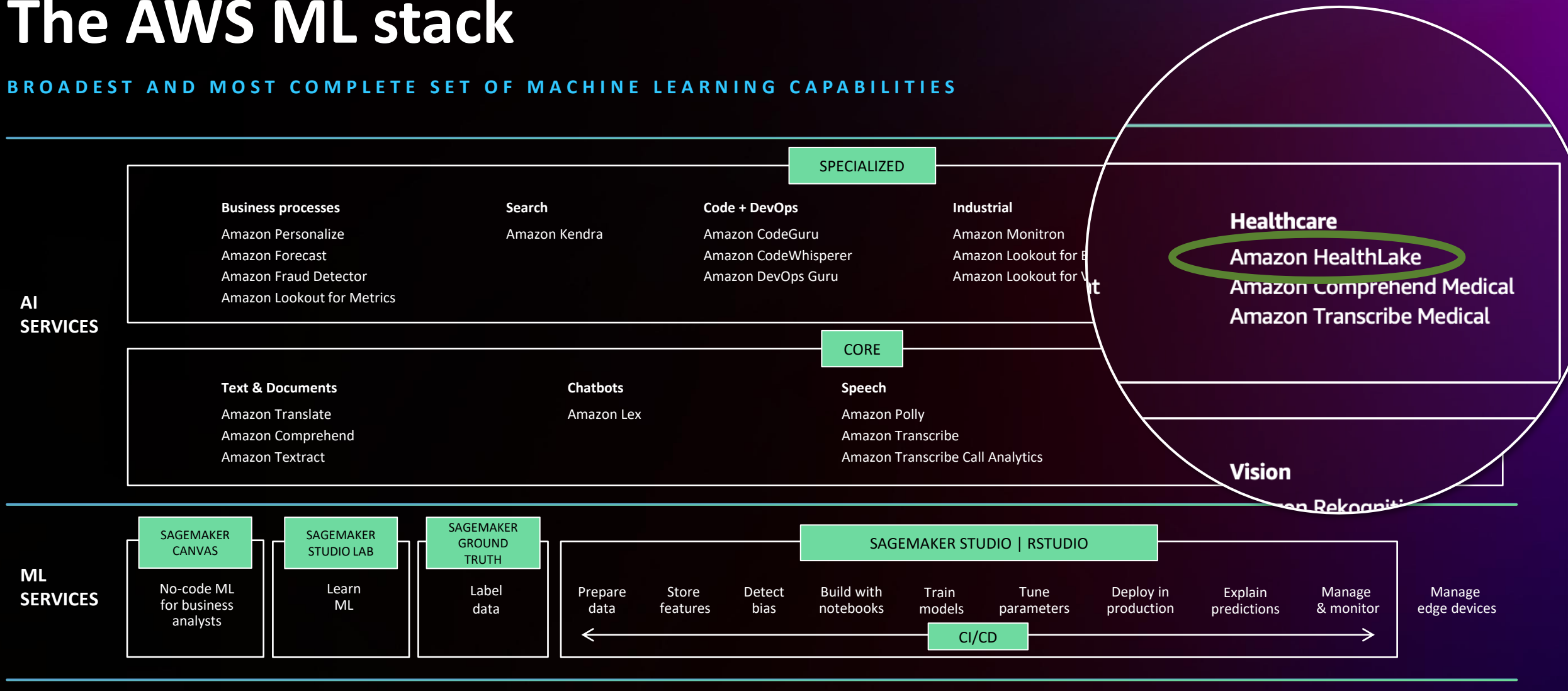
Build, train, and deploy machine learning models fast

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The AWS ML stack

BROADEST AND MOST COMPLETE SET OF MACHINE LEARNING CAPABILITIES



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Amazon HealthLake

A MANAGED, STANDARDS-BASED, SECURE, HIPAA-ELIGIBLE STORAGE AND ANALYTICS SERVICE

Unlocking the potential of your health and science data at scale



Store clinical/claims data using interoperability standards

Store a complete view of patient medical history from multiple data sources in the normalized common data model (FHIR-based) format to facilitate the exchange of information

Easily extract meaning from health data

Built-in Comprehend Medical to automatically extract meaning from unstructured data for easy search and querying

Apply analytics and ML on health data

Make predictions and identify trends with health data using Amazon SageMaker machine learning models and Amazon QuickSight analytics

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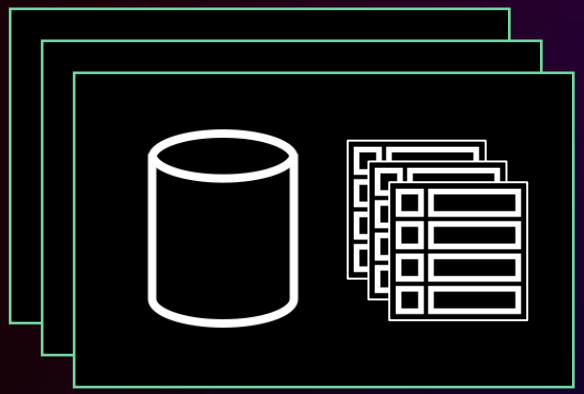
Data silos and complex pipelines

AMAZON HEALTHLAKE – MANAGED SERVICE – SINGLE-CLICK DATA STORE CREATION



Amazon HealthLake

Create Data Store

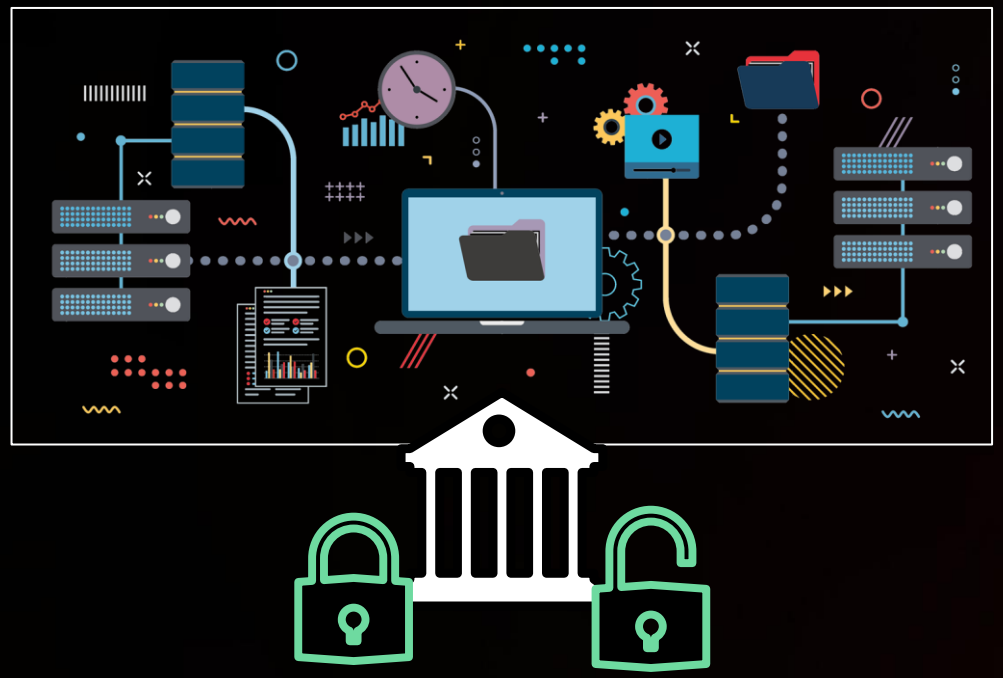


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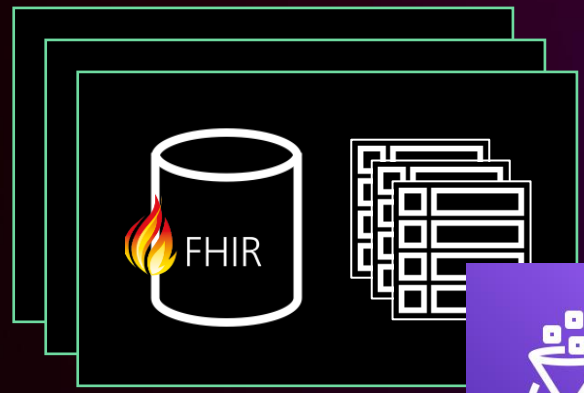
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Data interoperability and governance

AMAZON HEALTHLAKE – COMMON DATA SCHEMA AND AWS LAKE FORMATION ROLE-BASED ACCESS CONTROL



Amazon **HealthLake**



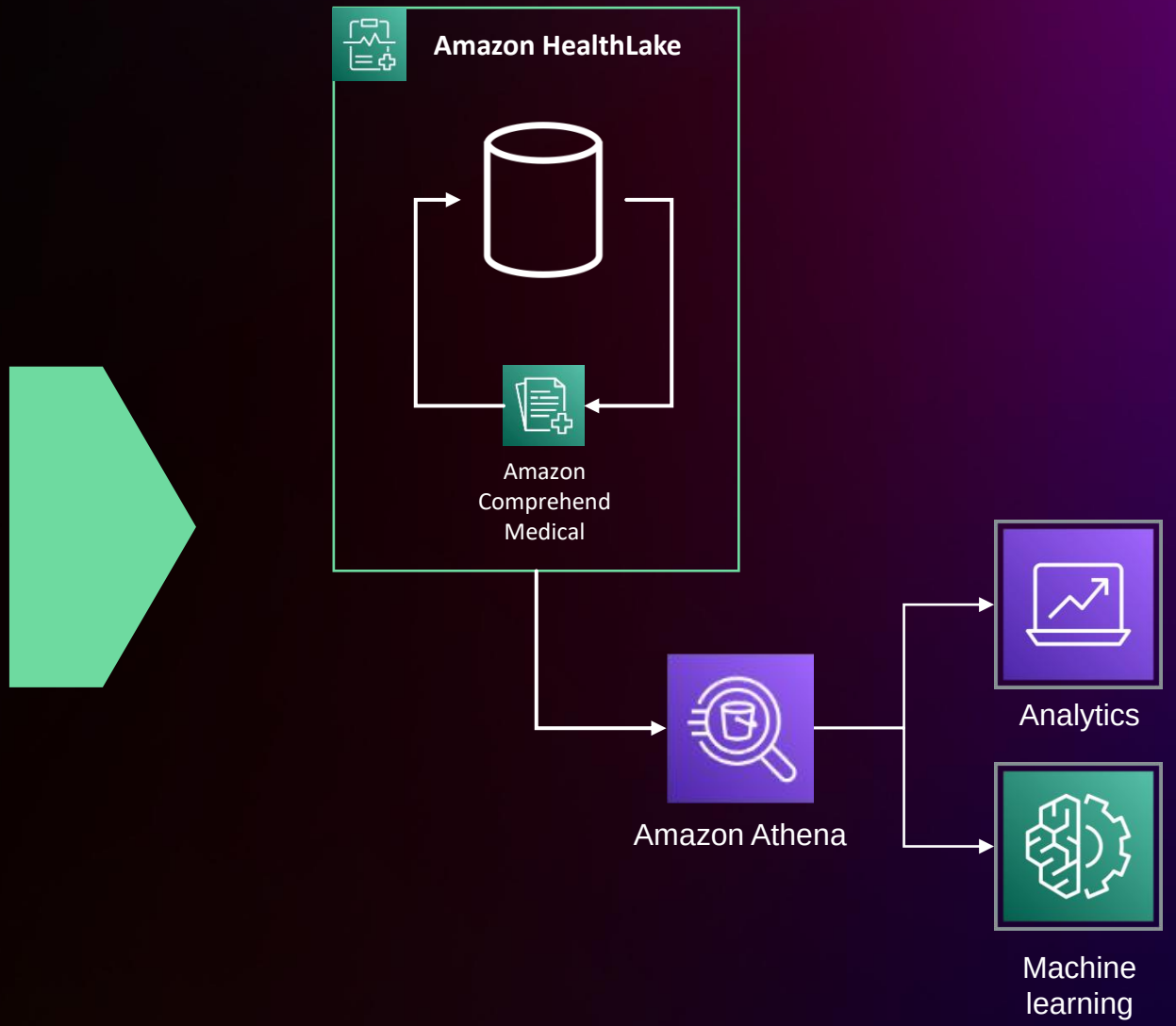
AWS Lake Formation

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Run analytics on unstructured data

AMAZON HEALTHLAKE WITH INTEGRATED COMPREHEND MEDICAL – HEALTHLAKE ANALYTICS





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Amazon HealthLake

Data sources



Electronic Health Records

Claims

Wearables + devices

Clinical notes

Real-time or batch

Use an Amazon HealthLake Partner – Connector Partner to convert data to FHIR

Amazon HealthLake

APIs
Create
Update
Read
Delete

Import

Data store

Structure

Tag and index

FHIR

Comprehend Medical

Search and query

APIs
Get
Search
Export

Analytics

Analytics using SQL

Longitudinal medical record

Dashboards/ML models

Amazon QuickSight

Identify trends
Interactive dashboards

Amazon SageMaker

Make predictions
Create predictive models

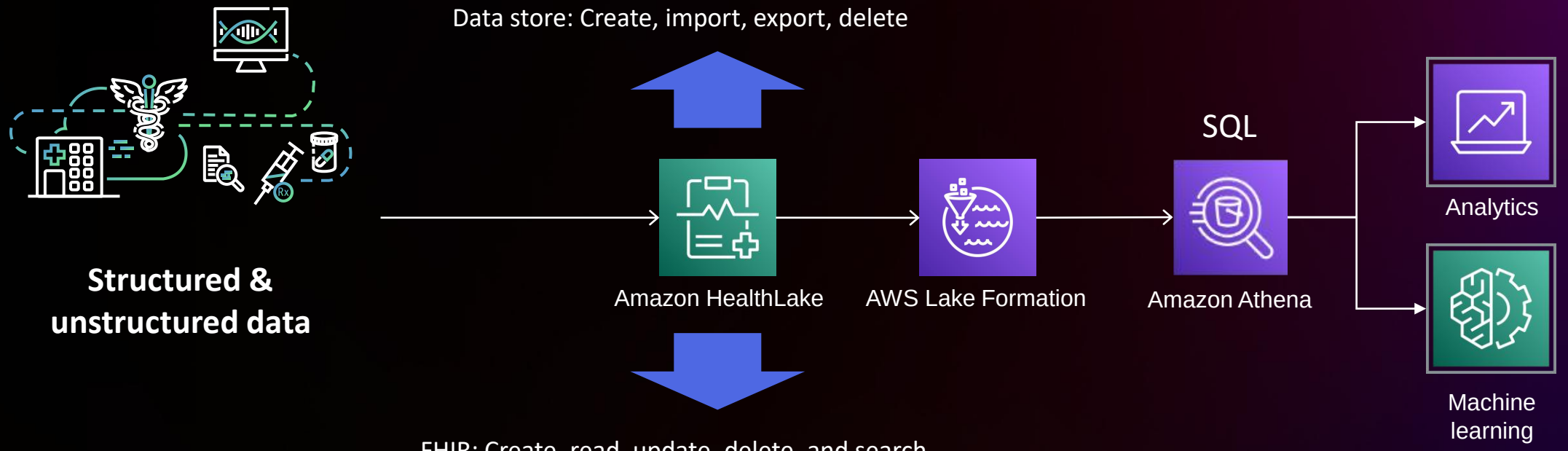
Third-party apps

Share data securely
Share and access data

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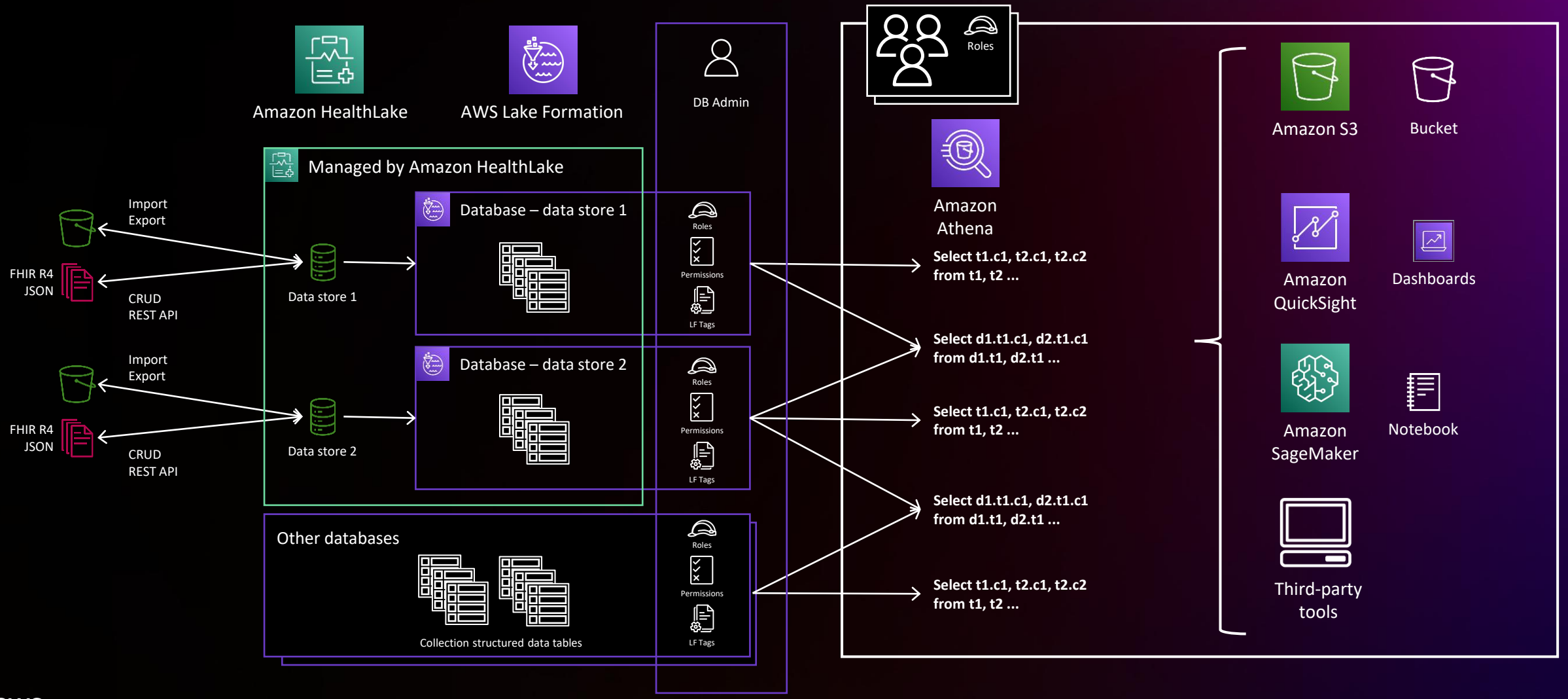
Amazon HealthLake analytics integration

Native integration with analytics services enabled through SQL access to data within Amazon HealthLake



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Amazon HealthLake and Lake Formation



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Extract medical insights from text

INTEGRATED AMAZON COMPREHEND MEDICAL



Medical notes

Physician notes, medical charts, lab reports, transcripts, and more

Amazon Comprehend Medical

Automatically extract insights from text

- Named entities and relation extraction
- PHI detection (Protected Health Information)
- ICD-10-CM linking
- RxNorm linking
- SNOMED CT linking

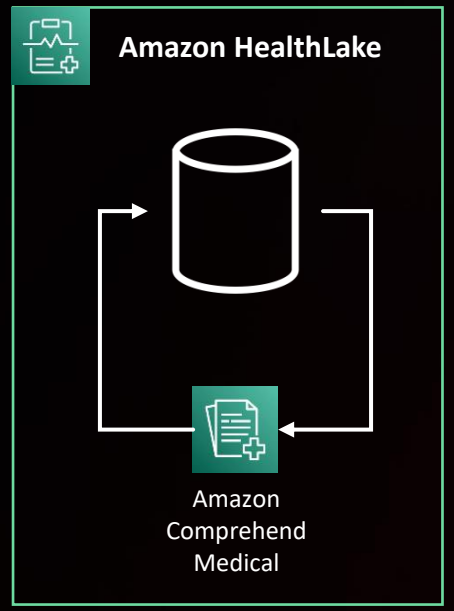
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System generated resources

HEALTHLAKE AMAZON COMPREHEND MEDICAL INTEGRATION – SYSTEM-GENERATED FHIR RESOURCES

Pt is 87 yo woman, highschool teacher with past medical history that includes
- status post cardiac catheterization in April 2019. She presents today with palpitations and chest pressure.

Pt is a 52 - year - old Caucasian male with an extensive past medical history that includes coronary artery disease , atrial fibrillation , hypertension , hyperlipidemia , presented to North ED with complaints of chills , nausea , acute left flank pain and some numbness in his left leg.

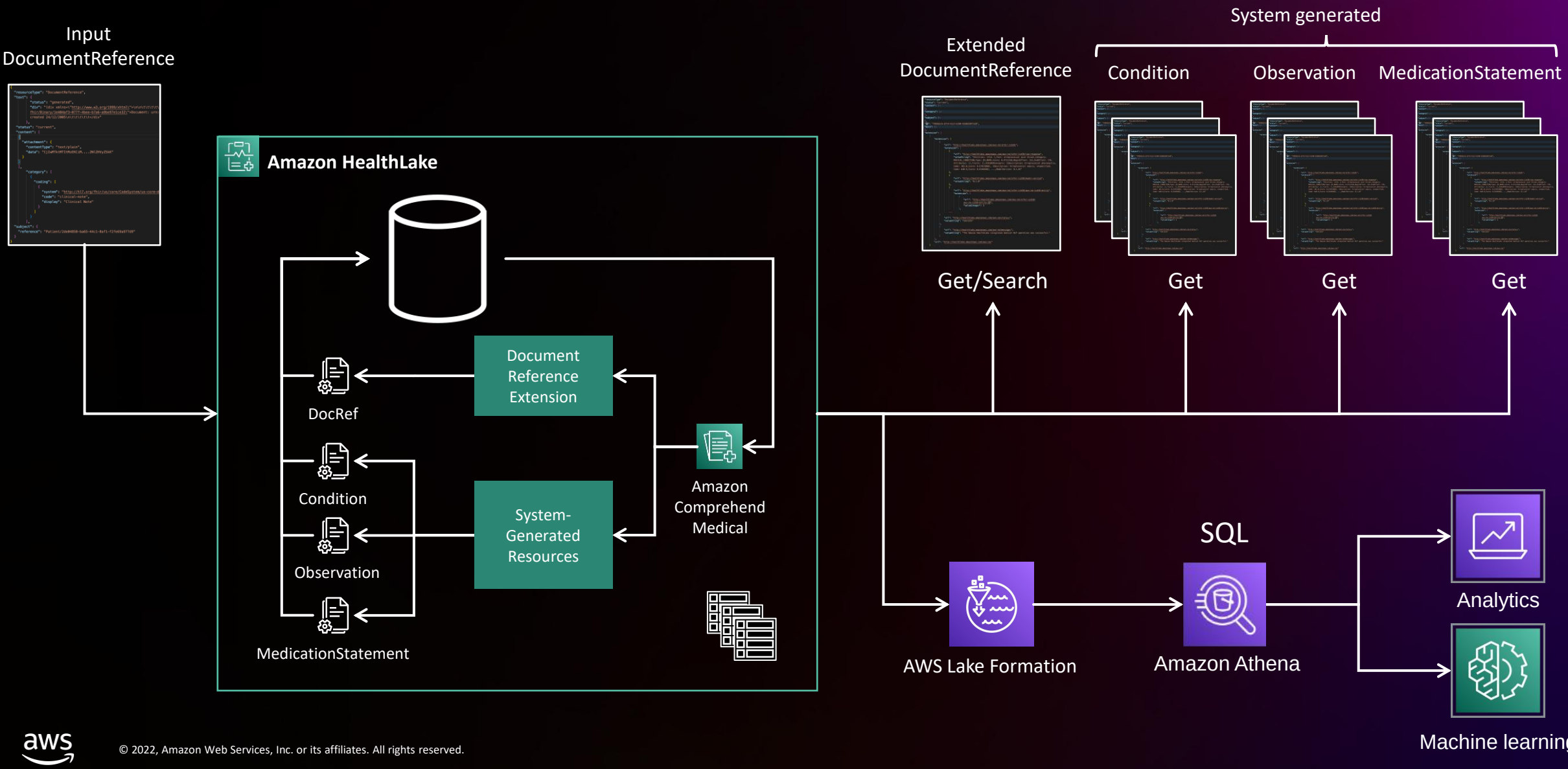


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},]
...

Unstructured → **Structured**

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DocumentReferences with HealthLake extensions



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Amazon HealthLake – Features added this year

- Analytics – Query with SQL
- System-generated resources from Amazon Comprehend Medical integration
- Include (_include) search support
- Updated quotas for CRUD operations
- Bundle support
- Maximum import job sized increased for StartFHIRImportJob
  - Assumptions: A typical resource is about 1 KB in size, and a patient file has about 500 resources on average; based on these numbers, the resources for 1 million patients can be imported in a single job

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Amazon HealthLake enables…



Amazon HealthLake



Providers

Population health

Health equity

Readmissions risk

…

Payors

Value-based care

Care management

Risk adjustment

…

Life sciences

Real-world evidence

Clinical trial eligibility

Secondary data analysis

…

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RUSH

Health Equity Care and Analytics Platform (HECAP)

Anil Saldanha

Chief Innovation Officer

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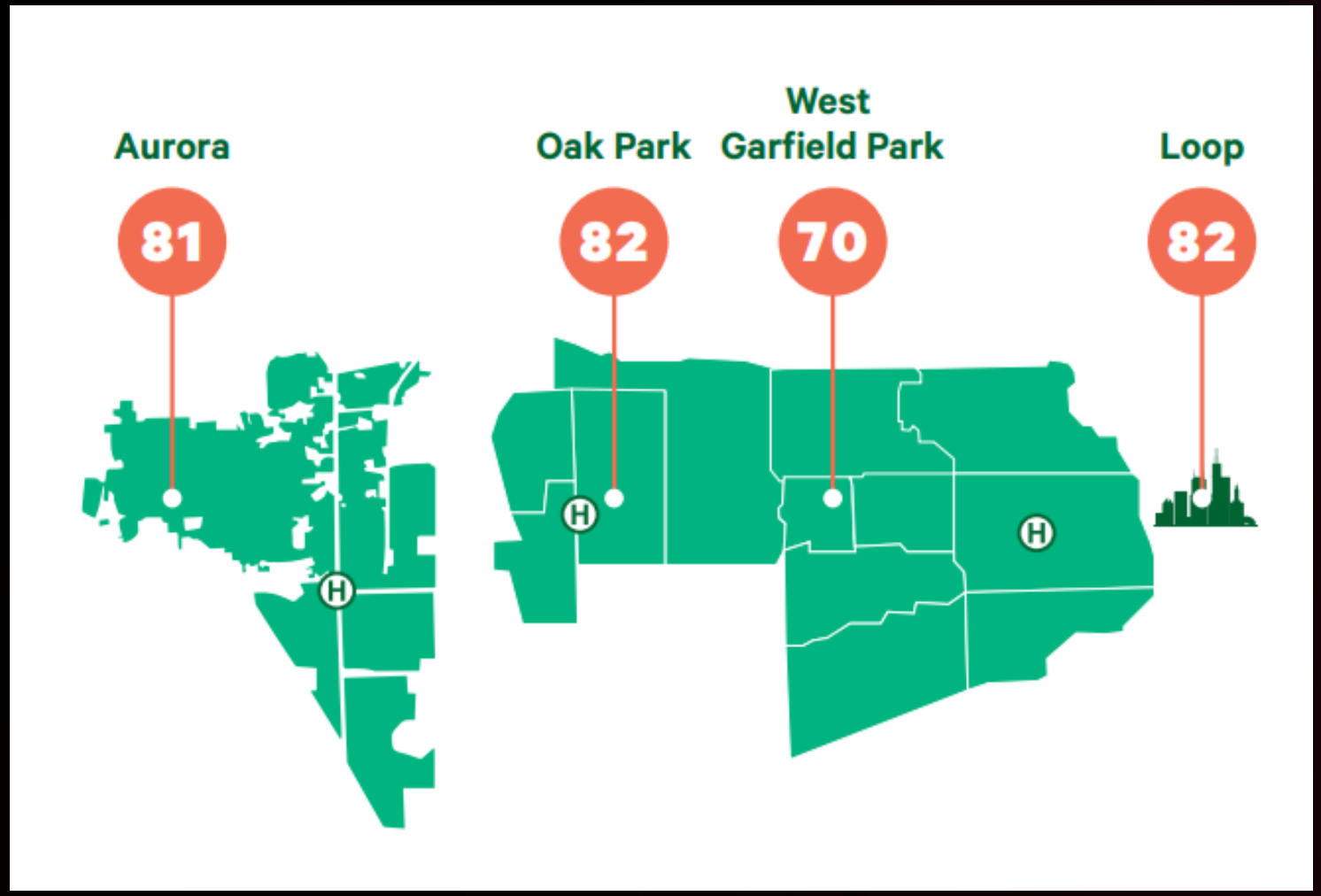
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Health Equity Care and Analytics Platform (HECAP)

Health data lake integrating EHR, SDoH, and cardiometabolic data to provide actionable insights for healthcare systems and patients

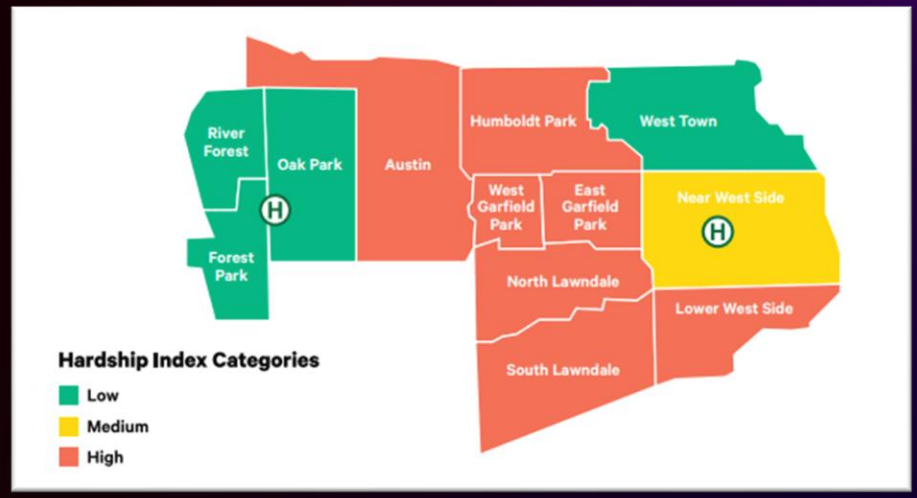
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Life expectancy on the west side of Chicago



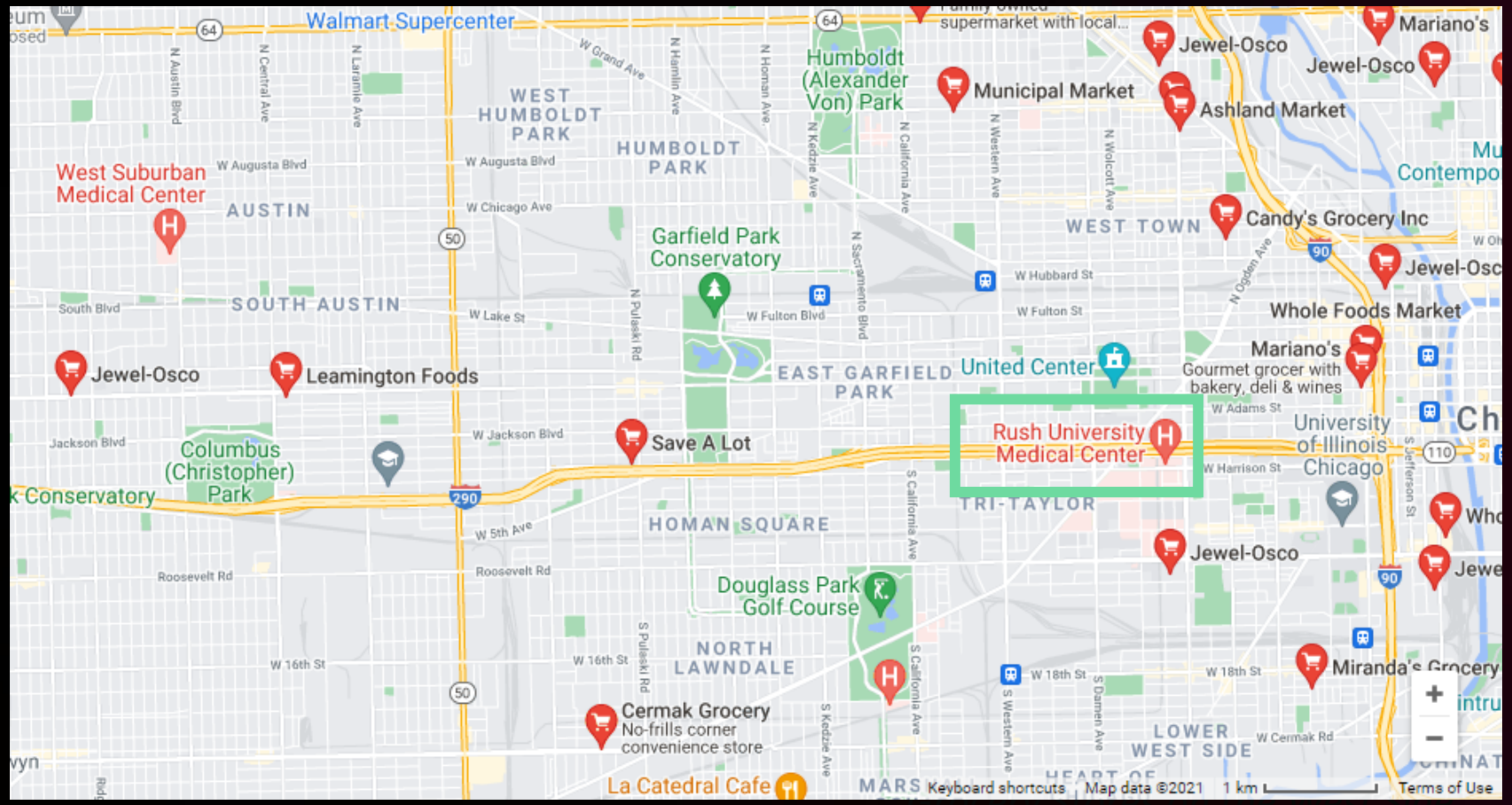
Leading causes of death

- Heart disease
- Cancer
- Stroke
- Diabetes



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Underlying causes of preventable death and disease



470,000 lives

Socioeconomic health disparities:

- Food insecurity
- Social and mental health support
- Affordable housing
- Transportation
- Environmental and community safety
- Education and employment opportunities

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HECAP objectives

1. Enrich data lake content on AWS
2. Collect and integrate patient generated data (e.g., survey, DME)
3. Develop SDoH and cardiometabolic risk stratification models
4. Develop presentation layer of data lake and risk registries
5. Utilize standards and open API to promote utilization/integration

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HECAP architecture

Data sources

Rush EMR data

FHIR

CMS blue button claims data

FHIR

BlueButton Download my data

Patient generated data

FHIR





Publicly available data

CDC Centers for Disease Control and Prevention

HealthData.gov

HECAP

AWS Data Lake (analytics)

FHIR

Amazon HealthLake

Amazon SageMaker

Amazon Athena

AWS Lake Formation

HECAP

Presentation

FHIR



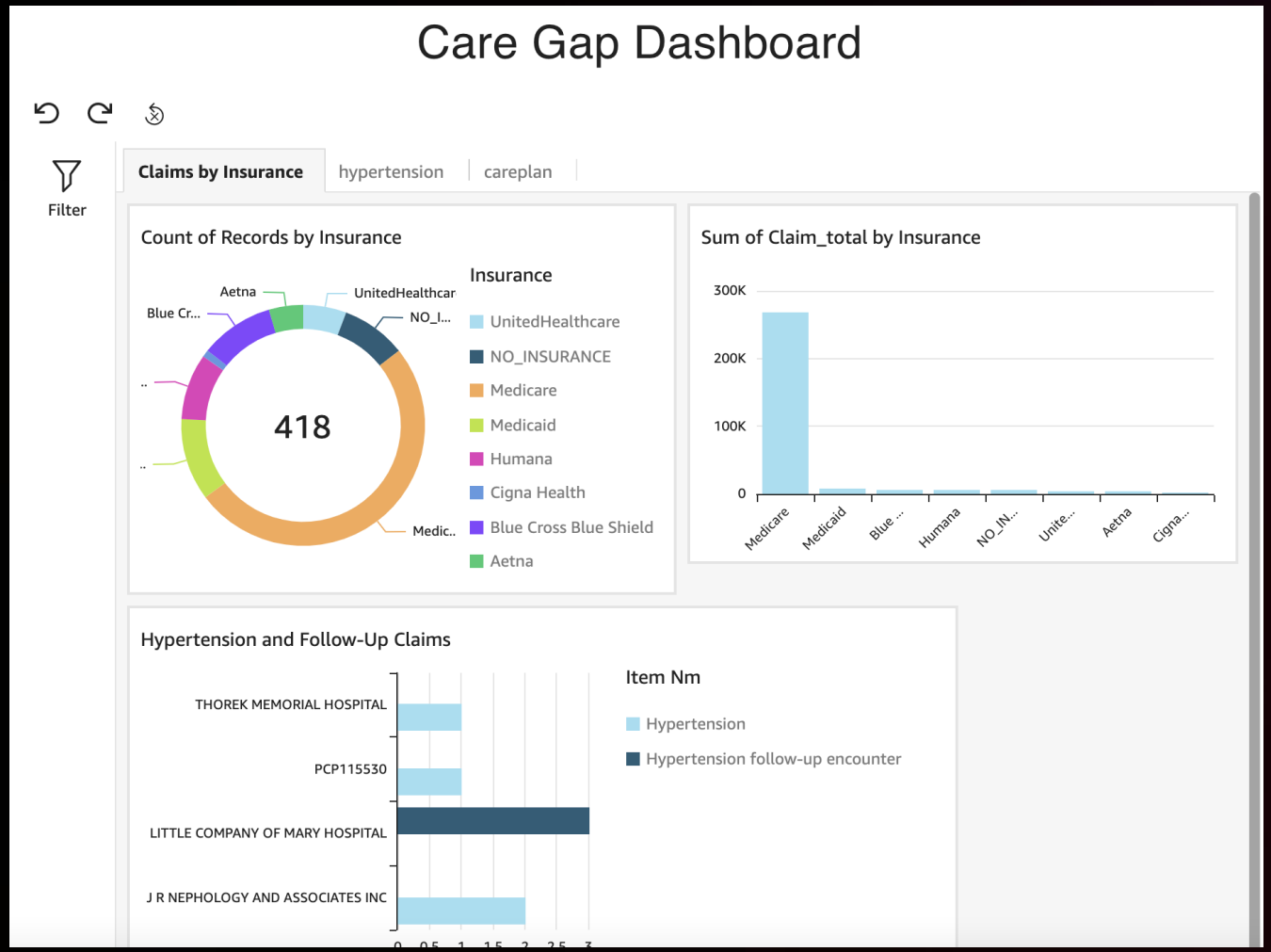
Amazon QuickSight

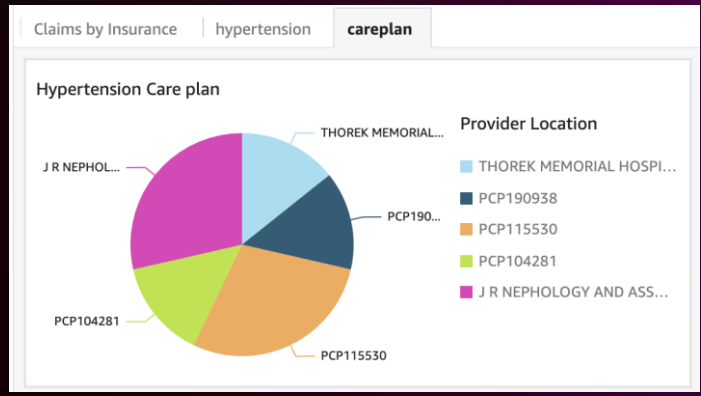
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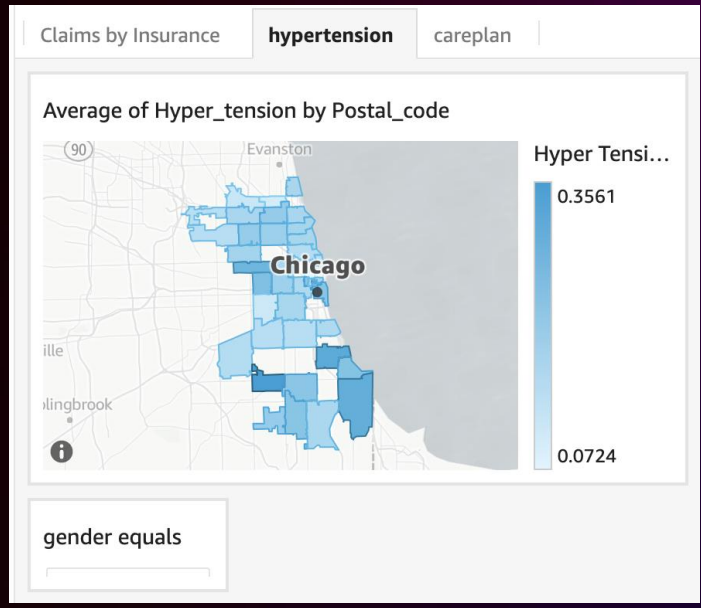
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HECAP dashboard powered by HealthLake

CARE GAPS (WEST CHICAGO)



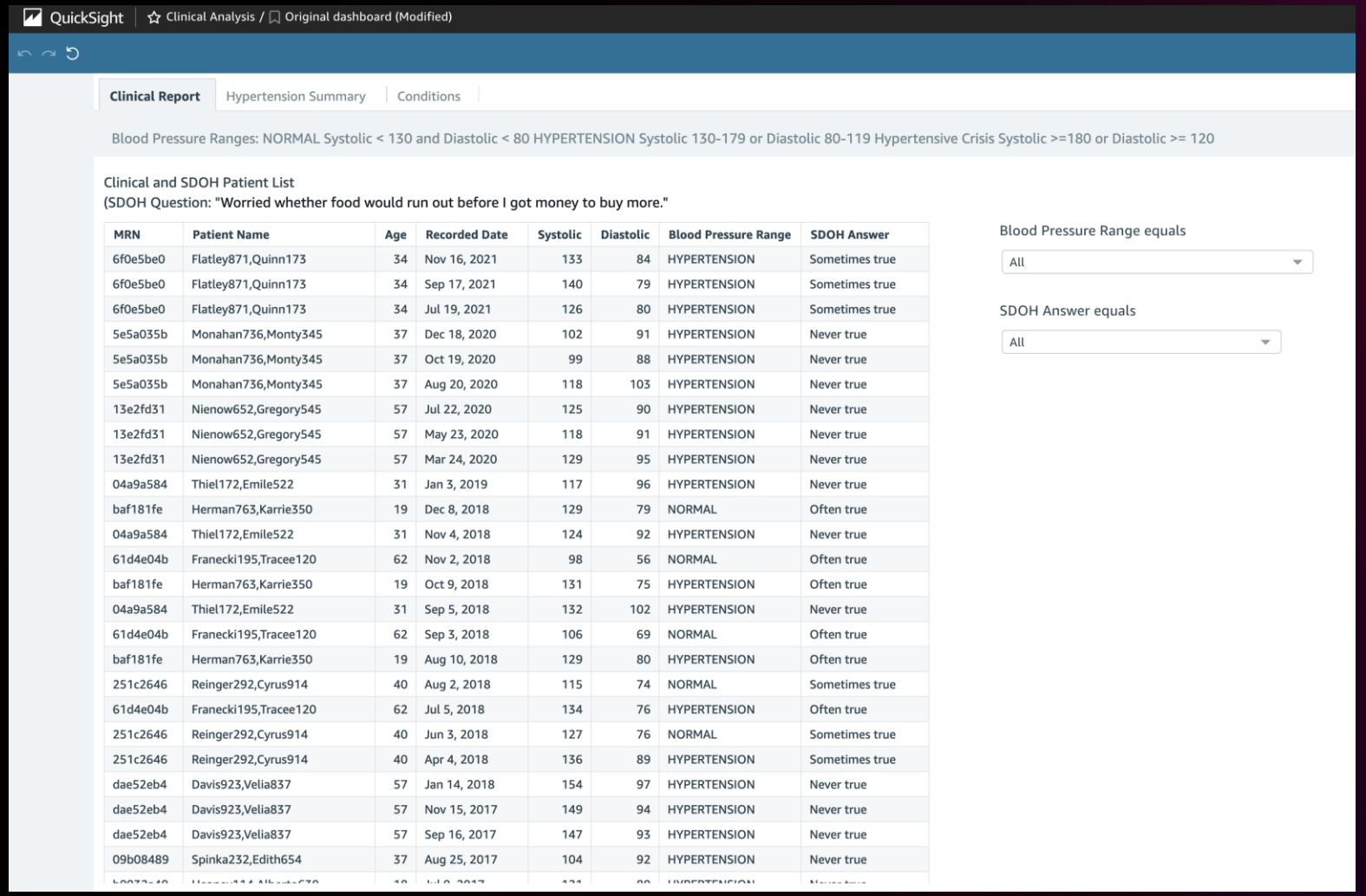




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CARE GAPS (WEST CHICAGO)

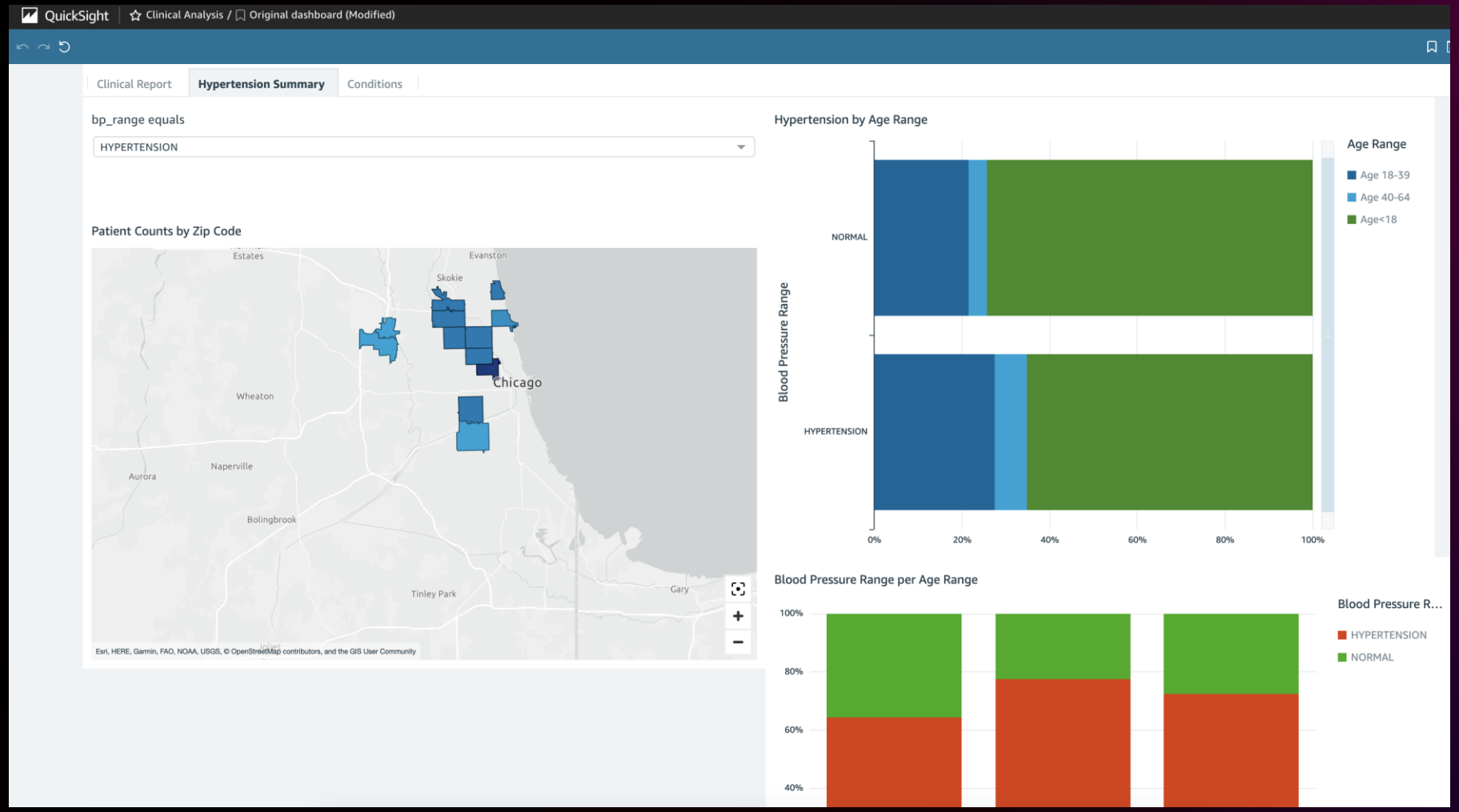


MRN	Patient Name	Age	Recorded Date	Systolic	Diastolic	Blood Pressure Range	SDOH Answer
6f0e5be0	Flatley871,Quinn173	34	Nov 16, 2021	133	84	HYPERTENSION	Sometimes true
6f0e5be0	Flatley871,Quinn173	34	Sep 17, 2021	140	79	HYPERTENSION	Sometimes true
6f0e5be0	Flatley871,Quinn173	34	Jul 19, 2021	126	80	HYPERTENSION	Sometimes true
5e5a035b	Monahan736,Monty345	37	Dec 18, 2020	102	91	HYPERTENSION	Never true
5e5a035b	Monahan736,Monty345	37	Oct 19, 2020	99	88	HYPERTENSION	Never true
5e5a035b	Monahan736,Monty345	37	Aug 20, 2020	118	103	HYPERTENSION	Never true
13e2fd31	Nienow652,Gregory545	57	Jul 22, 2020	125	90	HYPERTENSION	Never true
13e2fd31	Nienow652,Gregory545	57	May 23, 2020	118	91	HYPERTENSION	Never true
13e2fd31	Nienow652,Gregory545	57	Mar 24, 2020	129	95	HYPERTENSION	Never true
04a9a584	Thiel172,Emile522	31	Jan 3, 2019	117	96	HYPERTENSION	Never true
baf181fe	Herman763,Karrie350	19	Dec 8, 2018	129	79	NORMAL	Often true
04a9a584	Thiel172,Emile522	31	Nov 4, 2018	124	92	HYPERTENSION	Never true
61d4e04b	Franecki195,Tracee120	62	Nov 2, 2018	98	56	NORMAL	Often true
baf181fe	Herman763,Karrie350	19	Oct 9, 2018	131	75	HYPERTENSION	Often true
04a9a584	Thiel172,Emile522	31	Sep 5, 2018	132	102	HYPERTENSION	Never true
61d4e04b	Franecki195,Tracee120	62	Sep 3, 2018	106	69	NORMAL	Often true
baf181fe	Herman763,Karrie350	19	Aug 10, 2018	129	80	HYPERTENSION	Often true
251c2646	Reinger292,Cyrus914	40	Aug 2, 2018	115	74	NORMAL	Sometimes true
61d4e04b	Franecki195,Tracee120	62	Jul 5, 2018	134	76	HYPERTENSION	Often true
251c2646	Reinger292,Cyrus914	40	Jun 3, 2018	127	76	NORMAL	Sometimes true
251c2646	Reinger292,Cyrus914	40	Apr 4, 2018	136	89	HYPERTENSION	Sometimes true
dae52eb4	Davis923,Velia837	57	Jan 14, 2018	154	97	HYPERTENSION	Never true
dae52eb4	Davis923,Velia837	57	Nov 15, 2017	149	94	HYPERTENSION	Never true
dae52eb4	Davis923,Velia837	57	Sep 16, 2017	147	93	HYPERTENSION	Never true
09b08489	Spinka232,Edith654	37	Aug 25, 2017	104	92	HYPERTENSION	Never true

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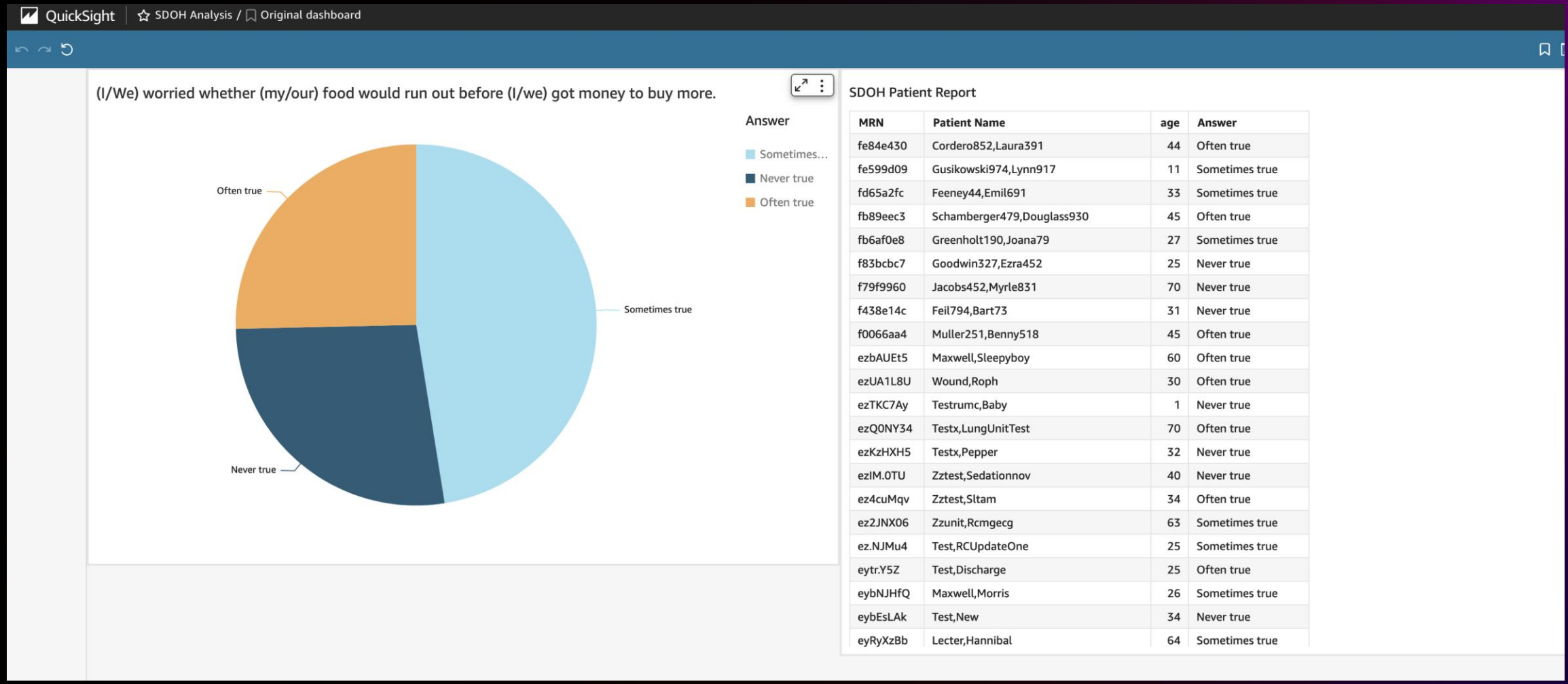
CARE GAPS (WEST CHICAGO)



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HECAP dashboard powered by HealthLake

CARE GAPS (WEST CHICAGO)



SDOH Patient Report

MRN	Patient Name	age	Answer
fe84e430	Cordero852,Laura391	44	Often true
fe599d09	Gusikowski974,Lynn917	11	Sometimes true
fd65a2fc	Feeney44,Emil691	33	Sometimes true
fb89eec3	Schamberger479,Douglass930	45	Often true
fb6af0e8	Greenholt190,Joana79	27	Sometimes true
f83bcbc7	Goodwin327,Ezra452	25	Never true
f79f9960	Jacobs452,Myrle831	70	Never true
f438e14c	Feil794,Bart73	31	Never true
f0066aa4	Muller251,Benny518	45	Often true
ezbAUEt5	Maxwell,Sleepyboy	60	Often true
ezUA1L8U	Wound,Roph	30	Often true
ezTKC7Ay	Testrumc,Baby	1	Never true
ezQ0NY34	Testx,LungUnitTest	70	Often true
ezKzHXH5	Testx,Pepper	32	Never true
ezIM.0TU	Zztest,Sedationnov	40	Never true
ez4cuMqv	Zztest,Sltam	34	Often true
ez2JNX06	Zzunit,Rcmgecg	63	Sometimes true
ez.NJMu4	Test,RCUpdateOne	25	Sometimes true
eytr.Y5Z	Test,Discharge	25	Often true
eybNJHfQ	Maxwell,Morris	26	Sometimes true
eybEsLAk	Test,New	34	Never true
eyRyXzBb	Lecter,Hannibal	64	Sometimes true

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Next steps

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AWS Health Lounge

Connect with **AWS Health experts** and other attendees in our dedicated lounge space for **informal discussions and networking**

Explore **AWS Healthcare and Life Sciences demos** and new additions to the AWS for Health portfolio!

Location: AWS Industries Networking Lounges; Caesars Forum Main Hall



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AWS + Children's National Hospital





Artwork provide by Alice, age 11, patient with neurological condition

"I drew a heart because I love all of the people that took care of me at Children's National."

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