

# Overview of Cosmos

When you have participation from hundreds of organizations combining EHR data from almost 200 million patients, you can improve the health and lives of people everywhere. Cosmos is what will help make that possible. It will bring together data from across the Epic community to form the universe's largest database of EHR patient information, which you can use to:

- **Gain insights at the point of care.** Best Care for My Patient will help clinicians make key clinical decisions—such as which medication to prescribe or whether to perform surgery—by looking at the millions of patients and interactions in Cosmos and showing what's worked best for similar patients.
- **Accelerate the pace of healthcare innovation.** When you and hundreds of your peers share data with Cosmos, you can draw upon the collective data of the Epic community to analyze health information and create knowledge at an unprecedented scale.
- **Collaborate with peers.** With the Look-Alikes feature, Cosmos will connect clinicians who care for similar patients with rare characteristics so they can collaborate and learn from each other's experience.

## How Does Cosmos Work?

Organizations choose to participate in Cosmos and contribute a [HIPAA-defined limited data set](#) for all patients to the centralized Cosmos database. Every Cosmos user gets access to the community-wide data set that will continue to grow over time. Users explore Cosmos using SlicerDicer, Epic's data exploration tool.

We collect feedback from the Epic community about use cases for Cosmos. Based on that feedback, the definition of a limited data set, and guidance from the Cosmos Governing Council, we define the Cosmos data set.

### Core Data Set

The following table lists the core Cosmos data domains and the key elements included within those domains.

Domain	Includes
Allergies	Allergen, reaction, reaction type, severity
Birth History	Delivery method, gestational age, birth count, birth order, birth weight, discharge weight, length, head circumference, APGAR, length of stay, type of nourishment
Care Teams	Provider specialty
Demographics (Limited Data Set)	Age*, legal sex, gender identity, sex assigned at birth, race, ethnicity, country, state, county, 5-digit ZIP, patient status, date of death, cause of death, spoken and written language, marital status
Diagnoses	Diagnosis, problem list diagnosis, billing diagnosis



<b>Encounters and Admissions</b>	Encounter type (outpatient, admission, ED, HOV), department specialty, means of arrival, discharge disposition, reason for visit/chief complaint, insurance/financial class, ED acuity, ICU stay
<b>Family History</b>	Relationship (including child-birthing parent linkages), relation legal sex
<b>Immunizations</b>	Immunization, route
<b>Infections</b>	Infection
<b>Lab Component Results</b>	Component, result value, abnormal flag, LOINC
<b>Medications</b>	Medication (prescription, hospital or clinic administration, patient-reported)
<b>Microbiology Results</b>	Organism, antibiotic, sensitivity
<b>MyChart Data</b>	MyChart usage
<b>OB History</b>	Anesthesia method, birth complications, delivery method
<b>Procedures</b>	Clinical procedure, billed procedure
<b>SmartData Elements</b>	Elements used with these record types: patients, encounters, orders, notes, history, problems
<b>Social History</b>	Tobacco, alcohol, substance use, birth control, SDOH
<b>Ventilators</b>	Ventilator use, intubation
<b>Vitals</b>	Blood pressure, pulse, temp, respirations, SpO <sub>2</sub> , height, weight, BMI, head circumference

*\*How Cosmos Handles Age*

Although full date of birth information is permitted in a limited data set, Cosmos generally stores age in months. For neonatal and pediatric research, having age in days is helpful, so the Cosmos data set only includes patient age in days when needed for those use cases. We defined the following grouping that controls the granularity of birth date information when sending encounters to Cosmos.

<b>Patient's age during encounter</b>	<b>Age unit</b>
Under 9 weeks	Days (birth date)
9 weeks – 6 months	Weeks (birth week)
6 months – beyond	Months (birth month)

### Newest Data Types

The Cosmos data set is continually growing to accommodate new use cases. The following table lists the latest data types we've added to the Cosmos data set. Note that in early 2021, we updated the Cosmos infrastructure to support a more streamlined approach for extending the data set. We can handle new data types, when appropriate, without your organization needing to upgrade to a new version or install a special update. Data types handled with this new approach appear as "version agnostic" in the table with the calendar month in which they were first available.

<b>Data type</b>	<b>Available as of</b>
<b>ED acuity</b>	February 2020 version
<b>Marital status</b>	November 2020 version
<b>OB history (anesthesia method, birth complications, delivery method)</b>	February 2021 version
<b>Ventilators and intubations</b>	February 2021 version

<b>MyChart usage</b>	Version agnostic – added March of 2021
<b>ICU stays</b>	Version agnostic – added March of 2021

## ***Future Data Types***

The following data types are planned for the future:

- Cancer staging
- Cancer treatment protocols
- Claims data
- Complex medications and mixtures
- Cost data
- Flowsheet data (specific data)
- Genetic variants
- Genomic indicators
- Human phenotypic ontologies
- Medication adherence information
- Past Health Maintenance alerts
- Patient-reported outcomes
- Referrals
- Transplant data

## ***Data Transfer***

The Cosmos engine is built on capabilities derived from Care Everywhere to exchange patient records using CDA documents. Cosmos CDA documents only include a limited data set, not full PHI. The Cosmos exchange works similarly to the organization-to-organization patient exchanges in Care Everywhere already in use across the Epic community.

You don't need an additional data warehouse, ETL, or i2b2 instance to participate in Cosmos. In most cases, no additional servers are required. Before you submit data, Epic will work with you to perform a Cosmos system impact assessment to understand, plan for, and minimize impact to your overall system performance.

### ***Longitudinal Records***

After you sign up for Cosmos and complete the initial setup, the Cosmos engine submits historic patient data in configurable increments to Cosmos.

### ***Updates to Records***

When the patient or encounter data changes, the system flags and transmits the updates to Cosmos.

### ***Cross-Organization Patient Matching***

Cosmos enables cross-organization patient matching without the need for patient demographics through patient links established in Care Everywhere. These links (Care Everywhere IDs) are masked using a SHA-256 hashing mechanism when sent to Cosmos. This obscures the IDs in an irreversible way. As new links are established through Care Everywhere, Cosmos identifies and merges cross-organization duplicates.

### ***Excluding Protected Data***

Cosmos is built on a flexible infrastructure that can accommodate different state-specific regulatory and consent requirements for data. During the Cosmos implementation process, your Epic representative will work with you to configure your Cosmos data submission as necessary to comply with state and local laws.



## Mapping

Cosmos uses industry-standard terminologies when available. As with any data sharing program, it might be necessary to map data to these terminologies so that every organization's data is standardized and uniform when aggregated. We provide mapping tools and processes to help you with additional Cosmos-specific mapping. Cosmos reuses mappings already completed for projects such as regulatory reporting or Happy Together. Conversely, mapping that you do for Cosmos will reduce the mapping needed for a Happy Together Longitudinal Plan of Care (LPOC) project.

### *Mapping in the Foundation System*

Starting with the May 2020 version of the Foundation System, the majority of data domains are pre-mapped to the required standards for Cosmos. This means that if you're a newly implementing organization that takes a cut of the Foundation System, much of your Cosmos mapping is already complete out of the box. You'll just need to complete additional mapping for lab result components and some procedures, as well as mapping for any custom values not included in the Foundation System that you decide to add—these processes are baked into your implementation so you can be ready to participate in Cosmos once your system is live.

## *The Cosmos Portal*

Initially, users explore Cosmos using SlicerDicer over a secure web portal. The SlicerDicer instance used for Cosmos is hosted by Epic, so you don't need to be live with SlicerDicer or Caboodle (the underlying data warehouse) at your own organization.

SlicerDicer enables complex query and visualization capabilities, while creating a layer of separation between users and the raw line-level patient data. Query results are returned through different visualizations, counts, and percentages. SlicerDicer provides broad and general access to users without the need for individual study-level approval each time a Cosmos user wants to explore the data.

Another tool in the Portal, the Hitchhiker's Guide to the Cosmos, gives users a place to learn more about the data they're exploring. The Guide includes expanded definitions for all of the data in Cosmos, including explanations of individual data elements, information about how the data is populated in Epic, known biases and limitations for a given data set, and full data lineage.

Additional functionality, such as machine learning embedded within SlicerDicer and the Look-Alikes and Best Care for My Patient features described above, will become available to participants as well.

## *Data Security*

Cosmos is built in a secure way to protect patient privacy by enforcing strict control on how data is collected, transmitted, stored, and accessed.

The points below highlight security measures at high level. If you're already signed up for Cosmos, you can review the [Cosmos Security and Privacy](#) document for a detailed look at Cosmos data security.

### *Transmission and Storage*

- No direct patient identifiers are stored in Cosmos.
- Data is transmitted using the secure Care Everywhere network.



- Cosmos is hosted by Epic in our secure data center.
- Data cannot be exported outside the Cosmos environment.

#### *Access Control*

- Participating organizations review their Cosmos users on a recurring basis. This provides regular opportunities to renew access for active users and end access for those who should no longer have it.
- All Cosmos users must have a current association with a Cosmos-participating organization.
- Users are provisioned at the request of participating organizations.
- Epic logs all logins and all queries executed within Cosmos for audit purposes. Query logging is performed using logging built into SlicerDicer as well as native logging available through SQL Server.

#### *Data Set Protection*

- Users electronically sign a HIPAA-required data use agreement as they first gain access to Cosmos.
- The data is shown in SlicerDicer at a summary level only, meaning users cannot drill down into line-level data (the data elements specific to one patient or encounter). This ensures the output is de-identified.
- SlicerDicer masks low cell counts when queries return fewer than 11 results. For example, the output appears as “11 or fewer” rather than the actual number. This threshold was selected to match CMS’s recommendation on the [Limited Data Set Data Use Agreement form \(section 8a\)](#) to not show cell counts lower than 11. It was validated by Cosmos Governing Council as well.
- Users cannot export data.

## How Does Cosmos Participation Work?

Participating organizations agree to the Cosmos Rules of the Road, which defines the expectations of all participants. Changes to the Rules of the Road can be proposed by organizations through the Epic community-elected Governing Council, voted on by all Cosmos participants, and approved by Epic.

When you sign up for Cosmos, you sign a license amendment, which includes the Cosmos Rules of the Road as an attachment that can be updated separately. This follows a similar process and structure used by the Epic community for Care Everywhere, which ensures that the Rules of the Road can be refined by the community over time.

### **Governance**

The Cosmos Governing Council is a community-elected 11-member group of representatives from the Epic community. Members of the Council provide strategic guidance on Cosmos functionality and also help define expectations of use for the community. Members serve voluntary 36-month staggered terms, with elections each spring.

The current Council, elected in 2021, is made up of the following members:

- Andrew Naidech, MD, MSPH – Northwestern Medicine



- Bala Hota, MD, MPH – Rush University
- Eduardo Iturrate, MSW, MD – NYU Langone Health
- Elisa Priest, DRPH – Baylor Scott & White Health
- Jon Puro – OCHIN
- Keith Marsolo, PhD – Duke University Health System
- Michael Draugelis – Penn Medicine
- Nicholas Rider, DO – Texas Children's Hospital
- Parthak Prodhan, MD, MBA – Arkansas Children's Hospital
- Susan Partridge, RN, MBA – Parkland
- Yasir Tarabichi, MD, MSCR – The MetroHealth System

## ***Defining Cosmos Users***

When your organization participates, you get access to Cosmos and get to define which users associated with your organization get access (in conformance with the Rules of the Road). All Cosmos users must have a current association with a Cosmos-participating organization. Users electronically sign a HIPAA-required data use agreement as they first gain access to Cosmos.

To ensure that only current users have access to Cosmos, participating organizations review their Cosmos users on a regular basis to renew access for active users and end access for users who no longer should have it.

### ***Third-Party Access***

Third-parties, such as consultants, vendors, and outsourcing firms, are not eligible for access to Cosmos unless recommended by the Cosmos Governing Council, approved by a majority of Cosmos participants, and agreed to by Epic.

Selling Cosmos data or access to Cosmos is prohibited in the Rules of the Road.

## ***Publishing Cosmos Findings***

Participants can publish Cosmos findings without seeking any type of approval from Epic or the Governing Council.

Epic and the community of Cosmos participants appreciate Cosmos attribution when applicable. You should send the Governing Council, on a semi-annual basis, a list of publications that cite research you conducted using Cosmos.

## ***Participation Costs***

Cosmos has no associated license or maintenance fees. We've also waived any type of cost sharing fee through at least December 31, 2027. Beyond that date, it's possible that participating organizations will be expected to contribute an annual co-op fee to offset third-party Cosmos costs such as hardware, third-party software licenses, third-party content, and insurance.

### ***Third-Party Funded Research***

You can use Cosmos for third-party funded research. In fact, you might find that your participation in Cosmos opens up new opportunities for third-party funded research.



If you use Cosmos for research that is funded by a third party, or if a third party requires that you use Cosmos as a condition of securing the funding, the Cosmos Governing Council and Epic will review your use case to validate that such use is appropriate. The third party might be charged a fee, which is designed to benefit the entire Cosmos community by offsetting co-op fees and enabling continued expansion of Cosmos. However, research funded entirely by government or non-profit third-party organizations likely will not require any fees.

### *Cosmos as a Promoting Interoperability Registry*

Some organizations have decided to use Cosmos as one of their registry choices for the Public Health and Clinical Data Exchange objective for Promoting Interoperability reporting. We aren't aware of a process to confirm that any particular registry definitively would count for Promoting Interoperability (Meaningful Use) or MIPS. Based on the guidance we've seen, Cosmos appears to meet the expectations for the clinical data exchange registry measure. The ONC has not defined a technical electronic submission standard for the type of data submitted to Cosmos. We encourage you to read over CMS's guidance and make your own determination as to whether Cosmos meets the requirements.

## Getting Started with Cosmos

Here's what you can do to prepare for Cosmos:

- **Sign the Cosmos contract amendment including the Rules of the Road.** It might take time to work through your organizational approvals. Start early!
- **Identify a Cosmos point person.** We recommend identifying someone to own the success of getting Cosmos up and running at your organization. The point person should be responsible for staying in the loop on Cosmos communications from Epic, working directly with Epic support when necessary, and helping coordinate the governance, mapping, and general setup efforts at your organization.

Additionally, here's a look at the setup tasks you'll undertake to get Cosmos live. You can find a full list of detailed tasks in the [Cosmos Setup and Support Guide](#).

- **Complete data mapping in Epic.** Data mapping is largest setup component for Cosmos. To complete mapping, you work with your Epic support team to streamline the effort with standard tools and processes. Mappings you do for Cosmos will also work for Happy Together. Epic will help you determine a mapping estimate for your organization.
- **Complete the configuration to turn Cosmos on.** Along with mapping, there is some additional system setup and validation necessary to get Cosmos up and running.
- **Give users access to Cosmos.** Your Cosmos point person should work with your clinical decision makers to decide who should get access to Cosmos. This group of users will receive access once the Cosmos portal is live.

Contact us at [cosmos@epic.com](mailto:cosmos@epic.com) to get started.

