

Use Case

FORTANIX CONFIDENTIAL COMPUTING MANAGER – COMPLEX USE CASE - SQL

VERSION 1.0

TABLE OF CONTENTS

1.0 INTRODUCTION3

2.0 CONTEXTUALIZING CONFIDENTIAL COMPUTING MANAGER3

3.0 ACCESSING DATA SOURCES 4

3.1 Inbound Connector 1: HTTPS-CSV4

3.2 Inbound Connector 2: HTTPS-CSV5

3.3 Inbound Connector 3: Google BigQuery.....5

3.4 Inbound Connector 4: HTTPS-CSV.....6

4.0 DATA ANALYSIS: UNVEILING INSIGHTS.....6

4.1 Conditions Data Table6

4.2 Patients Data Table.....7

4.3 Encounters Data Table.....7

4.4 Medications Data Table8

5.0 AGGREGATING DATA FOR COMPREHENSIVE ANALYSIS.....8

6.0 EXPLORING DATA WITH SQL SCRIPTS9

6.1 Aggregate SQL Script 1: Patient Condition with Gender Female.....9

6.2 Aggregate SQL Script 2: Patient Condition with Gender Male 10

6.3 Aggregate SQL Script 3: Patient with Diabetic Retinopathy 10

7.0 EXPORTING ANALYZED RESULTS 11

7.1 Outbound Connector 1: HTTPS-CSV 11

8.0 WORKFLOW CONFIGURATION AND EXECUTION 12

8.1 Creating a Workflow 12

8.2 Configuring the Workflow..... 12

8.3	Requesting and Approving the Workflow.....	13
8.4	Running the Application Workflow	13
9.0	DOCUMENT INFORMATION	15
9.1	Document Location	15
9.2	Document Updates	15

1.0 INTRODUCTION

This document describes a complex example of how you can use Fortanix Confidential Computing Manager with SQL queries to streamline data analysis within the healthcare institution.

As the leader of a busy healthcare institution, you are always looking for methods to improve patient care and operational efficiency. Utilizing the capabilities of Fortanix Confidential Computing Manager, you aim to simplify the data and uncover the valuable insights hidden within your huge datasets.

2.0 CONTEXTUALIZING CONFIDENTIAL COMPUTING MANAGER

While managing the stacks of patient files and data reports, you have decided to explore Fortanix Confidential Computing Manager. After releasing the potential of this application, you envision a future where your team can analyze data efficiently to make informed decisions while upholding compliance and safeguarding data privacy.

To achieve optimal outcomes in healthcare data analysis, it is imperative to follow a structured approach. The following procedure outlines key steps to leverage Fortanix Confidential Computing Manager effectively, ensuring secure and insightful data exploration:

1. **Step 1: Accessing Data Sources** - In this step, you will begin by accessing data from various sources securely and efficiently, laying the foundation for your analysis.
2. **Step 2: Data Analysis: Unveiling Insights** - This step involves delving into your data to uncover valuable insights that can inform decision-making and improve operational efficiency.
3. **Step 3: Exploring Data with SQL Scripts** - Here, you will utilize SQL scripts to explore your datasets in detail, extracting meaningful information to gain a deeper understanding of your data.
4. **Step 4: Aggregating Data for Comprehensive Analysis** - This step focuses on merging datasets to create a comprehensive view, enabling more thorough analysis and interpretation of the data.

5. **Step 5: Exporting Analyzed Results** - After your analysis is complete, you will securely export the analyzed results to share them with relevant stakeholders, ensuring data privacy and compliance.
6. **Step 6: Workflow Configuration and Execution** - Finally, you will configure and execute workflows to streamline data processing and analysis, optimizing your use of the Fortanix Confidential Computing Manager platform.

3.0 ACCESSING DATA SOURCES

To gather your real-world data effectively, you will utilize **Inbound Data Connectors** to access information from diverse sources, including CSV files and Google BigQuery. These connectors serve as gateways to collaborate data into the Fortanix Confidential Computing Manager, ensuring seamless integration and accessibility of your datasets for further analysis and processing.

3.1 INBOUND CONNECTOR 1: HTTPS-CSV

To start, fetch the data about incoming medications from a CSV file hosted on the healthcare provider's internal server. This file contains details such as medication names, dosages, prescribing physicians, patient IDs, and prescription dates.

- **Data Connector Type:** CSV
- **Connector Name:** medications_data
- **Description:** This connector fetches data regarding incoming medications from a CSV file hosted on the healthcare provider's internal server. The CSV file includes information such as medication names, dosage, prescribing physician, patient ID, and date prescribed.
- **Labels:** (optional)
- **URL:** <https://fortanix-pocs-data.s3.us-west-2.amazonaws.com/medications.csv>



NOTE: Ensure to obtain a valid and pre-signed URL for accessing the data if you want to fetch the data from a URL. This URL can be hosted on [Amazon Web Services](#) (AWS), [Microsoft Azure](#), or the [Google Cloud Platform](#) (GCP).

3.2 INBOUND CONNECTOR 2: HTTPS-CSV

Next, access the data about incoming patients from a CSV file stored on the hospital's local network. This file includes patient IDs, names, dates of birth, genders, contact information, and admission dates.

- **Data Connector Type:** CSV
- **Connector Name:** patients_data
- **Description:** This connector retrieves data about incoming patients from a CSV file stored on the hospital's local network. The CSV file contains details such as patient IDs, names, dates of birth, genders, contact information, and admission dates.
- **Labels:** (optional)
- **URL:** <https://fortanix-pocs-data.s3.us-west-2.amazonaws.com/patients.csv>



NOTE: Ensure to obtain a valid and pre-signed URL for accessing the data if you want to fetch the data from a URL. This URL can be hosted on [Amazon Web Services](#) (AWS), [Microsoft Azure](#), or the [Google Cloud Platform](#) (GCP).

3.3 INBOUND CONNECTOR 3: GOOGLE BIGQUERY

For more comprehensive data, connect it to a Google BigQuery dataset named Conditions_data. This dataset, maintained by the hospital's research department, contains detailed information about various medical conditions, including names, descriptions, diagnostic criteria, and treatment protocols.

- **Data Connector Type:** Big Query
- **Connector Name:** conditions_data
- **Description:** This connector accesses a Google BigQuery dataset named Conditions_data, which contains comprehensive information about various medical conditions. The dataset is maintained by the hospital's research department and includes data such as condition names, descriptions, diagnostic criteria, and treatment protocols.
- **Labels:** (optional)
- **Project ID:** fortanix
- **Dataset Name:** healthcare
- **Table Name:** conditions-1

- **API Key:** To create the API key, refer to the official documentation of [Google Big Query](#).

3.4 INBOUND CONNECTOR 4: HTTPS-CSV

Finally, retrieve the data about patient encounters from a CSV file hosted on a secure server. This file contains encounter IDs, patient IDs, encounter dates, attending physicians, diagnoses, and procedures performed during the encounter.

- **Data Connector Type:** CSV
- **Connector Name:** encounters_data
- **Description:** This connector retrieves data about incoming patient encounters from a CSV file hosted on a secure server. The CSV file contains details of patient encounters, including encounter IDs, patient IDs, encounter dates, attending physicians, diagnoses, and procedures performed during the encounter.
- **Labels:** (optional)
- **URL:** <https://fortanix-pocs-data.s3.us-west-2.amazonaws.com/encounters.csv>



NOTE: Ensure to obtain a valid and pre-signed URL for accessing the data if you want to fetch the data from a URL. This URL can be hosted on [Amazon Web Services](#) (AWS), [Microsoft Azure](#), or the [Google Cloud Platform](#) (GCP).

4.0 DATA ANALYSIS: UNVEILING INSIGHTS

After securely importing your data into Fortanix Confidential Computing Manager, it is time to delve into the analysis. This involves merging various datasets, such as patient records, medication details, and encounter information. You can achieve this by employing SQL scripts, which enables you to handle and process the data effectively.

4.1 CONDITIONS DATA TABLE

START	STOP	patients-Id	ENCOUNTER	CODE	DESCRIPTION
##### #		1d604da9-9a81-4ba9-80c2-de3375d59b40	8f104aa7-4ca9-4473-885a-bba2437df588	40055000	Chronic sinusitis (disorder)
##### #	##### #	8d4c4326-e9de-4f45-	9d35ec9f-352a-4629-	4.45E+08	Viral sinusitis (disorder)

		9a4c-f8c36bff89ae	92ef-38eae38437e7		
##### #	##### #	8d4c4326-e9de-4f45-9a4c-f8c36bff89ae	ae7555a9-eaff-4c09-98a7-21bc6ed1b1fd	1.96E+08	Acute viral pharyngitis (disorder)
##### #	##### #	10339b10-3cd1-4ac3-ac13-ec26728cb592	e1ab4933-07a1-49f0-b4bd-05500919061d	10509002	Acute bronchitis (disorder)
##### #	##### #	f5dcd418-09fe-4a2f-baa0-3da800bd8c3a	b8f76eba-7795-4dcd-a544-f27ac2ef3d46	1.96E+08	Acute viral pharyngitis (disorder)

4.2 PATIENTS DATA TABLE

Patients ID	Birthdate	SSN	Name	Gender	Address
1d604da9-9a81-4ba9-80c2-de3375d59b40	25-05-1989	999-76-6866	José Eduardo181 Gámez206	M	427 Balistreri Way Unit 19
034e9e3b-2def-4559-bb2a-7850888ae060	14-11-1983	999-73-5361	Milo271 Feil794	M	422 Farrell Path Unit 69
10339b10-3cd1-4ac3-ac13-ec26728cb592	02-06-1992	999-27-3385	Jayson808 Fadel536	M	1056 Harris Lane Suite 70
8d4c4326-e9de-4f45-9a4c-f8c36bff89ae	27-05-1978	999-85-4926	Mariana775 Rutherford999	F	999 Kuhn Forge

4.3 ENCOUNTERS DATA TABLE

ID	Start	Stop	Patients ID	Organisation	Provider
d0c40d10-8d87-447e-836e-	2010-01-23T17:45:28Z	2010-01-23T18:10:28Z	034e9e3b-2def-4559-bb2a-	e002090d-4e92-300e-	e6283e46-fd81-3611-9459-

99d26ad52e a5			7850888ae06 0	b41e- 7d1f21dee4c6	0edb1c3da35 7
e88bc3a9- 007c-405e- aabc- 792a38f4aa2 b	2012-01- 23T17:45:28Z	2012-01- 23T18:00:2 8Z	034e9e3b- 2def-4559- bb2a- 7850888ae06 0	772ee193- bb9f-30eb- 9939- 21e86c8e4da5	6f1d59a7- a5bd-3cf9- 9671- 5bad2f351c28
8f104aa7- 4ca9-4473- 885a- bba2437df58 8	2001-05- 01T15:02:18Z	2001-05- 01T15:17:1 8Z	1d604da9- 9a81-4ba9- 80c2- de3375d59b4 0	5d4b9df1- 93ae-3bc9- b680- 03249990e55 8	af01a385- 31d3-3c77- 8fdb- 2867fe88df2f
b85c339a- 6076-43ed- b9d0- 9cf013dec49 d	2011-07- 28T15:02:18Z	2011-07- 28T15:17:1 8Z	1d604da9- 9a81-4ba9- 80c2- de3375d59b4 0	3dc9bb2d- 5d66-3e61- bf9a- e234c6433577	bb17e691- 262b-3546- 93d5- d88e7de9324 6
dae2b7cb- 1316-4b78- 954f- fa610a6c6d0 e	2010-07- 27T12:58:08Z	2010-07- 27T13:28:0 8Z	10339b10- 3cd1-4ac3- ac13- ec26728cb59 2	b03dba4f- 892f-365c- bfd1- bfcfa7a98d5d	7ed6b84a- b847-3744- 9d42- 15c42297a0c2

4.4 MEDICATIONS DATA TABLE

Patients ID	Base Cost	Payer Coverage	Dispenses	Total Cost
8d4c4326-e9de-4f45-9a4c-f8c36bff89ae	677.08	10	12	8124.96
8d4c4326-e9de-4f45-9a4c-f8c36bff89ae	624.09	0	12	7489.08
8d4c4326-e9de-4f45-9a4c-f8c36bff89ae	43.32	20	12	519.84
10339b10-3cd1-4ac3-ac13-ec26728cb592	8.14	7	1	8.14
1d604da9-9a81-4ba9-80c2-de3375d59b40	11.91	0	1	11.91

5.0 AGGREGATING DATA FOR COMPREHENSIVE ANALYSIS

To streamline your analysis, merge the patient data, medication details, and encounter information into a single table named `patient_medication_encounter`. This table will facilitate a comprehensive analysis of patient demographics, medication usage, and encounter details.

This SQL script combines data from multiple tables—patients, medications, conditions, and encounters—using JOIN operations. It selects distinct patient IDs, along with their gender, race, encounter class, and condition codes.

Table Name: Patient_Medication_Encounter

Query Language: SQL Join Query Script (Join Query)

```
SELECT DISTINCT "patients"."patients-Id",
    "patients".GENDER,
    "patients".RACE,
    encounters.ENCOUNTERCLASS,
    conditions.CODE as condition_code
FROM "patients"
    JOIN medications ON medications."patients-Id" = "patients"."patients-Id"
    JOIN conditions ON conditions."patients-Id" = "patients"."patients-Id"
    JOIN encounters ON encounters."patients-Id" = "patients"."patients-Id"
WHERE medications.CODE = '860975'
    AND medications.STOP = '';
```

6.0 EXPLORING DATA WITH SQL SCRIPTS

This section delves into SQL scripts to explore your data more deeply. These scripts help you find specific information you may be interested in, like patient demographics and health conditions.

6.1 AGGREGATE SQL SCRIPT 1: PATIENT CONDITION WITH GENDER FEMALE

This script focuses on and helps you identify and analyze conditions specific to women's health.

- **Name:** Patient_Condition_Gender_F
- **Description:** Filters patient conditions for females.
- **Group:** Fortanix Marketplace Imports
- **Query Language:** SQL Aggregate

```
SELECT COUNT(DISTINCT "patients-Id")
FROM joined_data
WHERE ENCOUNTERCLASS = 'ambulatory'
AND GENDER='F';
```

6.2 AGGREGATE SQL SCRIPT 2: PATIENT CONDITION WITH GENDER MALE

This script is similar to the previous one, but targets the health conditions that predominantly affect men.

- **Name:** Patient_Condition_Gender_M
- **Description:** Filters patient conditions for males.
- **Group:** Fortanix Marketplace Imports
- **Query Language:** SQL Aggregate

```
SELECT COUNT(DISTINCT "patients-Id")
FROM joined_data
WHERE ENCOUNTERCLASS = 'ambulatory'
AND GENDER='M';
```

6.3 AGGREGATE SQL SCRIPT 3: PATIENT WITH DIABETIC RETINOPATHY

This script targets patients diagnosed with diabetic retinopathy, a complication of diabetes. It helps you understand the prevalence and management of this condition within the patient population.

- **Name:** Patients_Diabetic_Retinopathy
- **Description:** Identifies patients diagnosed with diabetic retinopathy.
- **Group:** Fortanix Marketplace Imports
- **Query Language:** SQL Aggregate

```
COUNT(DISTINCT "patients-Id")
FROM joined_data
WHERE condition_code = '422034002';
```

7.0 EXPORTING ANALYZED RESULTS

After completing your analysis, it is essential to securely share your findings with the relevant stakeholders. To accomplish this, you will need to set up Outbound Connectors within the Fortanix Confidential Computing Manager. These connectors enable you to export your processed data securely to external systems or stakeholders. You can configure the Outbound Connectors with specific details such as the type of connector, description, and destination URL to ensure the safe transfer of data.

7.1 OUTBOUND CONNECTOR 1: HTTPS-CSV

This outbound connector facilitates the secure transfer of healthcare data to external systems or stakeholders. The exported CSV file contains sanitized patient data, aggregated statistics, or other relevant information derived from data processing operations.

- **Data Connector Type:** CSV
- **Connector Name:** results_export
- **Description:** This outbound connector exports processed data results in CSV format to an HTTPS endpoint.
- **Labels:** (optional)
- **URL:** <https://fortanix-pocs-data.s3.amazonaws.com/output.csv>

The following is the output of SQL queries, each offering insightful metrics regarding patient counts based on specific criteria such as gender distribution and the prevalence of a particular medical condition within the dataset.

```
"SELECT COUNT(DISTINCT ""patients-Id"")
FROM joined_data
WHERE ENCOUNTERCLASS = 'ambulatory'
AND GENDER='M';",25

"SELECT COUNT(DISTINCT ""patients-Id"")
FROM joined_data
WHERE ENCOUNTERCLASS = 'ambulatory'
AND GENDER='F';",22
```

```
"SELECT COUNT(DISTINCT ""patients-Id"")
FROM joined_data
WHERE condition_code = '422034002';",6
```

8.0 WORKFLOW CONFIGURATION AND EXECUTION

After setting up all your data connectors and scripts, it's time to create and optimize your workflow to ensure efficient data processing and analysis.

8.1 CREATING A WORKFLOW

Create a workflow in the Fortanix Confidential Computing Manager User Interface (UI). *For detailed information, refer to the [Creating a Workflow](#) documentation.*

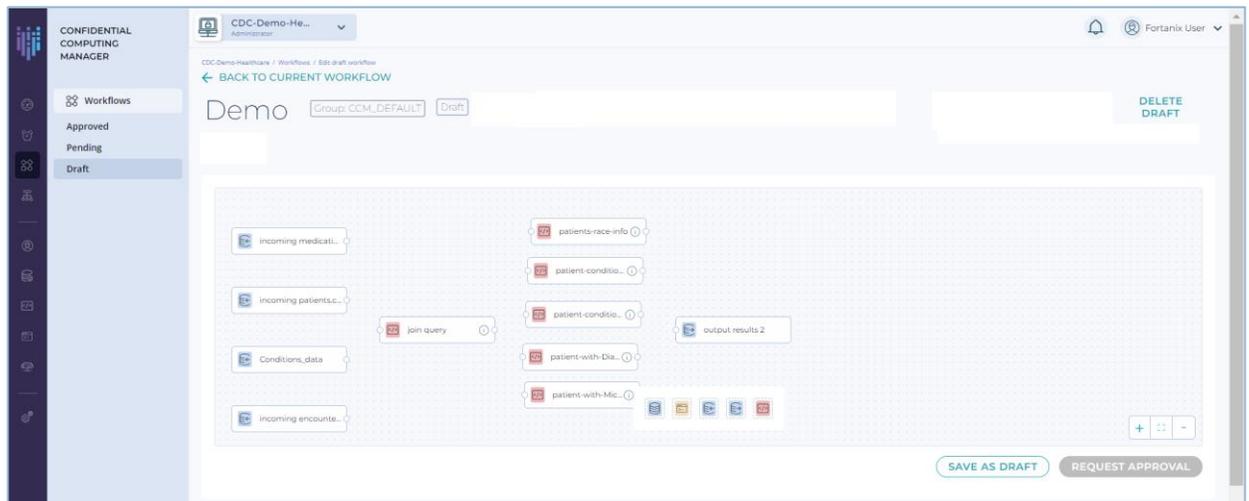


FIGURE 1: DRAFTING THE WORKFLOW

8.2 CONFIGURING THE WORKFLOW

After you have added the inbound connector, scripts, and outbound connectors to the Fortanix Confidential Computing Manager UI, you must place them in the workflow working area and connect them. *For detailed information, refer to the [Configuring a Workflow](#) documentation.*

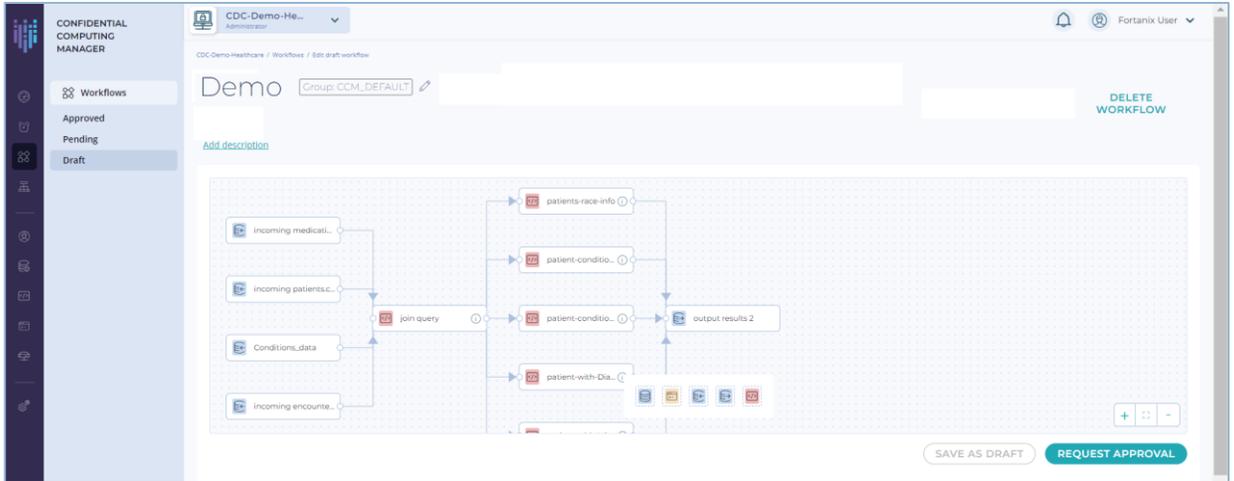


FIGURE 2: CONNECT THE NODES

8.3 REQUESTING AND APPROVING THE WORKFLOW

With your workflow configured, you need to send a request for approval and wait for them to review the workflow approval request and either approve or decline as necessary. *For detailed information, refer to the [Requesting the Workflow Approval](#) documentation.*

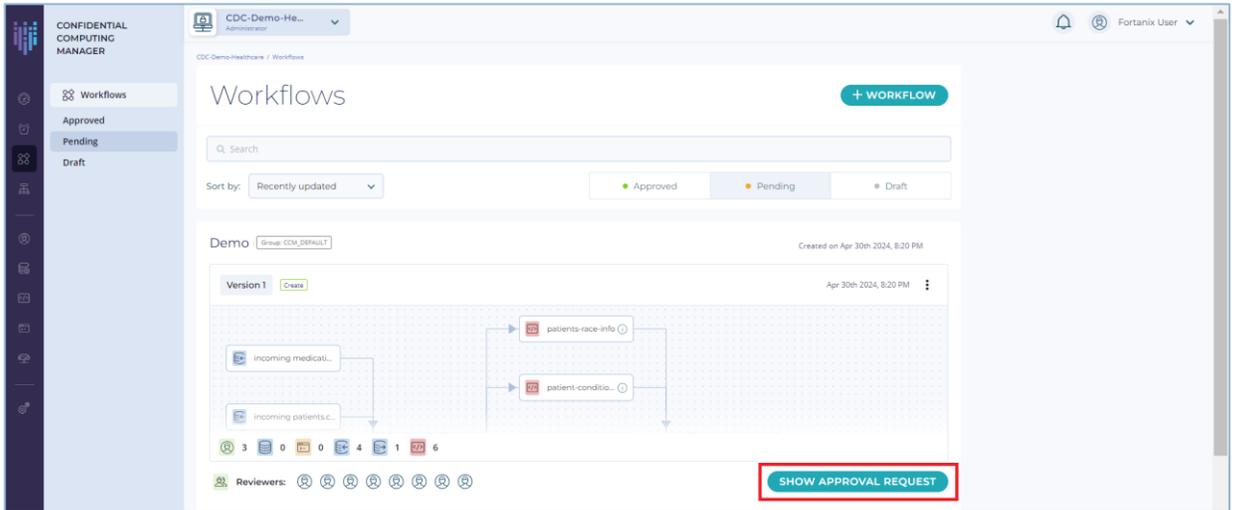


FIGURE 3: APPROVE THE WORKFLOW

8.4 RUNNING THE APPLICATION WORKFLOW

After your workflow is approved and finalized, you can proceed with running the ACI application workflow. *For detailed information, refer to the [Running the ACI Application Workflow](#) documentation.*

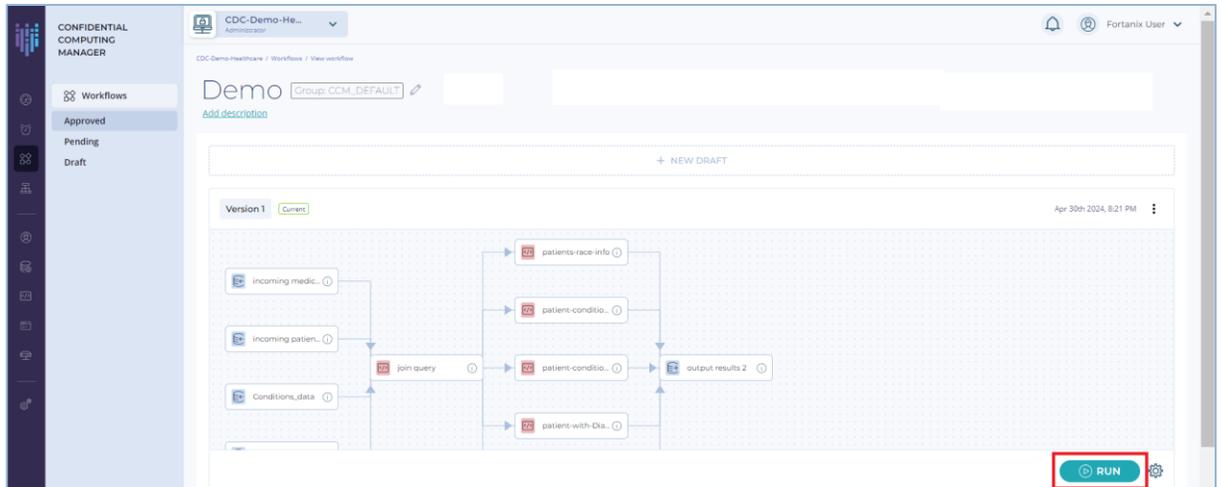


FIGURE 4: RUN THE WORKFLOW

Congratulations! By effectively utilizing Fortanix Confidential Computing Manager, you have optimized your healthcare data analysis workflows. Through secure data gathering, thorough analysis, and seamless export processes, you have gained invaluable insights that will empower better decision-making and enhance patient outcomes throughout your organization.

9.0 DOCUMENT INFORMATION

9.1 DOCUMENT LOCATION

The latest published version of this document is located at the URL:

<https://support.fortanix.com/hc/en-us/articles/25477710963604-Fortanix-Confidential-Computing-Manager-Complex-Use-Case-SQL>

9.2 DOCUMENT UPDATES

This document will typically be updated on a periodic review and update cycle.

For any urgent document updates, please send an email to: support@fortanix.com

© 2016 – 2024 Fortanix, Inc. All Rights Reserved.

Fortanix® and the Fortanix logo are registered trademarks or trade names of Fortanix, Inc.

All other trademarks are the property of their respective owners.

NOTICE: This document was produced by Fortanix, Inc. (Fortanix) and contains information which is proprietary and confidential to Fortanix. The document contains information that may be protected by patents, copyrights, and/or other IP laws. If you are not the intended recipient of this material, please destroy this document and inform info@fortanix.com immediately.