

Sri Lanka Institute of Information Technology

Data warehousing & Business Intelligence (IT3021)

Continuous Assignment – 2024, Semester 1

Assignment 1



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1. Data set selection

Dataset Title - Healthcare Treatment Analytics Dataset

Source – Kaggle

Link - <https://www.kaggle.com/datasets/shrinivasv/hospital-treatments-data-for-hospital>

This dataset simulates a real-world healthcare environment where treatments are recorded along with information about treatments, providers, patients, diseases, treatment locations and speciality with 700,000 records. The tables of the dataset as follows:

Treatment Table -

The Treatment table captures detailed information about medical treatments provided to patients. It includes data such as treatment ID, start and completion dates, outcome status, cost, type of treatment (e.g., therapeutic, surgical), and treatment duration.

Provider Table -

The Provider table contains data about medical practitioners or specialists who deliver treatments. It includes a unique provider ID, full name, the speciality they are associated with, and the hospital they are affiliated with.

Speciality Table -

The Speciality table defines medical specializations such as cardiology, neurology, or orthopedics. Each provider and disease is linked to a speciality via a speciality ID.

Patient Table -

The Patient table holds demographic information about individuals receiving treatment. It includes a patient ID, full name, gender, and age.

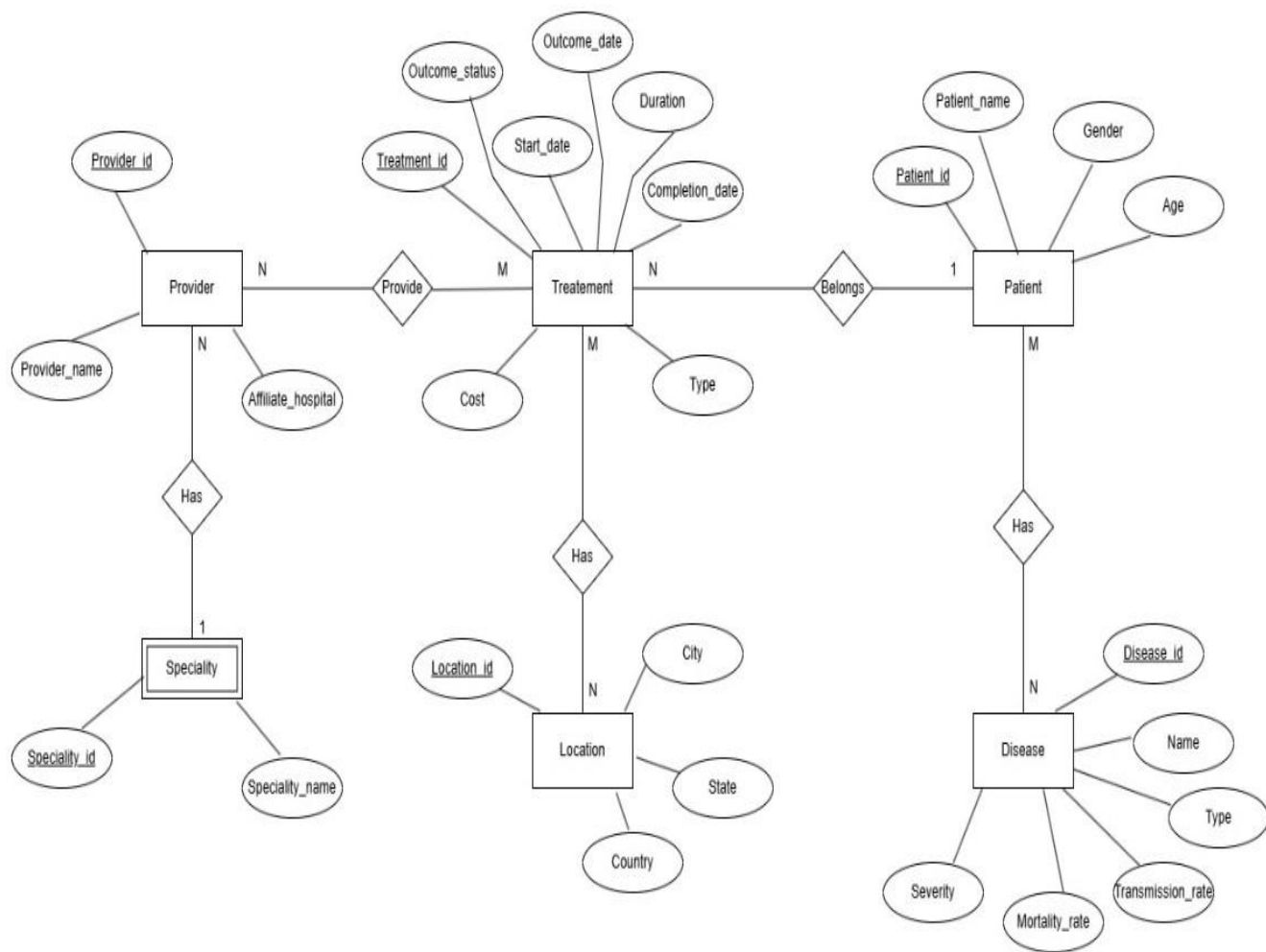
Disease Table -

The Disease table stores information about medical conditions diagnosed in patients. It includes a disease ID, name, type (e.g., infectious, non-infectious), severity, transmission mode, mortality rate, and associated speciality.

Location Table -

The Location table identifies where each treatment was administered, based on the provider's location. It includes a location ID, country (India), state (e.g., Maharashtra, Karnataka), and city.

1.1 ER Diagram



2. Preparation of data sources

Overview

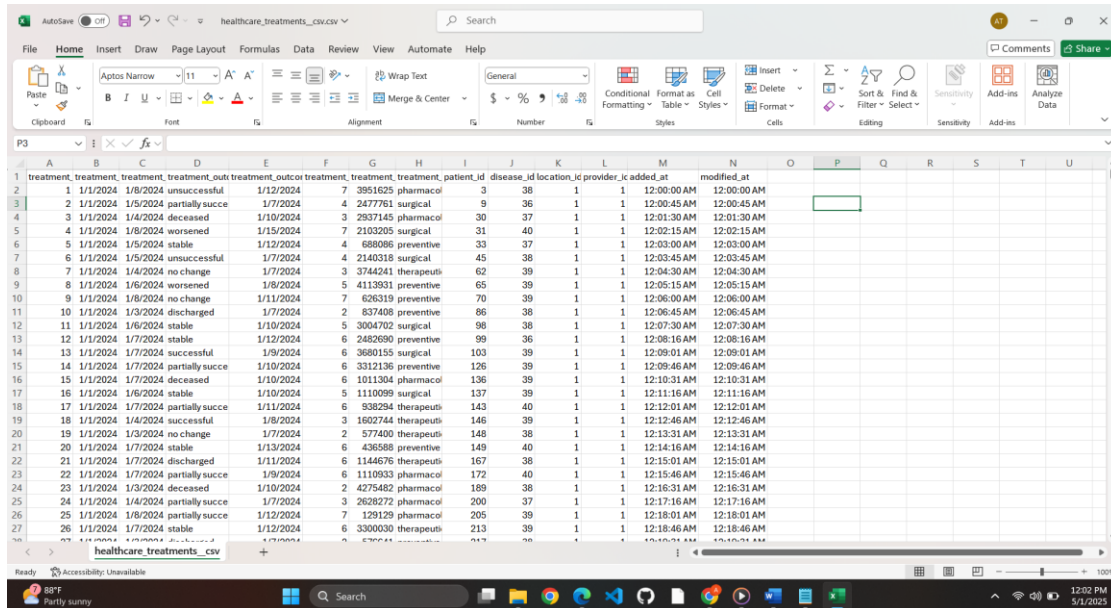
To simulate real-world ETL complexity, the dataset was provided in three different file formats CSV, TXT, and Excel. These files were treated as independent data sources and prepared for integration into the staging environment of the data warehouse.

Source Files and Formats

File Name	Format	Entity Covered
healthcare_treatments_csv.csv	csv	Treatment
Disease.csv	csv	Disease
Location.csv	csv	Location
Speciality.csv	csv	Speciality
Patients.xlsx	Excel	patients
Provider.csv	Text	Provider

CSV file for Treatment Records

The treatment.csv table records detailed information about each healthcare treatment event, including when the treatment started and ended, its outcome, duration, and cost. It also specifies the type of treatment (such as pharmacological, surgical, preventive, or therapeutic), and links each treatment to the relevant patient, disease, provider, and location using unique IDs. Additionally, the table includes metadata columns to track when each record was added and last modified, supporting data integrity and auditability



treatment_id	treatment_outcome	treatment_outcome_text	treatment_outcome_code	treatment_outcome_date	treatment_outcome_time	treatment_outcome_duration	treatment_outcome_cost	treatment_outcome_provider_id	treatment_outcome_location_id	treatment_outcome_disease_id	treatment_outcome_patient_id	treatment_outcome_added_at	treatment_outcome_modified_at
1	1/1/2024	1/6/2024	unsuccessful	1/12/2024	7	3951625	pharmacol	3	38	1	1	12:00:00 AM	12:00:00 AM
2	1/1/2024	1/5/2024	partially succe	1/7/2024	4	2477761	surgical	9	36	1	1	12:00:45 AM	12:00:45 AM
3	1/1/2024	1/4/2024	deceased	1/10/2024	3	2937145	pharmacol	30	37	1	1	12:01:30 AM	12:01:30 AM
4	1/1/2024	1/8/2024	worsened	1/15/2024	7	2103205	surgical	31	40	1	1	12:02:15 AM	12:02:15 AM
5	1/1/2024	1/5/2024	stable	1/12/2024	4	688086	preventive	33	37	1	1	12:03:00 AM	12:03:00 AM
6	1/1/2024	1/5/2024	unsuccessful	1/7/2024	4	2140318	surgical	45	38	1	1	12:03:45 AM	12:03:45 AM
7	1/1/2024	1/4/2024	no change	1/7/2024	3	3744341	therapeut	62	39	1	1	12:04:30 AM	12:04:30 AM
8	1/1/2024	1/6/2024	worsened	1/8/2024	5	4113931	preventive	65	39	1	1	12:05:15 AM	12:05:15 AM
9	1/1/2024	1/8/2024	no change	1/11/2024	7	626319	preventive	70	39	1	1	12:06:00 AM	12:06:00 AM
10	1/1/2024	1/3/2024	discharged	1/7/2024	2	837408	preventive	86	38	1	1	12:06:45 AM	12:06:45 AM
11	1/1/2024	1/6/2024	stable	1/10/2024	5	3004702	surgical	98	38	1	1	12:07:30 AM	12:07:30 AM
12	1/1/2024	1/7/2024	stable	1/12/2024	6	2482690	preventive	99	36	1	1	12:08:16 AM	12:08:16 AM
13	1/1/2024	1/7/2024	successful	1/9/2024	6	3680158	surgical	103	39	1	1	12:09:01 AM	12:09:01 AM
14	1/1/2024	1/7/2024	partially succe	1/10/2024	6	3312136	preventive	126	39	1	1	12:09:46 AM	12:09:46 AM
15	1/1/2024	1/7/2024	deceased	1/10/2024	6	1011304	pharmacol	136	39	1	1	12:10:31 AM	12:10:31 AM
16	1/1/2024	1/6/2024	stable	1/10/2024	5	1110099	surgical	137	39	1	1	12:11:16 AM	12:11:16 AM
17	1/1/2024	1/7/2024	partially succe	1/11/2024	6	938294	therapeut	143	40	1	1	12:12:01 AM	12:12:01 AM
18	1/1/2024	1/4/2024	successful	1/8/2024	3	1602744	therapeut	146	39	1	1	12:12:46 AM	12:12:46 AM
19	1/1/2024	1/3/2024	no change	1/7/2024	2	577400	therapeut	148	38	1	1	12:13:31 AM	12:13:31 AM
20	1/1/2024	1/7/2024	stable	1/13/2024	6	436588	preventive	149	40	1	1	12:14:16 AM	12:14:16 AM
21	1/1/2024	1/7/2024	discharged	1/11/2024	6	1144676	therapeut	167	38	1	1	12:15:01 AM	12:15:01 AM
22	1/1/2024	1/7/2024	partially succe	1/9/2024	6	1110933	pharmacol	172	40	1	1	12:15:46 AM	12:15:46 AM
23	1/1/2024	1/3/2024	deceased	1/10/2024	2	4275482	pharmacol	189	38	1	1	12:16:31 AM	12:16:31 AM
24	1/1/2024	1/4/2024	partially succe	1/7/2024	3	2628272	pharmacol	200	37	1	1	12:17:16 AM	12:17:16 AM
25	1/1/2024	1/6/2024	partially succe	1/12/2024	7	129129	pharmacol	205	39	1	1	12:18:01 AM	12:18:01 AM
26	1/1/2024	1/7/2024	stable	1/12/2024	6	3300330	therapeut	213	39	1	1	12:18:46 AM	12:18:46 AM

CSV file for Disease Records

The Disease.csv table contains information about various diseases relevant to the healthcare dataset. Each row represents a unique disease and includes details such as the disease name, type (e.g., infectious, non-infectious, acute, chronic), severity level (moderate or severe), mode of transmission (like airborne or indirect contact), and the mortality rate as a decimal value. The table also links each disease to a specific medical specialty through the speciality_id column, indicating which type of healthcare provider is qualified to treat it.

disease_id	disease_name	disease_type	severity	transmission	mortality	speciality_id
36	Pneumonia	Infectious	Moderate	Airborne	0.1	8
36	Bone Fractures	Acute	Moderate	Indirect conta	0.01	8
37	Tumors	Non-infectious	Severe	Indirect conta	0.2	8
40	Kidney Stones	Non-infectious	Moderate	Indirect conta	0.01	8
39	Aneurysms	Non-infectious	Severe	Indirect conta	0.2	8
2	Arrhythmia	Chronic	Moderate	Non-applicabl	0.05	1
3	Hypertension	Chronic	Moderate	Non-applicabl	0.1	1
4	Coronary Artery Disease	Chronic	Severe	Non-applicabl	0.2	1
1	Heart Attack	Acute	Critical	Non-applicabl	0.3	1
5	Heart Failure	Chronic	Critical	Non-applicabl	0.5	1
58	Otitis Media	Non-infectious	Severe	Indirect conta	0.1	12
57	Acute Kidney Injury	Acute	Severe	Indirect conta	0.1	12
56	Chronic Kidney Disease	Chronic	Severe	Indirect conta	0.2	12
59	Kidney Stones	Non-infectious	Moderate	Indirect conta	0.01	12
60	Polycystic Kidney Disease	Chronic	Severe	Indirect conta	0.2	12
41	Depression	Non-infectious	Moderate	Indirect conta	0.05	9
43	Bipolar Disorder	Non-infectious	Severe	Indirect conta	0.1	9
44	Schizophrenia	Non-infectious	Severe	Indirect conta	0.2	9
42	Anxiety	Non-infectious	Moderate	Indirect conta	0.01	9
45	PTSD	Non-infectious	Moderate	Indirect conta	0.05	9
55	Erectile Dysfunction	Non-infectious	Moderate	Indirect conta	0.01	11
51	Kidney Stones	Non-infectious	Moderate	Indirect conta	0.01	11
53	Prostate Cancer	Non-infectious	Severe	Indirect conta	0.2	11
50	Bladder Infection	Infectious	Moderate	Direct contact	0.01	11
54	Urinary Incontinence	Non-infectious	Moderate	Indirect conta	0.01	11
35	Lymphoma	Non-infectious	Moderate	Indirect conta	0.1	7

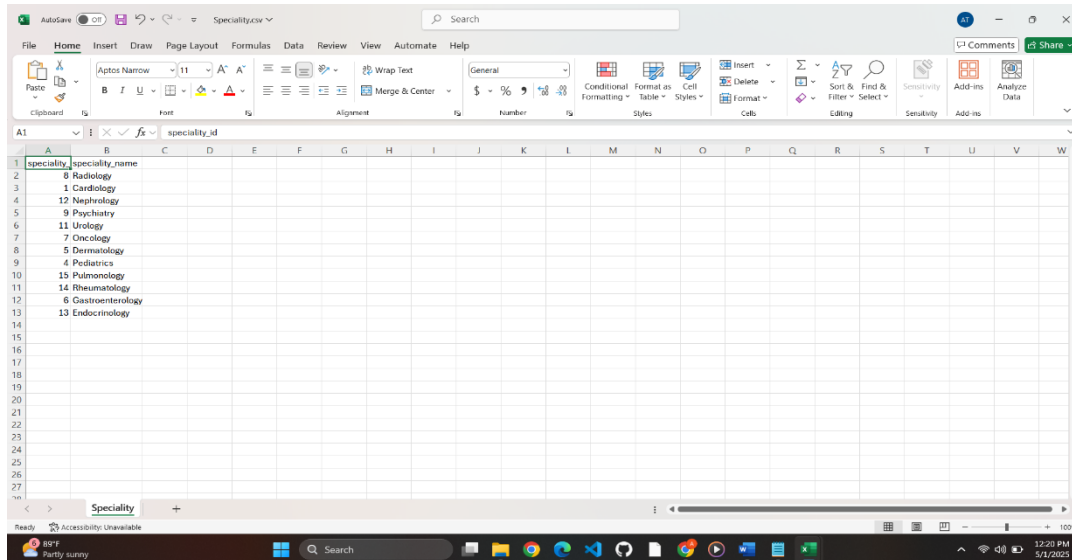
Excel file for Patients records

The patients.xlsx table contains demographic details for each patient in the healthcare dataset. Each record includes a unique patient ID, the patient's full name, gender (male or female), and age. This table serves as a reference for identifying patients and linking them to their respective treatments and medical histories within the analytics.

patient_id	patient_name	gender	age
3	Kian Menon	Male	71
9	Kian Joshi	Male	50
30	Namrata Kulkarni	Female	54
31	Rashmi Chopra	Female	78
33	Arani Tripathi	Female	32
45	Laksh Reddy	Male	80
62	Chaitali Nanda	Female	49
65	Kian Verma	Male	70
70	Deepika Puri	Female	33
86	Om Raghav	Male	68
98	Sai Chawla	Male	27
99	Arjun Deshmukh	Male	36
103	Krishna Saha	Male	19
126	Sakshi Yogi	Female	52
136	Kritika Naik	Female	61
137	Anurag Rai	Male	23
143	Aditya Datta	Male	51
146	Charu Varma	Female	69
148	Kabir Bhagat	Male	80
149	Laksh Zaveri	Male	52
167	Sneha Deshmukh	Female	60
172	Raghu Mukherjee	Male	27
189	Riddhi Grover	Female	42
200	Komal Saxena	Female	69
205	Yash Bhagat	Male	26
213	Nupur Kadam	Female	69

CSV file for Speciality records

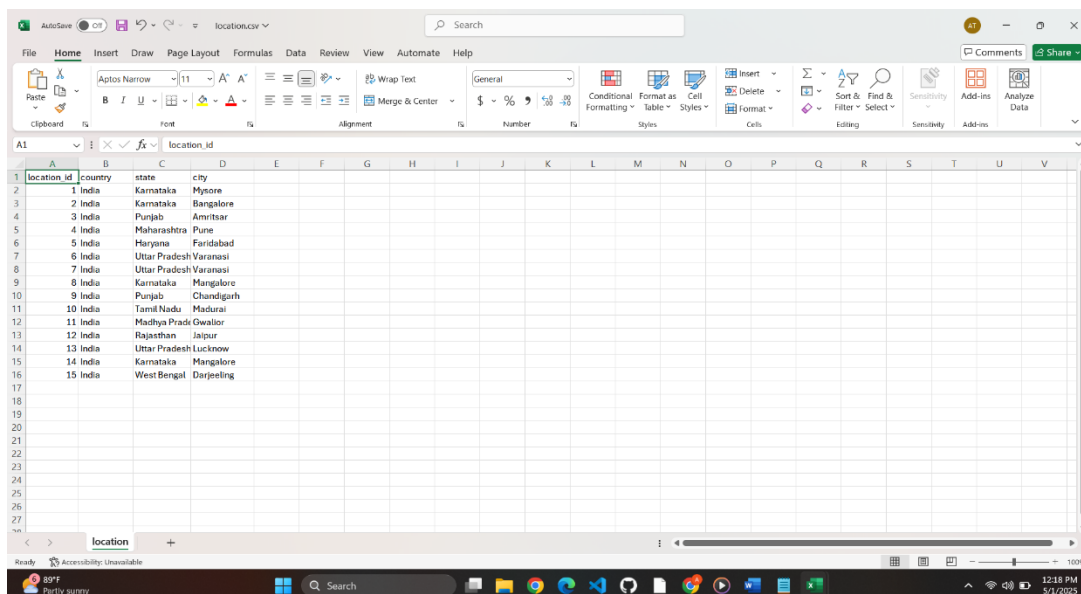
The Speciality.csv table provides a list of medical specialties available in the healthcare dataset. Each record contains a unique speciality_id and the corresponding speciality_name, such as Radiology, Cardiology, Nephrology, Psychiatry, and others. This table serves as a reference for linking healthcare providers and diseases to their respective areas of medical expertise, enabling more detailed analysis of treatment patterns and outcomes by specialty



speciality_id	speciality_name
6	Radiology
1	Cardiology
12	Nephrology
9	Psychiatry
11	Urology
7	Oncology
5	Dermatology
4	Pediatrics
15	Pulmonology
14	Rheumatology
6	Gastroenterology
13	Endocrinology

CSV file for Location records

The Location.csv table contains information about the locations where healthcare services are provided. Each record includes a unique location_id, the country (India), the state (such as Maharashtra, Madhya Pradesh, Karnataka, etc.), and the city within that state. This table serves as a reference for linking treatments and providers to specific geographic locations, enabling analysis of healthcare trends and outcomes by region.



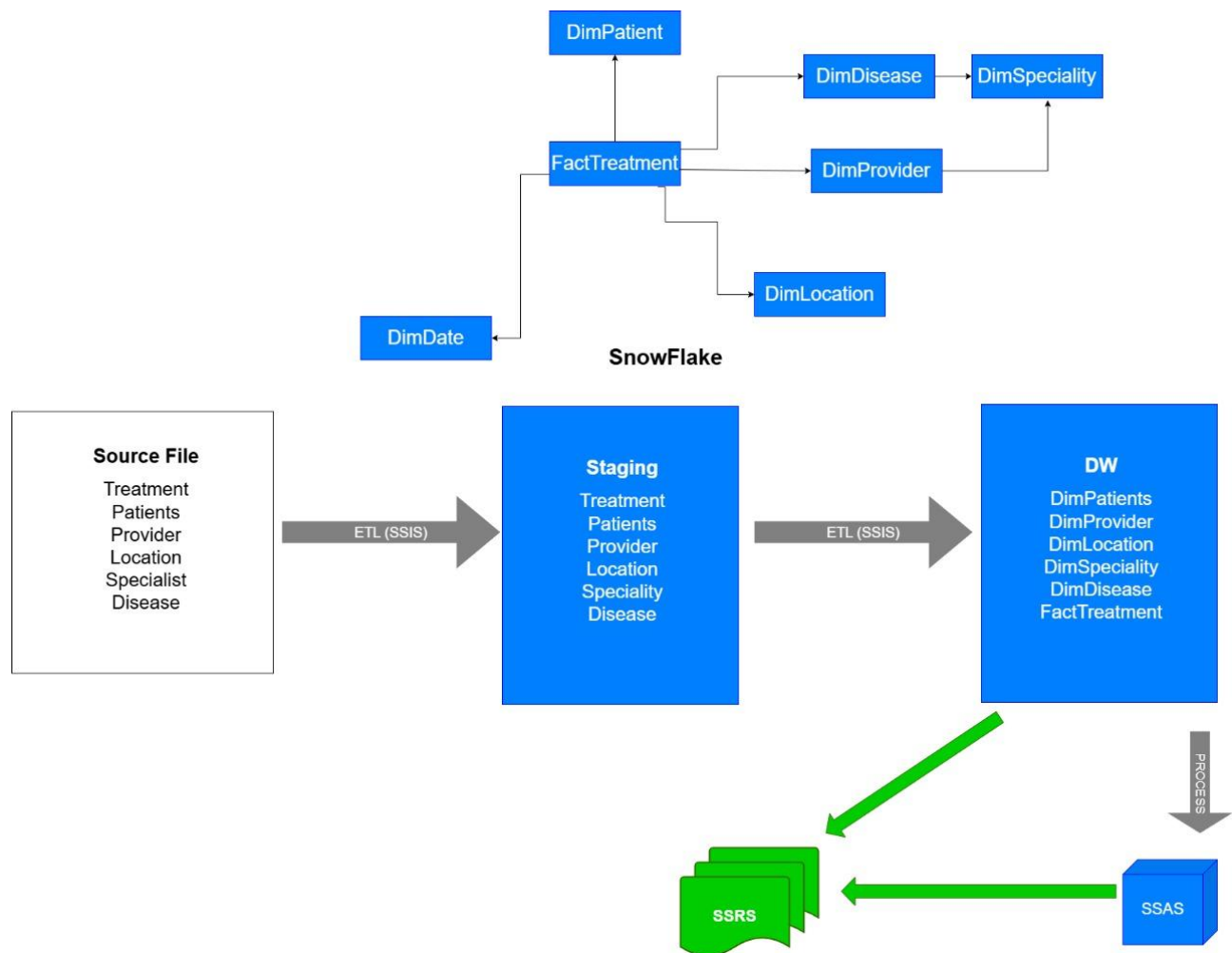
location_id	country	state	city
1	India	Karnataka	Mysore
2	India	Karnataka	Bangalore
3	India	Punjab	Amritsar
4	India	Maharashtra	Pune
5	India	Haryana	Faridabad
6	India	Uttar Pradesh	Varanasi
7	India	Uttar Pradesh	Varanasi
8	India	Karnataka	Mangalore
9	India	Punjab	Chandigarh
10	India	Tamil Nadu	Madurai
11	India	Madhya Pradesh	Gwalior
12	India	Rajasthan	Jaipur
13	India	Uttar Pradesh	Lucknow
14	India	Karnataka	Mangalore
15	India	West Bengal	Darjeeling

Text file for Provider records

The Provider.txt table lists healthcare providers or specialists in the dataset. Each record includes a unique provider_id, the provider's full name, the speciality_id indicating their area of medical expertise, and the name of the hospital where they are affiliated. This table enables linking treatments to specific practitioners and analyzing provider performance or specialization trends within the healthcare system.

```
provider_id,provider_name,speciality_id,affiliated_hospital  
1,Nandini Srivastava,8,AIIMS  
2,Aashi Devi,1,Kokilaben Hospital  
3,Madhavi Ahluwalia,12,Global Hospitals  
4,Priya Menon,9,Narayana Health  
5,Rudra Gandhi,11,Columbia Asia  
6,Leela Jha,7,Care Hospitals  
7,Pratibha Yadav,5,Manipal Hospital  
8,Sarika Zutshi,4,AIIMS  
9,Sangeeta Chadha,12,Tata Memorial Hospital  
10,Gauri Khanna,11,BLK Super Speciality Hospital  
11,Vihaan Subramanian,15,Manipal Hospital  
12,Akanksha Chadha,8,Wockhardt Hospitals  
13,Meera Bajaj,14,BLK Super Speciality Hospital  
14,Deepa Pandey,6,Fortis Hospital  
15,Ishaan Ghosh,13,Columbia Asia
```


3. Solution architecture



Solution Component Summaries

Source File

Contains the raw data tables: Treatment, Patients, Provider, Location, Specialist, and Disease. These files are the initial data sources for the ETL process.

Staging

A temporary storage area where data from the source files is loaded (via SSIS ETL). Here, data is cleansed, transformed, and prepared for loading into the Data Warehouse. Staging tables mirror the source structure for Treatment, Patients, Provider, Location, Specialist, and Disease.

DW (Data Warehouse)

The central repository for integrated, cleaned, and transformed data. It contains dimension tables

(DimPatients, DimProvider, DimLocation, DimSpeciality, DimDisease) and a fact table (FactTreatment), organized in a snowflake schema to support analytical processing.

ETL (SSIS)

SQL Server Integration Services (SSIS) is used for Extract, Transform, Load operations. It moves data from Source Files to Staging, and then from Staging to the Data Warehouse, ensuring data quality and integrity at each step.

Snowflake Schema

The data warehouse uses a snowflake schema, with FactTreatment at the center linked to multiple dimension tables (DimPatient, DimProvider, DimLocation, DimSpeciality, DimDisease, DimDate). This structure supports efficient querying and analysis.

SSAS (SQL Server Analysis Services)

Processes the data warehouse tables to create OLAP cubes, enabling multidimensional analysis and fast aggregation of large datasets.

SSRS (SQL Server Reporting Services)

Consuming the processed cubes from SSAS, SSRS generates reports and visualizations for end users, supporting business intelligence and decision-making.

Process Flow:

- Data flows from Source Files → Staging → Data Warehouse via ETL (SSIS).
- The Data Warehouse is processed by SSAS to build analytical cubes.

4. Data warehouse design & development

4.1 Fact Table

FactTreatment

Column Name	Data Type	Derived Col.	Key Col.	Description
TreatmentSK	int	Y	PK	Surrogate Key
TreatmentAlternateID	numeric	N		Business key
StartDateKey	int	N	FK	FK from Date Dimension
CompletionDateKey	int	N	FK	FK from Date Dimension
OutcomeDateKey	int	N	FK	FK from Date Dimension
ProviderKey	int	N	FK	FK from Provider
PatientKey	int	N	FK	FK from Patient
DiseaseKey	int	N	FK	FK from Disease
LocationKey	int	N	FK	FK from Location
DurationInDays	int	N		
Cost	decimal	N		
TreatmentType	nvarchar	N		
OutcomeStatus	nvarchar	N		
SrcTreatmentModifiedDate	datetime	N		Source System Date
SrcOutcomeModifiedDate	datetime	N		Source System Date
InsertDate	datetime	Y		System Date
ModifiedDate	datetime	Y		System Date

4.2 Dimension Tables

DimDisease

Column Name	Data Type	Derived Col.	Key Col.	Description
DiseaseSK	int	Y	PK	Surrogate Key
AlternateDiseaseID	int	N		Business key
DiseaseName	nvarchar(255)	N		
Type	nvarchar(255)	N		
Severity	nvarchar(50)	N		
TransmissionMode	nvarchar(100)	N		
MortalityRate	decimal(5,2)	N		
SpecialityKey	int	N	FK	FK from Speciality
StartDate	datetime	Y		System Date
EndDate	datetime	Y		System Date
InsertDate	datetime	Y		System Date
ModifiedDate	datetime	Y		System Date

DimLocation

Column Name	Data Type	Derived Col.	Key Col.	Description
LocationSK	int	Y	PK	Surrogate Key
AlternateLocationID	int	N		Business key
Country	nvarchar(100)	N		
State	nvarchar(100)	N		
City	nvarchar(100)	N		
StartDate	datetime	Y		System Date
EndDate	datetime	Y		System Date
InsertDate	datetime	Y		System Date
ModifiedDate	datetime	Y		System Date

DimPatients

Column Name	Data Type	Derived Col.	Key Col.	Description
PatientSK	int	Y	PK	Surrogate Key
AlternatePatientID	int	N		Business key
FullName	nvarchar(255)	N		
Gender	nvarchar(10)	N		
Age	float	N		
StartDate	datetime	Y		System Date
EndDate	datetime	Y		System Date
InsertDate	datetime	Y		System Date

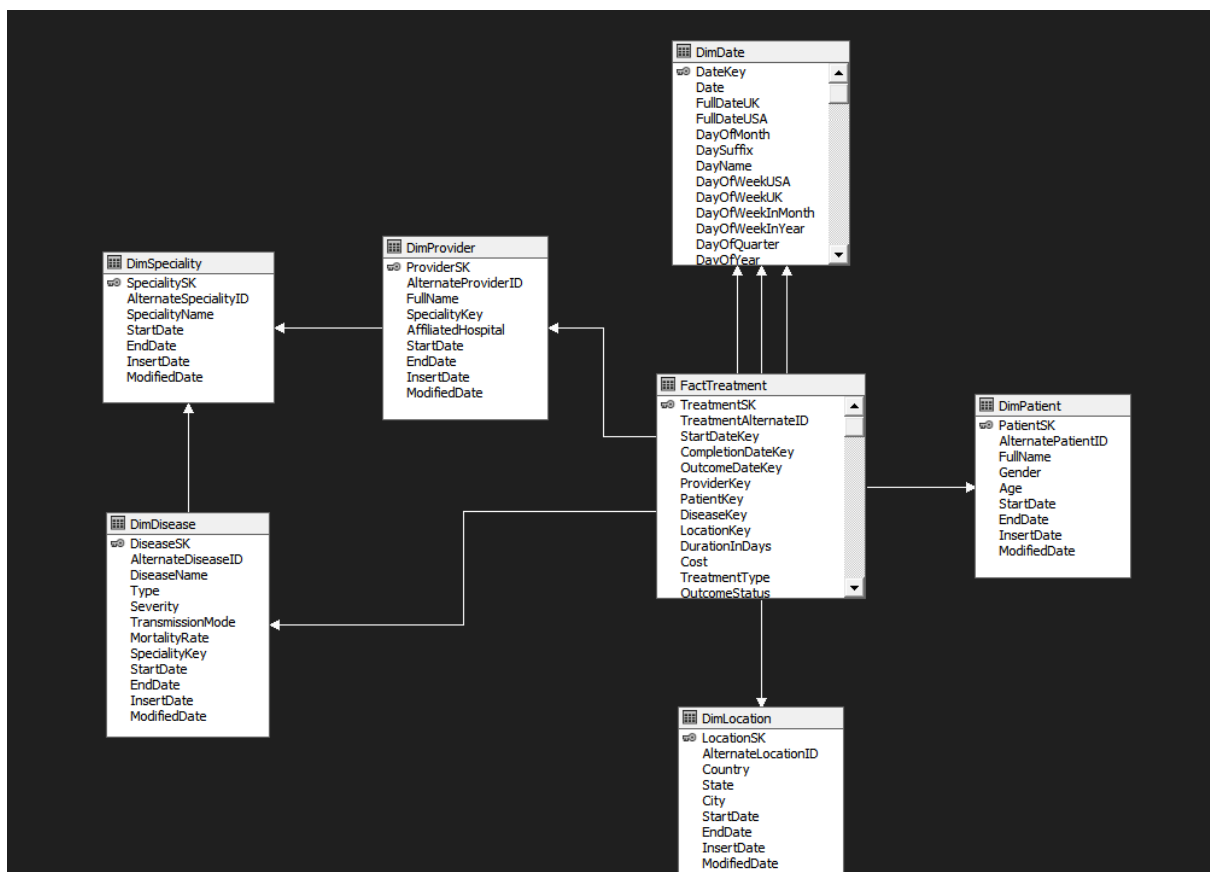
DimProvider

Column Name	Data Type	Derived Col.	Key Col.	Description
ProviderSK	int	Y	PK	Surrogate Key
AlternateProviderID	int	N		Business key
FullName	nvarchar(255)	N		
SpecialityKey	int	N	FK	FK from Speciality
AffiliatedHospital	nvarchar(255)	N		
StartDate	datetime	Y		System Date
EndDate	datetime	Y		System Date
InsertDate	datetime	Y		System Date
ModifiedDate	datetime	Y		System Date

DimSpeciality

Column Name	Data Type	Derived Col.	Key Col.	Description
SpecialitySK	int	Y	PK	Surrogate Key
AlternateSpecialityID	varchar(50)	N		Business key
SpecialityName	varchar(255)	N		
StartDate	datetime	Y		System Date
EndDate	datetime	Y		System Date
InsertDate	datetime	Y		System Date
ModifiedDate	datetime	Y		System Date

4.3 Relational Diagram



4.4 Assumptions

The FactTreatment table in my data warehouse architecture contains detailed records of medical treatments administered to patients across various hospitals. Each treatment record is associated with multiple dimensions, including the healthcare provider who performed the treatment, the disease being treated, the patient who received it, and the location where it took place. The treatment facts also include key performance attributes such as cost, duration, treatment type, and outcome status.

This schema illustrates how a single provider can deliver treatments to many patients, and how each patient may undergo multiple treatments for different medical conditions. However, in this analysis, particular emphasis is placed on the provider perspective analyzing treatment trends and outcomes based on the provider's specialty and hospital affiliation.







The dimensional structure enables focused reporting and analytics on provider performance, treatment effectiveness, and regional healthcare delivery patterns. By connecting treatment data to dimensions like DimSpeciality, DimLocation, and DimDisease, I can filter and segment the data to uncover insights into how specific specialities contribute to successful outcomes and how healthcare is distributed across various regions.

Consequently, in my scenario, I am analyzing and documenting treatment activity with a focus on provider roles, disease specialization, and location-based performance to support decision-making in healthcare management and resource allocation.

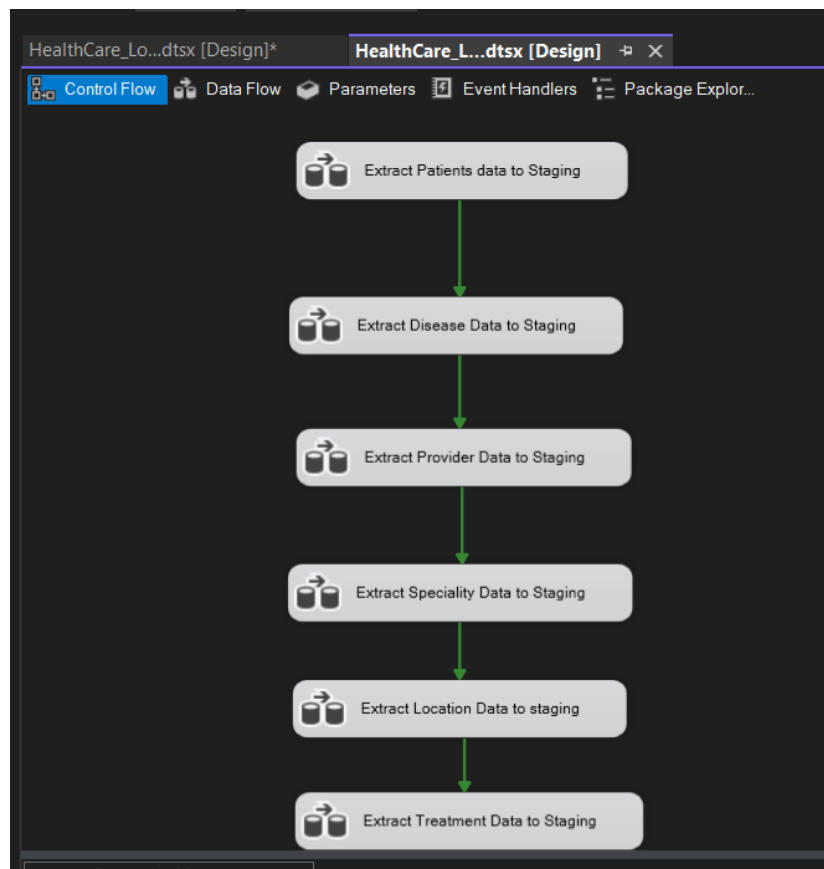
5. ETL development

The ETL (Extract, Transform, Load) process was implemented using SQL Server Integration Services (SSIS). It extracts data from multiple formats, loads it into staging tables, transforms the data (including surrogate key generation and foreign key resolution), and finally loads it into the data warehouse (DW) structured as a snowflake schema.

5.1 Data Sources

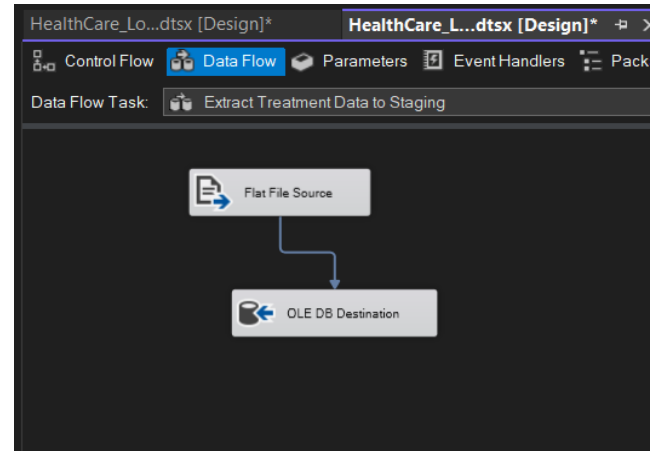
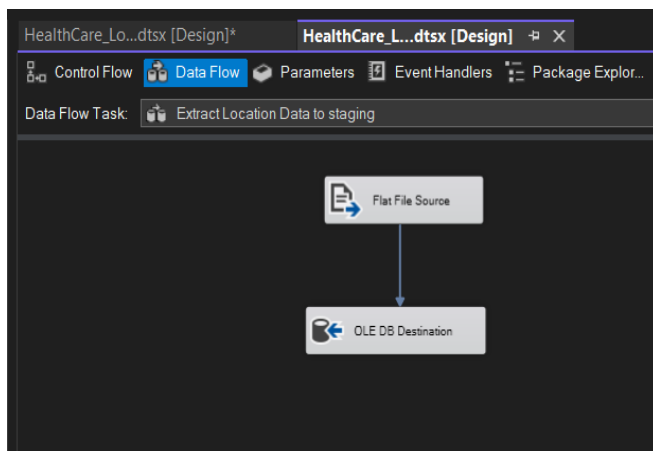
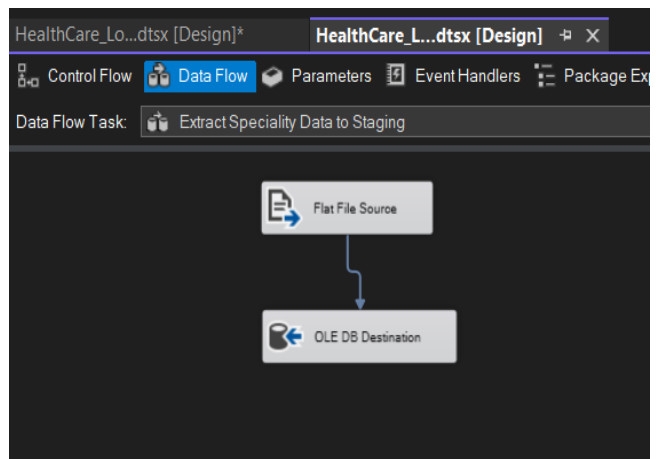
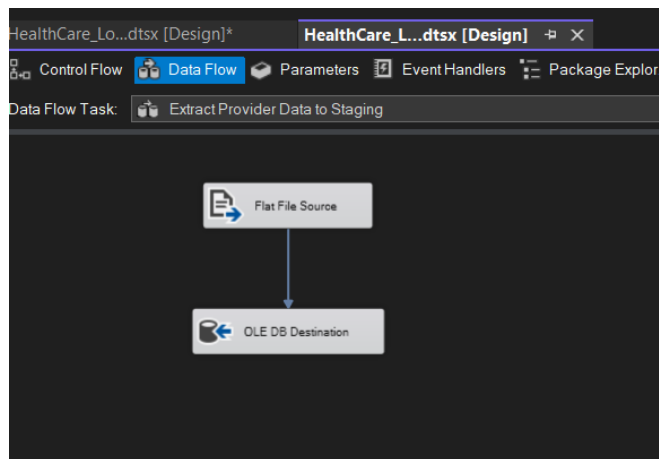
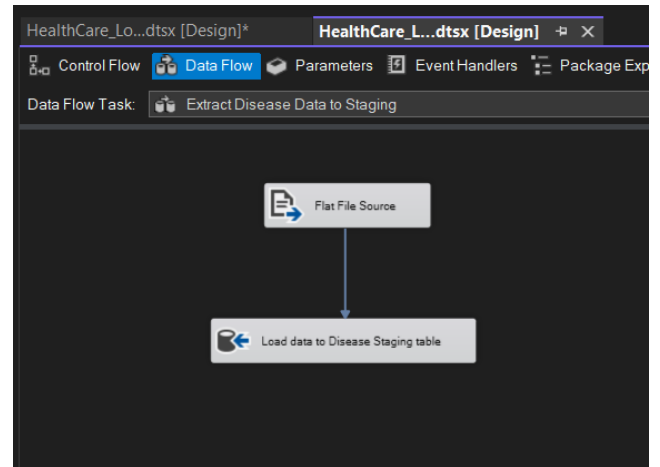
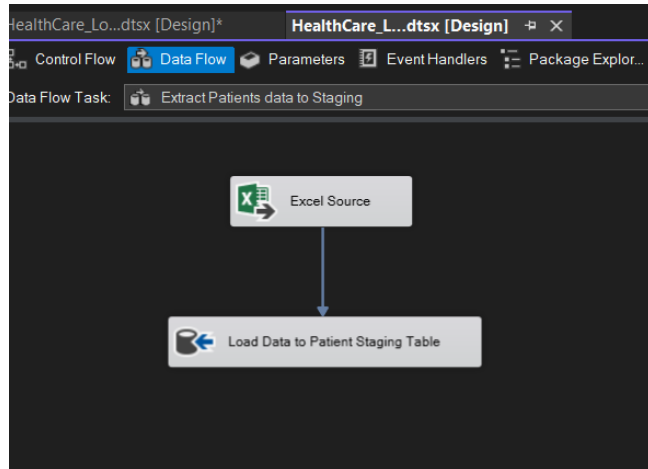
<input type="checkbox"/> Name	Date modified	Type	Size
 Disease.csv	4/24/2025 2:42 PM	Microsoft Excel Co...	4 KB
 healthcare_treatments__csv.csv	4/26/2025 6:14 PM	Microsoft Excel Co...	74,820 KB
 location.csv	4/26/2025 3:36 PM	Microsoft Excel Co...	1 KB
 Patients.xlsx	4/20/2025 12:22 PM	Microsoft Excel W...	18,836 KB
 Provider.txt	4/26/2025 3:45 PM	Text Document	1 KB
 Speciality.csv	4/26/2025 3:00 PM	Microsoft Excel Co...	1 KB

5.2 Extract & Load Data to Staging

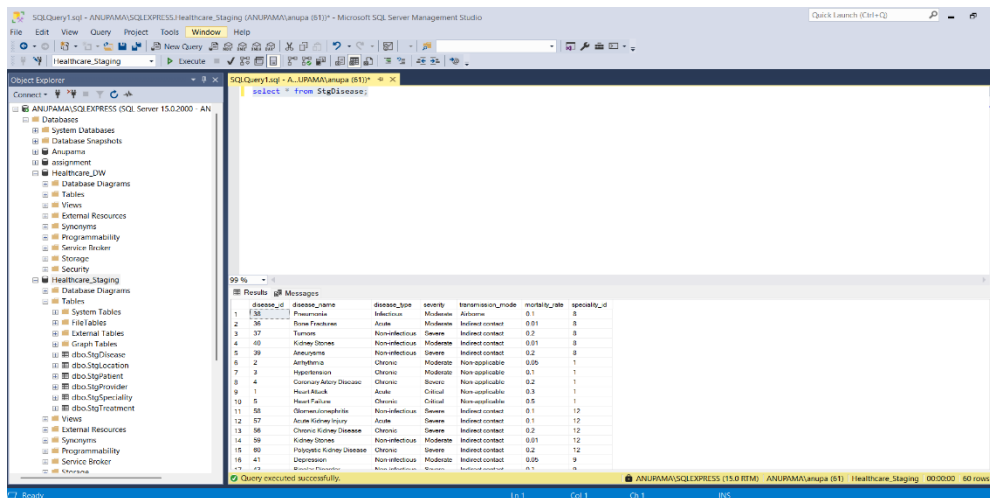


Data from source files (Treatment, Patients, Provider, Location, Specialist, Disease) is extracted and loaded into a staging area using SSIS packages.

Data Flows

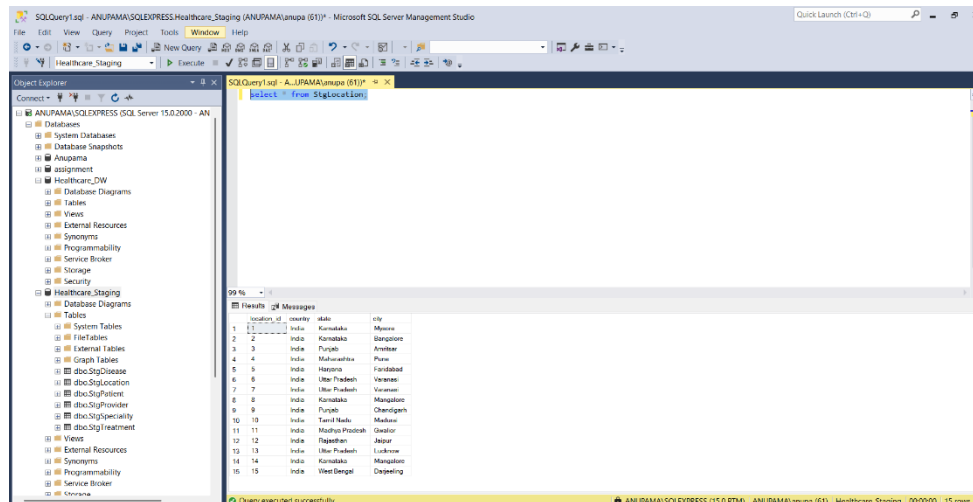


Loading Disease data to StgDisease Table



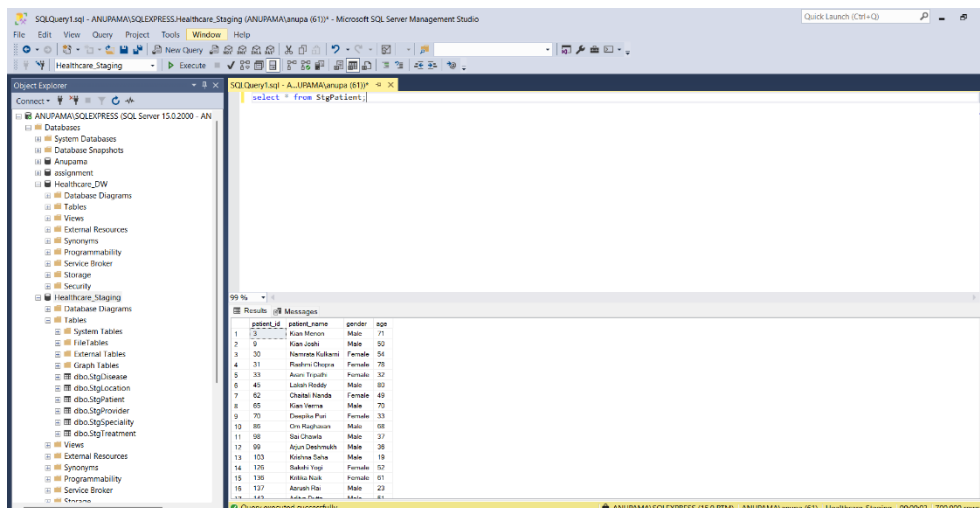
disease_id	disease_name	disease_type	severity	transmission_mode	mortality_rate	specialty_id
1	Pneumonia	Infectious	Moderate	Indirect contact	0.1	8
2	Time Fractures	Acute	Moderate	Indirect contact	0.01	8
3	Typhoid	Non-infectious	Severe	Indirect contact	0.2	8
4	Kidney Stones	Non-infectious	Moderate	Indirect contact	0.01	8
5	Acne	Non-infectious	Severe	Indirect contact	0.2	8
6	Asthma	Chronic	Moderate	Non-applicable	0.05	1
7	Hypertension	Chronic	Moderate	Non-applicable	0.1	1
8	Chronic Kidney Disease	Chronic	Severe	Indirect contact	0.2	12
9	Heart Attack	Acute	Critical	Non-applicable	0.3	1
10	Heart Failure	Chronic	Critical	Non-applicable	0.5	1
11	Obstructive Pulmonary Disease	Non-infectious	Severe	Indirect contact	0.1	12
12	Acute Kidney Injury	Acute	Severe	Indirect contact	0.1	12
13	Chronic Kidney Disease	Chronic	Severe	Indirect contact	0.2	12
14	Kidney Stones	Non-infectious	Moderate	Indirect contact	0.01	12
15	Hypertensive Kidney Disease	Chronic	Severe	Indirect contact	0.2	12
16	Depression	Non-infectious	Moderate	Indirect contact	0.05	9
17	Alcohol Use Disorder	Non-infectious	Critical	Indirect contact	0.1	9

Loading Location data to StgLocation Table



location_id	country	state	city
1	India	Karnataka	Mysore
2	India	Karnataka	Bangalore
3	India	Punjab	Amritsar
4	India	Madhya Pradesh	Pune
5	India	Haryana	Faridkot
6	India	Uttar Pradesh	Vareilly
7	India	Uttar Pradesh	Vareilly
8	India	Karnataka	Mangalore
9	India	Punjab	Chandigarh
10	India	Tamil Nadu	Madurai
11	India	Madhya Pradesh	Gwalior
12	India	Rajasthan	Jodhpur
13	India	Uttar Pradesh	Ludhiana
14	India	Karnataka	Mangalore
15	India	Vietnam	Da Nang

Loading Patients data to StgPatients Table



patient_id	patient_name	gender	age
1	Ravi Kumar	Male	71
2	Ravi Kumar	Male	50
3	Ravi Kumar	Female	54
4	Ravi Kumar	Female	78
5	Ravi Kumar	Female	52
6	Ravi Kumar	Male	60
7	Ravi Kumar	Female	49
8	Ravi Kumar	Male	70
9	Ravi Kumar	Female	53
10	Ravi Kumar	Male	68
11	Ravi Kumar	Male	37
12	Ravi Kumar	Male	58
13	Ravi Kumar	Male	19
14	Ravi Kumar	Female	57
15	Ravi Kumar	Female	61
16	Ravi Kumar	Male	23
17	Ravi Kumar	Male	61

Loading Provider data to StgProvider Table

The screenshot shows the SQL Server Enterprise Manager interface. The left pane displays the database structure for 'ANUPAMA\SQLEXPRESS (SQL Server 15.0.2000 - ANUPAMA)'. The 'Healthcare_Staging' database is selected, and the 'StgProvider' table is highlighted under the 'Tables' folder. The right pane shows the SQL query editor with the following query:

```
select * from StgProvider;
```

The query results are displayed in a table with 15 rows and 10 columns: provider_id, provider_name, specialty_id, affiliated_hospital, and others. The status bar at the bottom indicates 'Query executed successfully' and '15 rows'.

Loading Treatment data to StgTreatment Table

The screenshot shows the SQL Server Enterprise Manager interface. The left pane displays the database structure for 'ANUPAMA\SQLEXPRESS (SQL Server 15.0.2000 - ANUPAMA)'. The 'Healthcare_Staging' database is selected, and the 'StgTreatment' table is highlighted under the 'Tables' folder. The right pane shows the SQL query editor with the following query:

```
select * from StgTreatment;
```

The query results are displayed in a table with 15 rows and 15 columns: treatment_id, treatment_start_date, treatment_completion_date, treatment_outcome_status, treatment_outcome_date, treatment_duration, treatment_cost, treatment_type, patient_id, disease_id, location_id, provider_id, and others. The status bar at the bottom indicates 'Query executed successfully' and '700,000 rows'.

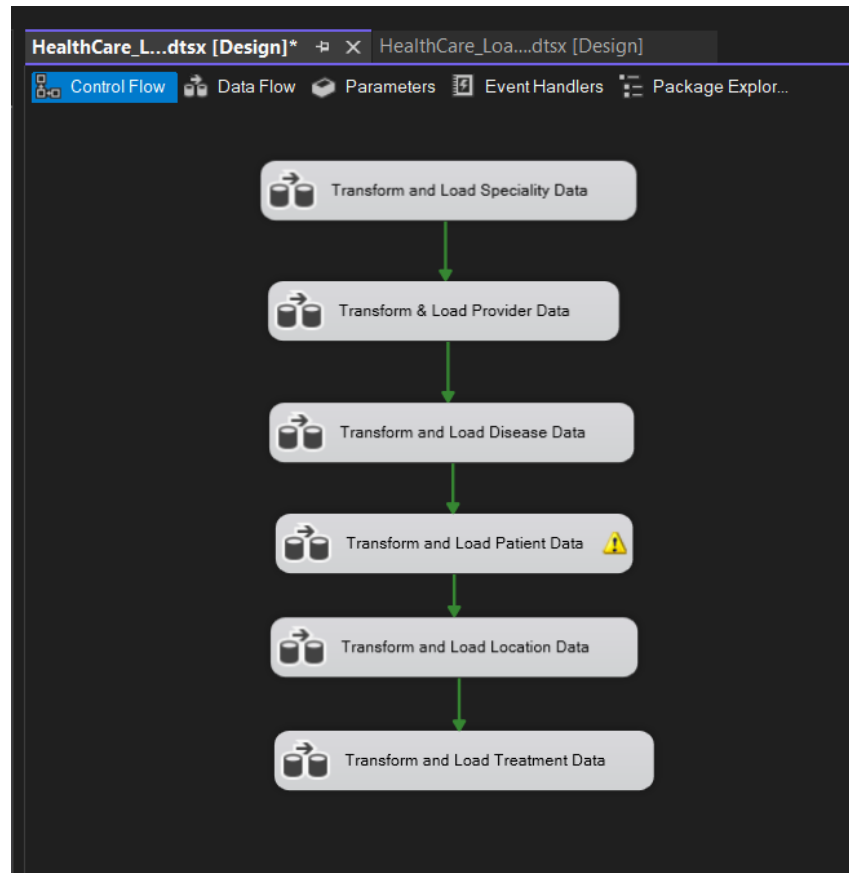
Loading Speciality data to StgSpeciality Table

The screenshot shows the SQL Server Enterprise Manager interface. The left pane displays the database structure for 'ANUPAMA\SQLEXPRESS (SQL Server 15.0.2000 - ANUPAMA)'. The 'Healthcare_Staging' database is selected, and the 'StgSpeciality' table is highlighted under the 'Tables' folder. The right pane shows the SQL query editor with the following query:

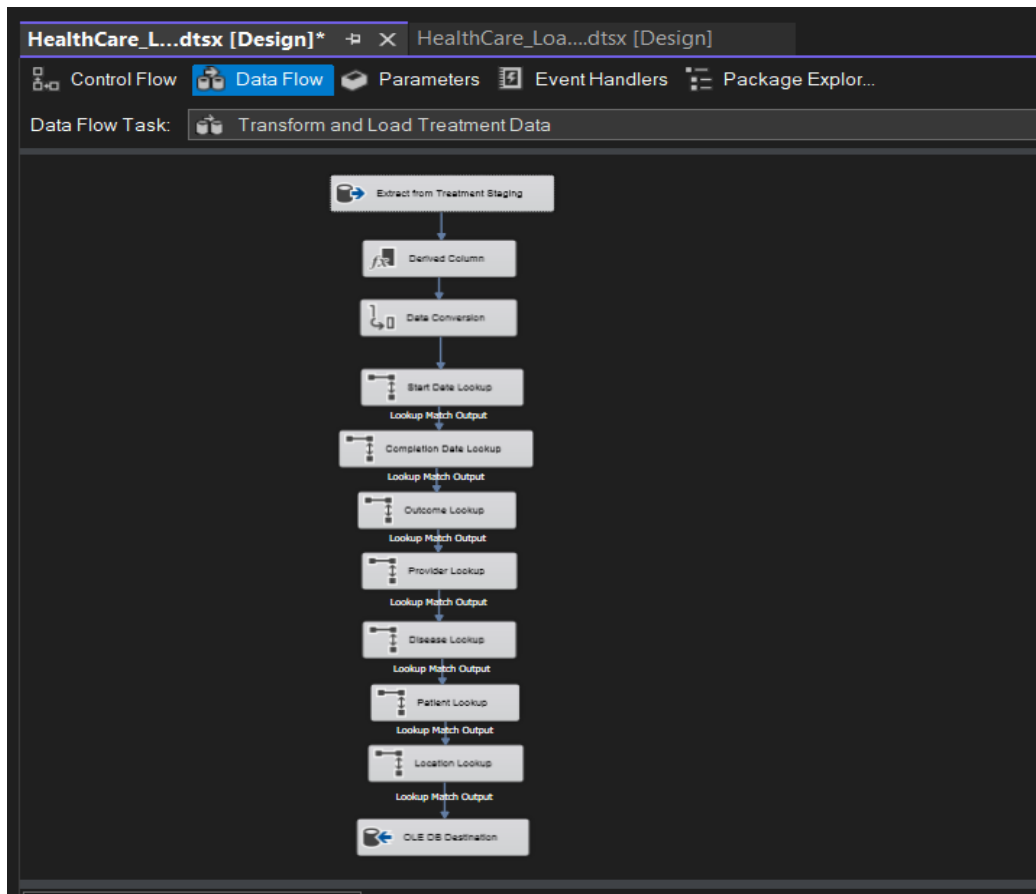
```
select * from StgSpeciality;
```

The query results are displayed in a table with 12 rows and 2 columns: specialty_id and specialty_name. The status bar at the bottom indicates 'Query executed successfully' and '12 rows'.

5.3 Extract, Transform & Load Data to Datawarehouse



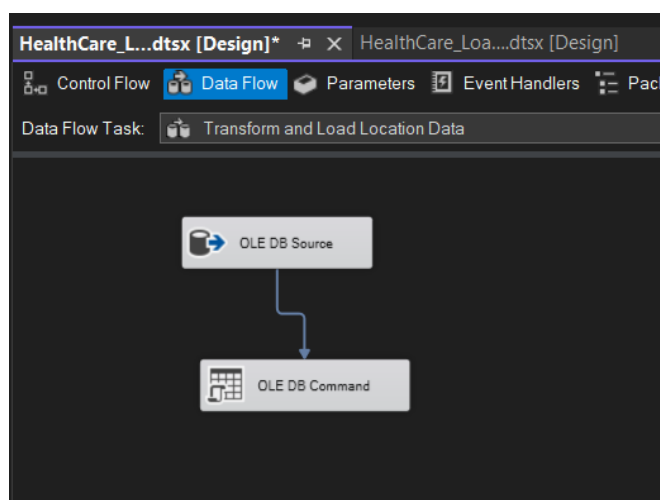
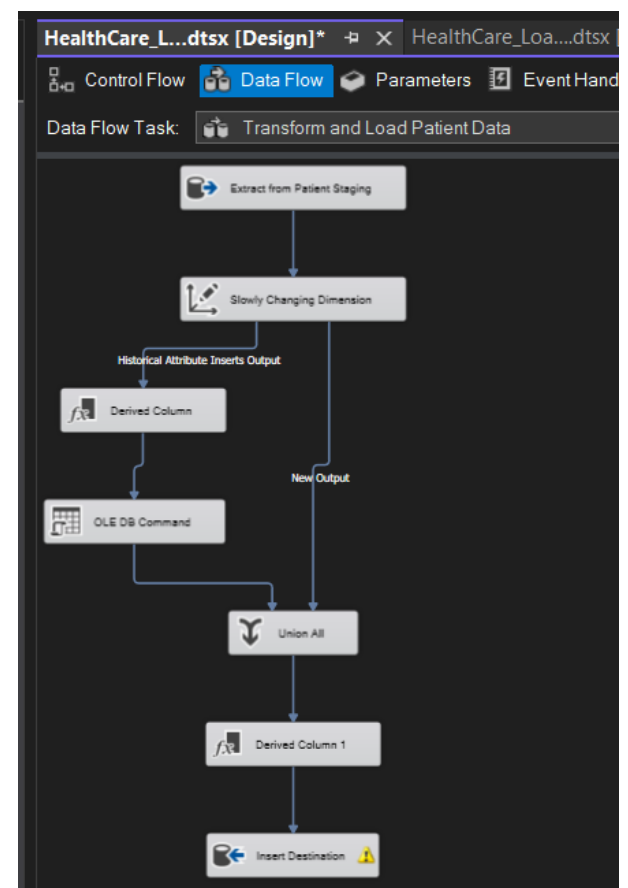
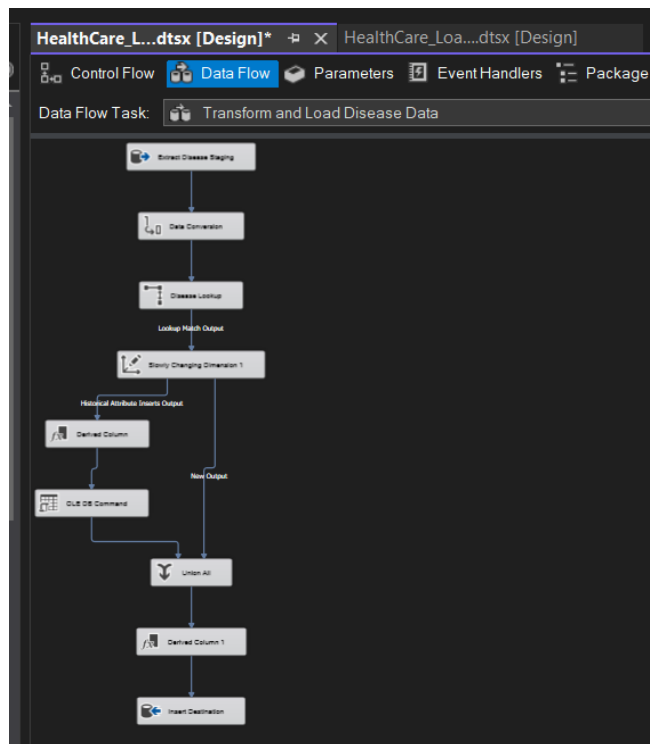
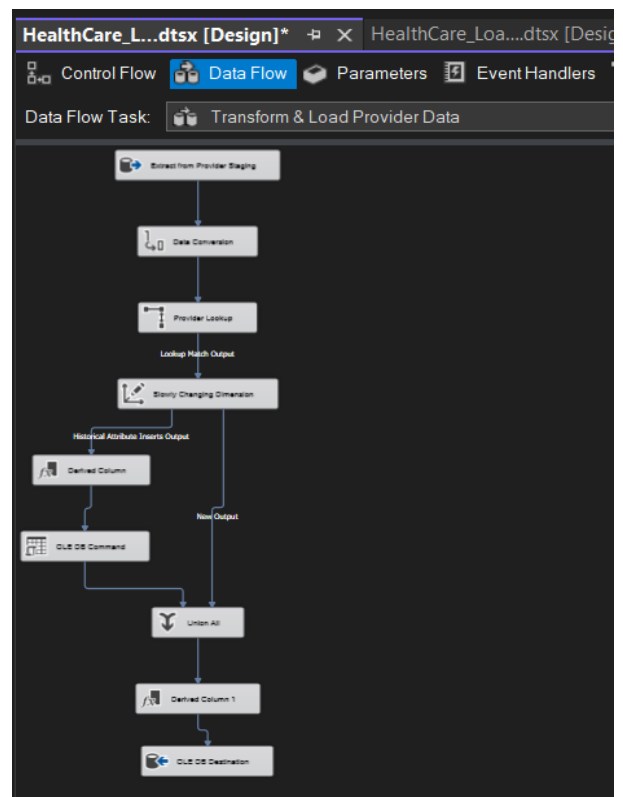
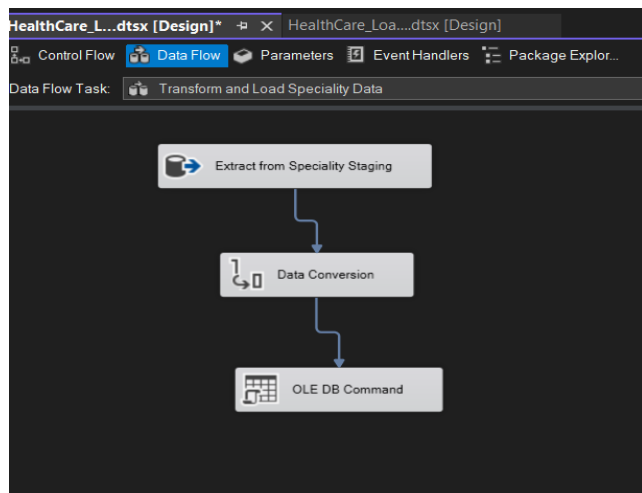
Data from staging tables (StgTreatment, StgPatients, StgProvider, StgLocation, StgSpecialist, StgDisease) is extracted, transformed and loaded from staging into the data warehouse.



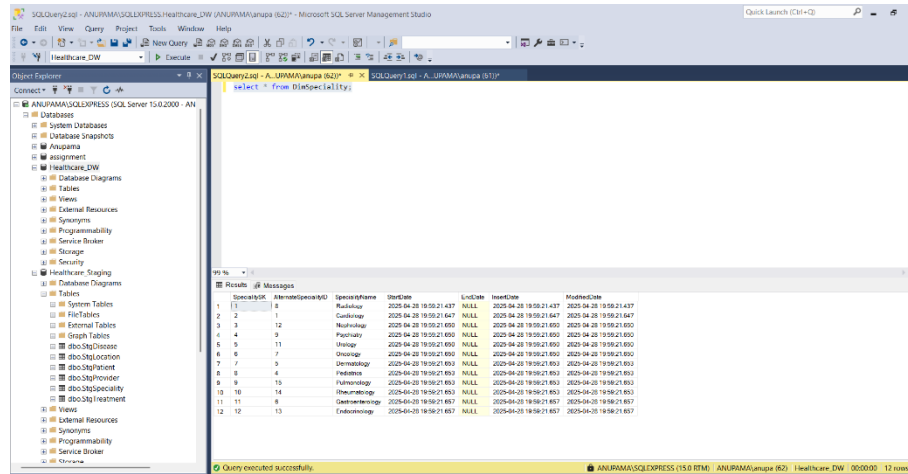
This process loads the FactTreatment table in to data warehouse by extracting treatment data from staging and using SSIS lookup transformations to fetch the corresponding surrogate keys from related dimension tables (such as Patient, Provider, Disease, Location, Speciality, and Date). These dimension keys are then stored as foreign keys in FactTreatment, enabling efficient joins and analytics in a snowflake schema

In data flow the extracted data then passes through a Data Conversion transformation, which changes data types as needed for downstream processing.

DimProvider, DimPatient & DimDisease are Slowly Changing Dimensions. The Slowly Changing Dimension (SCD) component manages changes in customer attributes, preserving historical data when necessary. For records requiring historical tracking, a Derived Column transformation adds or modifies fields before passing data to an OLE DB Command for updates. Both new and updated records are combined using a Union All transformation, after which a final Derived Column transformation applies any additional calculations or standardizations. The process concludes with the Insert Destination, which loads the cleansed and enriched customer data into the target data warehouse table, ensuring accuracy and consistency for downstream analytics and reporting



DimSpecialty



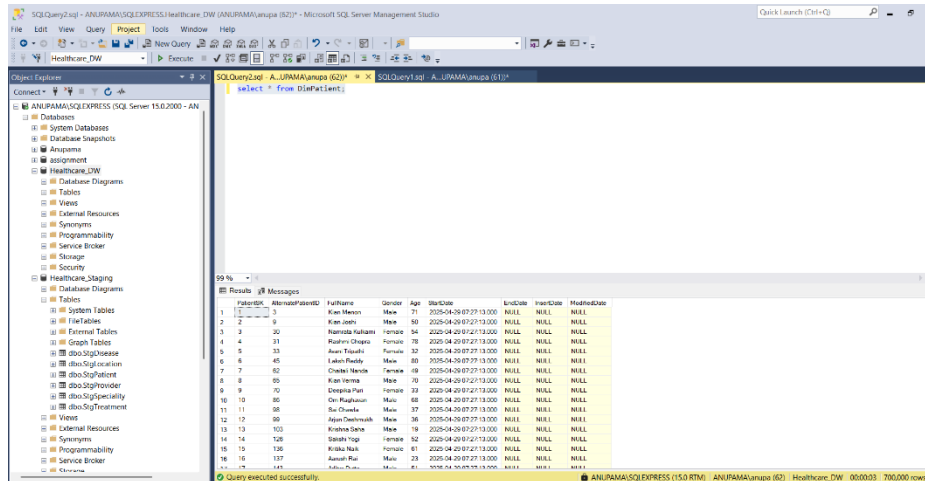
SQLQuery2.sql - ANUPAMA\SQLEXPRESS\Healthcare_DW (ANUPAMA\anupa (82)) - Microsoft SQL Server Management Studio

select * from DimSpecialty

SpecialtyID	AlternateSpecialtyID	SpecialtyName	StartDate	EndDate	InsertDate	ModifiedDate
1	1	Psychiatry	2025-04-28 19:59:21.437	NULL	2025-04-28 19:59:21.437	2025-04-28 19:59:21.437
2	1	Counseling	2025-04-28 19:59:21.647	NULL	2025-04-28 19:59:21.647	2025-04-28 19:59:21.647
3	12	Neurology	2025-04-28 19:59:21.800	NULL	2025-04-28 19:59:21.800	2025-04-28 19:59:21.800
4	9	Psychiatry	2025-04-28 19:59:21.800	NULL	2025-04-28 19:59:21.800	2025-04-28 19:59:21.800
5	11	Urology	2025-04-28 19:59:21.800	NULL	2025-04-28 19:59:21.800	2025-04-28 19:59:21.800
6	7	Orthopedic	2025-04-28 19:59:21.800	NULL	2025-04-28 19:59:21.800	2025-04-28 19:59:21.800
7	9	Dermatology	2025-04-28 19:59:21.800	NULL	2025-04-28 19:59:21.800	2025-04-28 19:59:21.800
8	4	Podiatry	2025-04-28 19:59:21.800	NULL	2025-04-28 19:59:21.800	2025-04-28 19:59:21.800
9	15	Pulmonology	2025-04-28 19:59:21.800	NULL	2025-04-28 19:59:21.800	2025-04-28 19:59:21.800
10	14	Rheumatology	2025-04-28 19:59:21.800	NULL	2025-04-28 19:59:21.800	2025-04-28 19:59:21.800
11	8	Ophthalmology	2025-04-28 19:59:21.800	NULL	2025-04-28 19:59:21.800	2025-04-28 19:59:21.800
12	13	Endocrinology	2025-04-28 19:59:21.800	NULL	2025-04-28 19:59:21.800	2025-04-28 19:59:21.800

Query executed successfully.

DimPatients



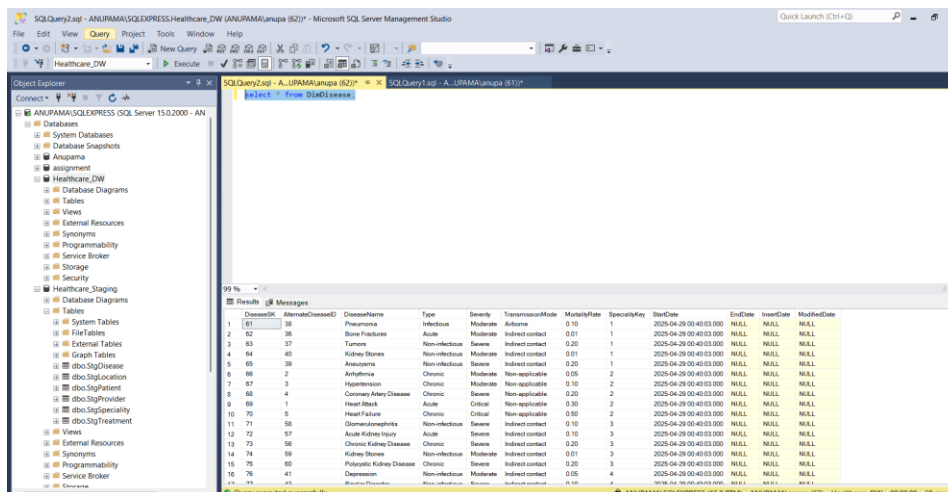
SQLQuery2.sql - ANUPAMA\SQLEXPRESS\Healthcare_DW (ANUPAMA\anupa (82)) - Microsoft SQL Server Management Studio

select * from DimPatients

PatientID	AlternatePatientID	FirstName	Gender	Age	BirthDate	LNIDB	InsertDate	ModifiedDate
1	1	Ram Naveen	Male	71	2025-04-28 20:07:21.000	NULL	NULL	NULL
2	2	Ram Jeeva	Male	60	2025-04-28 20:07:21.000	NULL	NULL	NULL
3	3	Ramadevi Kulkarni	Female	54	2025-04-28 20:07:21.000	NULL	NULL	NULL
4	4	Ramadevi Chandra	Female	78	2025-04-28 20:07:21.000	NULL	NULL	NULL
5	5	Arun Thakur	Female	32	2025-04-28 20:07:21.000	NULL	NULL	NULL
6	6	Lakshmi Reddy	Male	68	2025-04-28 20:07:21.000	NULL	NULL	NULL
7	7	Chandra Naveen	Female	68	2025-04-28 20:07:21.000	NULL	NULL	NULL
8	8	Kiran Verma	Male	70	2025-04-28 20:07:21.000	NULL	NULL	NULL
9	9	Deepika Nish	Female	33	2025-04-28 20:07:21.000	NULL	NULL	NULL
10	10	Om Rajaguru	Male	62	2025-04-28 20:07:21.000	NULL	NULL	NULL
11	11	Sar Chandra	Male	37	2025-04-28 20:07:21.000	NULL	NULL	NULL
12	12	Arun Chandra	Male	36	2025-04-28 20:07:21.000	NULL	NULL	NULL
13	13	Krishna Sona	Male	19	2025-04-28 20:07:21.000	NULL	NULL	NULL
14	14	Satish Nish	Female	52	2025-04-28 20:07:21.000	NULL	NULL	NULL
15	15	Kishu Nish	Female	61	2025-04-28 20:07:21.000	NULL	NULL	NULL
16	16	Anand Ravi	Male	33	2025-04-28 20:07:21.000	NULL	NULL	NULL
17	17	Arjun Ravi	Male	61	2025-04-28 20:07:21.000	NULL	NULL	NULL

Query executed successfully.

DimDisease



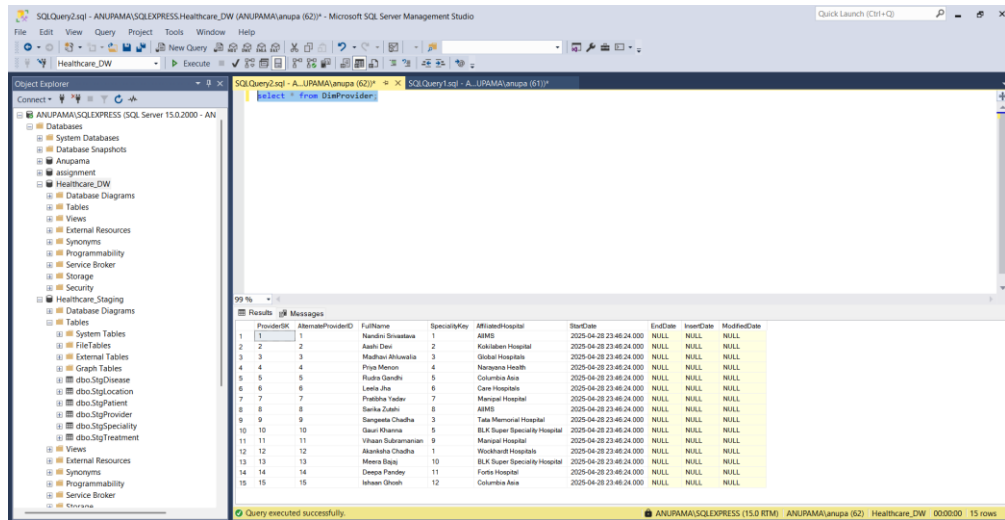
SQLQuery2.sql - ANUPAMA\SQLEXPRESS\Healthcare_DW (ANUPAMA\anupa (82)) - Microsoft SQL Server Management Studio

select * from DimDisease

DiseaseID	AlternateDiseaseID	DiseaseName	Type	Severity	TransmissionMode	MorbidityRate	SpecialtyKey	StartDate	EndDate	InsertDate	ModifiedDate
1	61	Pneumonia	Infectious	Moderate	Indirect contact	0.10	1	2025-04-28 20:00:00.000	NULL	NULL	NULL
2	62	Bone Fractures	Acute	Moderate	Indirect contact	0.01	1	2025-04-28 20:00:00.000	NULL	NULL	NULL
3	63	Cancer	Non-infectious	Severe	Indirect contact	0.20	1	2025-04-28 20:00:00.000	NULL	NULL	NULL
4	64	Kidney Stones	Non-infectious	Moderate	Indirect contact	0.01	1	2025-04-28 20:00:00.000	NULL	NULL	NULL
5	65	Aneurysm	Non-infectious	Severe	Indirect contact	0.20	1	2025-04-28 20:00:00.000	NULL	NULL	NULL
6	66	Arteriosclerosis	Chronic	Moderate	Non-applicable	0.05	2	2025-04-28 20:00:00.000	NULL	NULL	NULL
7	67	Hypertension	Chronic	Moderate	Non-applicable	0.10	2	2025-04-28 20:00:00.000	NULL	NULL	NULL
8	68	Common Atrial Disease	Chronic	Severe	Non-applicable	0.20	2	2025-04-28 20:00:00.000	NULL	NULL	NULL
9	69	Heart Block	Acute	Critical	Non-applicable	0.30	2	2025-04-28 20:00:00.000	NULL	NULL	NULL
10	70	Heart Failure	Chronic	Critical	Non-applicable	0.50	2	2025-04-28 20:00:00.000	NULL	NULL	NULL
11	71	Glomerulonephritis	Non-infectious	Severe	Indirect contact	0.10	3	2025-04-28 20:00:00.000	NULL	NULL	NULL
12	72	Acute Kidney Injury	Acute	Severe	Indirect contact	0.10	3	2025-04-28 20:00:00.000	NULL	NULL	NULL
13	73	Chronic Kidney Disease	Chronic	Severe	Indirect contact	0.20	3	2025-04-28 20:00:00.000	NULL	NULL	NULL
14	74	Kidney Stones	Non-infectious	Moderate	Indirect contact	0.01	3	2025-04-28 20:00:00.000	NULL	NULL	NULL
15	75	Polycystic Kidney Disease	Chronic	Severe	Indirect contact	0.20	3	2025-04-28 20:00:00.000	NULL	NULL	NULL
16	76	Depression	Non-infectious	Moderate	Indirect contact	0.05	4	2025-04-28 20:00:00.000	NULL	NULL	NULL
17	77	Bipolar Disorder	Non-infectious	Severe	Indirect contact	0.10	4	2025-04-28 20:00:00.000	NULL	NULL	NULL

Query executed successfully.

DimProvider



SQLQuery2.sql - ANUPAMA\SQLEXPRESS:Healthcare_DW (ANUPAMA\anupa (62)) - Microsoft SQL Server Management Studio

Object Explorer: Healthcare_DW

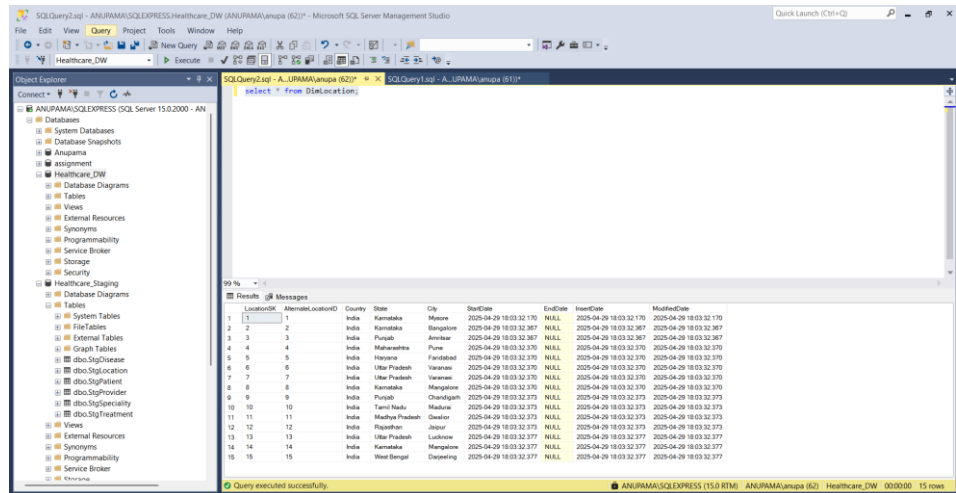
SQLQuery2.sql - A:UPPAMA\anupa (62) - select * from DimProvider

99 % - Results Messages

ProviderID	AlternateProviderID	Fullname	SpecialtyKey	Address/Hospital	StartDate	EndDate	InsertDate	ModifiedDate
1	1	Nandini Srinivas	1	AKHAI Hospital	2025-04-29 23:48:24.000	NULL	NULL	NULL
2	2	Aashi Devi	2	Kakibai Hospital	2025-04-29 23:48:24.000	NULL	NULL	NULL
3	3	Mahesh Khimada	3	Ukshai Hospital	2025-04-29 23:48:24.000	NULL	NULL	NULL
4	4	Piya Menon	4	Naranyan Health	2025-04-29 23:48:24.000	NULL	NULL	NULL
5	5	Rudra Gandhi	5	Columbia Asia	2025-04-29 23:48:24.000	NULL	NULL	NULL
6	6	Latha Jee	6	Care Hospitals	2025-04-29 23:48:24.000	NULL	NULL	NULL
7	7	Prathiba Yadav	7	Manoj Hospital	2025-04-29 23:48:24.000	NULL	NULL	NULL
8	8	Barika Zuhdi	8	AKHAI	2025-04-29 23:48:24.000	NULL	NULL	NULL
9	9	Sangeeta Chudha	9	Tata Memorial Hospital	2025-04-29 23:48:24.000	NULL	NULL	NULL
10	10	Gauri Khanna	10	BLK Super Specialty Hospital	2025-04-29 23:48:24.000	NULL	NULL	NULL
11	11	Vijayan Subramanian	11	Manoj Hospital	2025-04-29 23:48:24.000	NULL	NULL	NULL
12	12	Aparajitha Chitra	12	Westcott Hospitals	2025-04-29 23:48:24.000	NULL	NULL	NULL
13	13	Meera Baiji	13	BLK Super Specialty Hospital	2025-04-29 23:48:24.000	NULL	NULL	NULL
14	14	Deepa Pandey	14	Fortis Hospital	2025-04-29 23:48:24.000	NULL	NULL	NULL
15	15	Indira Ghosh	15	Columbia Asia	2025-04-29 23:48:24.000	NULL	NULL	NULL

Query executed successfully. ANUPAMA\SQLEXPRESS (15.0 RTM) ANUPAMA\anupa (62) Healthcare_DW 00:00:00 15 rows

DimLocation



SQLQuery2.sql - ANUPAMA\SQLEXPRESS:Healthcare_DW (ANUPAMA\anupa (62)) - Microsoft SQL Server Management Studio

Object Explorer: Healthcare_DW

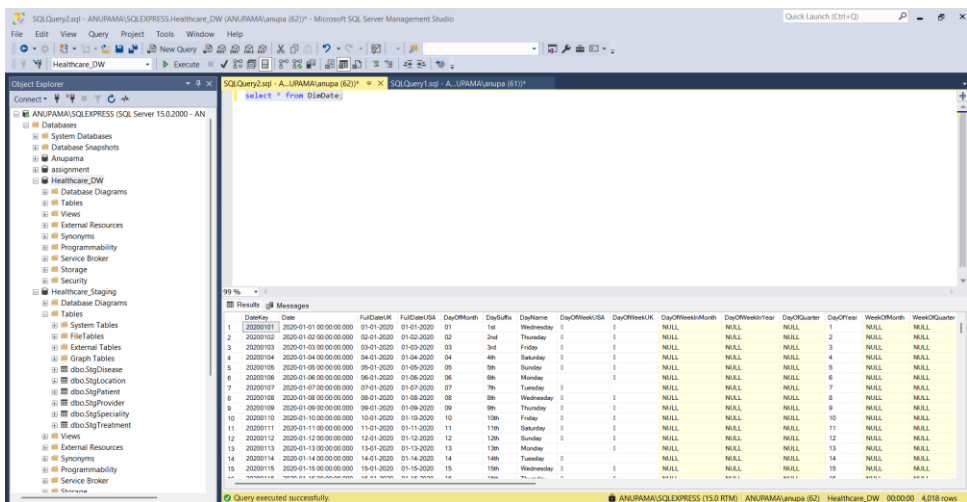
SQLQuery2.sql - A:UPPAMA\anupa (62) - select * from DimLocation

99 % - Results Messages

LocationID	AlternateLocationID	Country	State	City	StartDate	EndDate	InsertDate	ModifiedDate
1	1	India	Karnataka	Mysore	2025-04-29 18:03:32.370	NULL	2025-04-29 18:03:32.370	2025-04-29 18:03:32.370
2	2	India	Karnataka	Bengaluru	2025-04-29 18:03:32.367	NULL	2025-04-29 18:03:32.367	2025-04-29 18:03:32.367
3	3	India	Punjab	Amritsar	2025-04-29 18:03:32.370	NULL	2025-04-29 18:03:32.370	2025-04-29 18:03:32.370
4	4	India	Maharashtra	Pune	2025-04-29 18:03:32.370	NULL	2025-04-29 18:03:32.370	2025-04-29 18:03:32.370
5	5	India	Haryana	Faridkot	2025-04-29 18:03:32.370	NULL	2025-04-29 18:03:32.370	2025-04-29 18:03:32.370
6	6	India	Uttar Pradesh	Vareanasi	2025-04-29 18:03:32.370	NULL	2025-04-29 18:03:32.370	2025-04-29 18:03:32.370
7	7	India	Uttar Pradesh	Vareanasi	2025-04-29 18:03:32.370	NULL	2025-04-29 18:03:32.370	2025-04-29 18:03:32.370
8	8	India	Karnataka	Mangalore	2025-04-29 18:03:32.370	NULL	2025-04-29 18:03:32.370	2025-04-29 18:03:32.370
9	9	India	Punjab	Chandigarh	2025-04-29 18:03:32.370	NULL	2025-04-29 18:03:32.370	2025-04-29 18:03:32.370
10	10	India	Tamil Nadu	Madurai	2025-04-29 18:03:32.370	NULL	2025-04-29 18:03:32.370	2025-04-29 18:03:32.370
11	11	India	Madhya Pradesh	Jabalpur	2025-04-29 18:03:32.370	NULL	2025-04-29 18:03:32.370	2025-04-29 18:03:32.370
12	12	India	Rajasthan	Jaisalmer	2025-04-29 18:03:32.370	NULL	2025-04-29 18:03:32.370	2025-04-29 18:03:32.370
13	13	India	Uttar Pradesh	Lucknow	2025-04-29 18:03:32.377	NULL	2025-04-29 18:03:32.377	2025-04-29 18:03:32.377
14	14	India	Madhya Pradesh	Margaret	2025-04-29 18:03:32.377	NULL	2025-04-29 18:03:32.377	2025-04-29 18:03:32.377
15	15	India	West Bengal	Dispurang	2025-04-29 18:03:32.377	NULL	2025-04-29 18:03:32.377	2025-04-29 18:03:32.377

Query executed successfully. ANUPAMA\SQLEXPRESS (15.0 RTM) ANUPAMA\anupa (62) Healthcare_DW 00:00:00 15 rows

DimDate



SQLQuery2.sql - ANUPAMA\SQLEXPRESS:Healthcare_DW (ANUPAMA\anupa (62)) - Microsoft SQL Server Management Studio

Object Explorer: Healthcare_DW

SQLQuery2.sql - A:UPPAMA\anupa (62) - select * from DimDate

99 % - Results Messages















































Sequence	Date	FullCalendar	FullCalendarUSA	DayOfMonth	DayOfWeek	DayName	DayOfWeekUSA	DayOfWeekUK	DayOfWeekMonth	DayOfWeekMonth	DayQuarter	DayQuarter	WeekOfMonth	WeekQuarter
1	20200101	2020-01-01 00:00:00.000	01-01-2020	01	1st	Wednesday	1	1	NULL	NULL	1	NULL	NULL	NULL
2	20200102	2020-01-02 00:00:00.000	02-01-2020	02	2nd	Thursday	2	2	NULL	NULL	2	NULL	NULL	NULL
3	20200103	2020-01-03 00:00:00.000	03-01-2020	03	3rd	Friday	3	3	NULL	NULL	3	NULL	NULL	NULL
4	20200104	2020-01-04 00:00:00.000	04-01-2020	04	4th	Saturday	4	4	NULL	NULL	4	NULL	NULL	NULL
5	20200105	2020-01-05 00:00:00.000	05-01-2020	05	5th	Sunday	5	5	NULL	NULL	5	NULL	NULL	NULL
6	20200106	2020-01-06 00:00:00.000	06-01-2020	06	6th	Monday	6	6	NULL	NULL	6	NULL	NULL	NULL
7	20200107	2020-01-07 00:00:00.000	07-01-2020	07	7th	Tuesday	7	7	NULL	NULL	7	NULL	NULL	NULL
8	20200108	2020-01-08 00:00:00.000	08-01-2020	08	8th	Wednesday	8	8	NULL	NULL	8	NULL	NULL	NULL
9	20200109	2020-01-09 00:00:00.000	09-01-2020	09	9th	Thursday	9	9	NULL	NULL	9	NULL	NULL	NULL
10	20200110	2020-01-10 00:00:00.000	10-01-2020	10	10th	Friday	10	10	NULL	NULL	10	NULL	NULL	NULL
11	20200111	2020-01-11 00:00:00.000	11-01-2020	11	11th	Saturday	11	11	NULL	NULL	11	NULL	NULL	NULL
12	20200112	2020-01-12 00:00:00.000	12-01-2020	12	12th	Sunday	12	12	NULL	NULL	12	NULL	NULL	NULL
13	20200113	2020-01-13 00:00:00.000	13-01-2020	13	13th	Monday	13	13	NULL	NULL	13	NULL	NULL	NULL
14	20200114	2020-01-14 00:00:00.000	14-01-2020	14	14th	Tuesday	14	14	NULL	NULL	14	NULL	NULL	NULL
15	20200115	2020-01-15 00:00:00.000	15-01-2020	15	15th	Wednesday	15	15	NULL	NULL	15	NULL	NULL	NULL

Query executed successfully. ANUPAMA\SQLEXPRESS (15.0 RTM) ANUPAMA\anupa (62) Healthcare_DW 00:00:00 4,018 rows

FactTreatment

SQLQuery3.sql - ANUPAMA\SQLEXPRESS.Healthcare_DW (ANUPAMAJanupa (63)) - Microsoft SQL Server Management Studio

File Edit View Query Project Tools Window Help

 New Query                                             

Healthcare_DW

Execute

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Connect

ANUPAMA\SQLEXPRESS (SQL Server 15.0.2000 - ANUPAMAJanupa (63))

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ANUPAMAJanupa (63)

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dbo.StgDisease

dbo.StgLocation

dbo.StgPatient

dbo.StgProvider

dbo.StgSpecialty

dbo.StgTreatment

Views

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Synonyms

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Healthcare_DW

SQLQuery3.sql - A..UPAMAJanupa (63)*

SQLQuery2.sql - A..UPAMAJanupa (62)*

SQLQuery1.sql - A..UPAMAJanupa (61)*

select * from FactTreatment;

99 %

Results Messages

	TreatmentID	TreatmentItemID	StartDateKey	CompletionDateKey	OutcomeDateKey	ProviderKey	PatientKey	DiseaseKey	LocationKey	DurationInDays	Cost	TreatmentType	OutcomeStatus	SrcTreatmentModifiedDa
1	486978	467040	20240831	20240904	20240906	11	3346	73	11	4	2756141.00	surgical	deceased	NULL
2	496979	467041	20240831	20240907	20240912	11	3349	75	11	7	1816232.00	pharmacological	worsened	NULL
3	496980	467042	20240831	20240908	20240913	11	3365	74	11	6	2180736.00	pharmacological	worsened	NULL
4	496981	467043	20240831	20240907	20240909	11	3396	74	11	7	685964.00	therapeutic	deceased	NULL
5	496982	467044	20240831	20240907	20240912	11	3424	74	11	7	453091.00	pharmacological	partially successful	NULL
6	496983	467045	20240831	20240903	20240906	11	3433	71	11	3	3767457.00	therapeutic	partially successful	NULL
7	496984	467046	20240831	20240904	20240909	11	3454	74	11	4	135342.00	therapeutic	stable	NULL
8	496985	467047	20240831	20240906	20240912	11	3466	71	11	6	464176.00	surgical	partially successful	NULL
9	496986	467048	20240831	20240903	20240906	11	3476	73	11	3	595310.00	preventive	stable	NULL
10	496987	467049	20240831	20240904	20240908	11	3480	71	11	4	1225959.00	pharmacological	worsened	NULL
11	496988	467050	20240831	20240907	20240910	11	3481	75	11	7	3171874.00	pharmacological	partially successful	NULL
12	496989	467051	20240831	20240904	20240907	11	3493	71	11	4	529489.00	therapeutic	discharged	NULL
13	496990	467052	20240831	20240907	20240914	11	3494	75	11	7	3679480.00	therapeutic	discharged	NULL
14	496991	467053	20240831	20240903	20240908	11	3505	74	11	3	2087600.00	preventive	no change	NULL
15	496992	467054	20240831	20240904	20240911	11	3545	71	11	4	764794.00	preventive	discharged	NULL

Query executed successfully.

ANUPAMA\SQLEXPRESS (15.0 RTM) ANUPAMAJanupa (63) Healthcare_DW 00:00:06 865,578 rows

SQLQuery3.sql - ANUPAMA\SQLEXPRESS.Healthcare_DW

File Edit View Query Project Tools Window

Healthcare_DW

Execute

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 - dbo.DimSpeciality
 - dbo.FactTreatment
 - dbo.StgSpeciality
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 - dbo.StgPatient
 - dbo.StgProvider
 - dbo.StgSpeciality
 - dbo.StgTreatment

