



# DATA INTEGRITY IN THE PHARMACEUTICAL INDUSTRY

A Database Solution Approach

## ABSTRACT

This paper presents a database solution aimed at improving data cleanliness and regulatory compliance in the pharmaceutical industry. The proposed tool leverages advanced database methodologies to ensure data integrity, enhance regulatory checks, and streamline compliance reporting. By implementing this solution, pharmaceutical companies can achieve higher levels of accuracy and operational efficiency in managing clinical trial data, ultimately leading to improved regulatory compliance and better patient outcomes.

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Chosen Area: **Pharmaceuticals**

## **SECTION 1; AN INTRODUCTION**

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### **A. Chosen Area: Pharmaceuticals (Drug Administration and Market Analysis)**

Pharmaceutical firms heavily depend on extensive data for various operations, ranging from interpreting clinical results to evaluating drug efficacy through real-world health metrics. Firms must ensure adherence to strict standards and changing legal requirements that will require continuous monitoring of data quality, as even minor errors could lead to legal repercussions, harm to reputation, and most importantly, endanger the well-being and lives of patients.

### **B. Data Management Problems: Data Integration and/or Standardization of Data; Data Quality Assurance and Accuracy/Completeness**

The pharmaceutical and biotech industries grapple with the rigorous task of ensuring clinical trial records are accurate and aligned across various data sources which can be a real headache. Whether it is data from contract research organizations, central labs, or third-party sources, the need for clean, on-point and consistent data has become more complex and increasingly difficult to manage.

To keep data integrity in check, it's crucial for process owners to grasp how it affects products from both technical and regulatory standpoints. Sadly, many pharma firms miss the mark here. They overlook critical aspects like robust analytical procedures, controlling process parameters, data acquisition, interpretation methods, and oversight.

Regulatory changes add another layer of complexity. Leaders feel the weight of constantly shifting rules, making it trickier to stay on top. Adapting to these changes is a must, even though it's a headache. New data-related regulations can drive up costs, complicate things, and pose challenges in software development. Leaders also fret about cross-border data transfers and data localization issues, fearing they might stumble on the ever-changing regulatory terrain.

*Note:* The above data management issues encompass the scope of this paper, although there is a far more extensive list of issues plaguing pharmaceuticals and data management today which are not discussed in the following solutions.

**C. Motivation: Introduce and integrate clean research data which will improve user insights, abide by federal compliance requirements using better data management.**

The primary objective of this database project is to bolster various aspects of data management, such as ensuring data completeness, reducing duplication, enhancing accuracy, maintaining conformity, ensuring consistency, and upholding data integrity. One specific focus is on enhancing the quality of regulatory data stored within a proposed regulatory information management table.

The overarching aim of the improvement points is to develop a robust system for conducting data quality checks across data sources, management services, and the company's core systems responsible for handling data critical for upkeeping regulatory compliance which will extend to ensuring ISO standards compliance within the pharmaceutical industry.

**D. Potential Benefits: R&D productivity boost, improved compliance, and risk management.**

Implementing a robust database solution in a pharmaceutical firm offers numerous benefits to stakeholders and potentially the industry as a whole.

Improved compliance is a key advantage. A well-designed database solution ensures that regulatory requirements are met consistently, reducing the risk of non-compliance penalties and regulatory issues. This not only protects the firm's reputation but also instills trust among regulatory agencies and consumers.

Overall, the benefits of implementing a robust database solution in the pharmaceutical and biotech industries include improved data integrity, enhanced regulatory compliance, reduced risks, and increased efficiency in managing clinical trial data and regulatory requirements. The concerns surrounding data consistency across sources would eliminate various data gaps that can create delays in the firm's objectives.

**E. Potential Users: R&D scientists, Product managers, regulatory affairs specialists, marketing and sales teams, healthcare providers.**

Roster of users that can contribute to or benefit from the database solutions:

**R&D Scientists:** R&D scientists can contribute to the database by inputting and analyzing experimental data, conducting data-driven research, and collaborating with other teams to develop new drugs and treatments. Access to a centralized

database enables R&D scientists to easily retrieve and share research findings, track experimental results, and identify patterns or trends to drive innovation and enhance decision-making.

**Product Managers:** Product managers can contribute by updating product information, monitoring market trends, and aligning product development strategies with market demand. The database provides product managers with real-time insights into market dynamics, customer feedback, and competitor analysis, facilitating informed product decisions and effective product lifecycle management.

**Regulatory Affairs Specialists:** Regulatory affairs specialists can contribute by ensuring data compliance with regulatory standards, maintaining accurate documentation, and managing regulatory submissions. The database streamlines regulatory processes, facilitates regulatory tracking and reporting, and helps in timely compliance with regulatory changes, reducing risks of non-compliance and ensuring product approvals.

**Marketing and Sales Teams:** Marketing and sales teams can contribute by accessing customer data, analyzing market trends, and developing targeted marketing campaigns. The database provides insights into customer preferences, buying behavior, and market segmentation, enabling marketing and sales teams to tailor their strategies, optimize lead generation, and increase sales effectiveness.

**Healthcare Providers:** Healthcare providers can contribute by inputting patient data, accessing clinical trial results, and collaborating with researchers for evidence-based medicine. The database facilitates seamless data sharing between healthcare providers, researchers, and patients, leading to improved patient care, personalized treatments, and better clinical outcomes.

## SECTION 2; BUSINESS RULES & USER REQUIREMENTS

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<b>A. Business Activities</b>
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Outlining key business activities and requirements for the database system we need developed; core entities include patients, clinics/hospitals, medications, and prescriptions. Business activities must also take into account regulatory compliance and risk management.

In terms of relationships, patients can have multiple prescriptions, each prescription is associated with one patient, one clinic/hospital, and one medication. Clinics/hospitals can issue multiple prescriptions, and medications can be prescribed in multiple prescriptions. Each prescription is uniquely identified, and referential integrity constraints are essential to ensure data accuracy and validity.

Database must support tracking billing information for each prescription, including total cost based on medication price per unit and quantity prescribed. The system should enforce business rules such as unique identifiers, relationship constraints, and accurate recording of prescription details. Additionally, the database should facilitate regulatory compliance by storing necessary documentation, ensuring data security and privacy, and generating reports for regulatory audits. This comprehensive database solution will streamline our operations, improve patient care, ensure regulatory compliance, and mitigate risks effectively.

## **B. User Requirements**

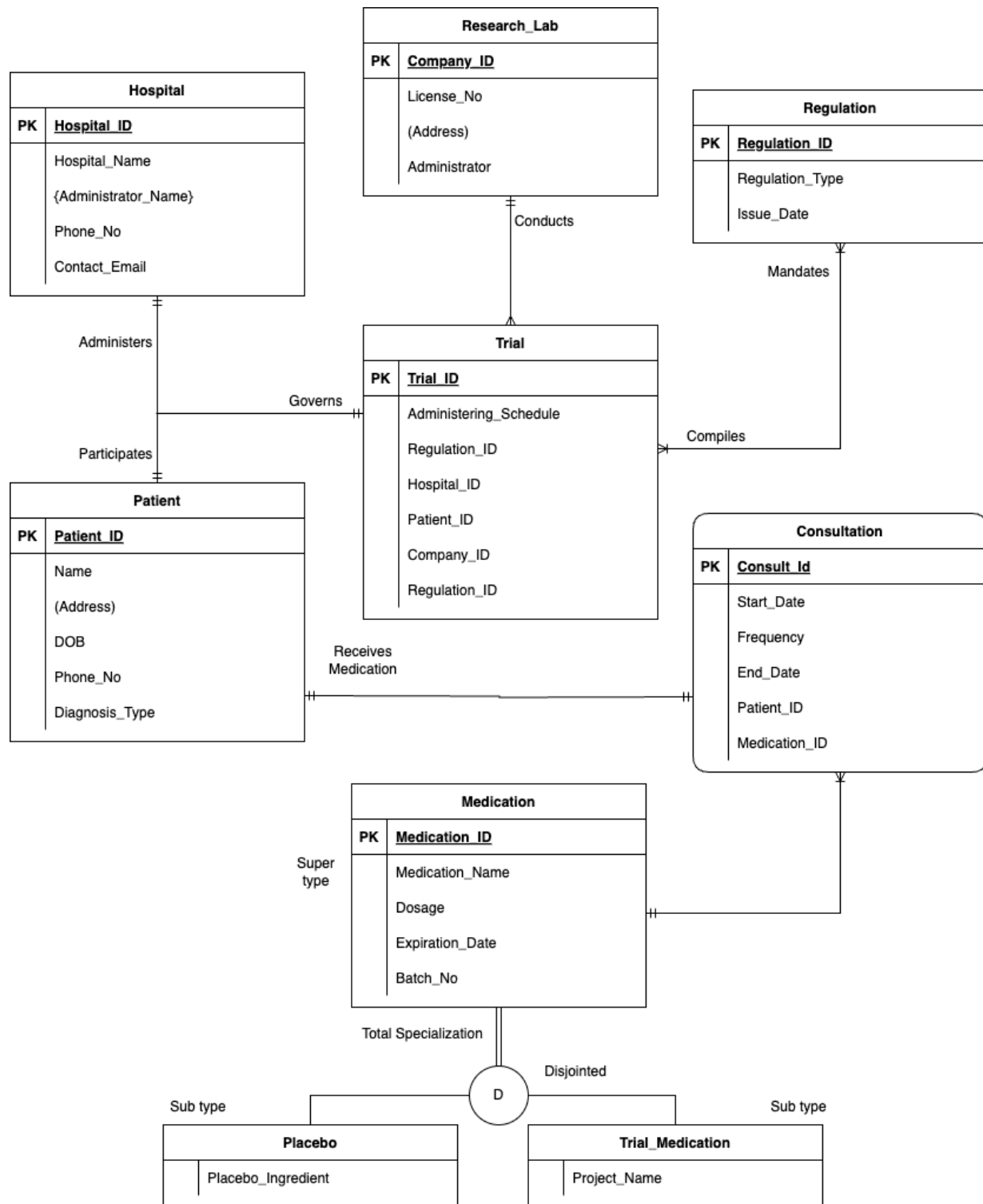
Our core entities include patients, medications, outside organizations, and regulatory inputs and prescriptions. Each patient has a unique identifier (Patient\_ID) along with attributes like Name, Address, Date\_of\_Birth, Gender, and Phone\_Number. Clinics/hospitals are also uniquely identified (Clinic\_ID) and have attributes such as Clinic\_Name, Address, Contact\_Number, and Email\_Address.

Medications are a vital entity with a unique identifier (Medication\_ID) and attributes like Medication\_Name, Dosage, Expiry\_Date, Manufacturer, and Price\_Per\_Unit. Prescriptions are the link between patients, clinics, medications, and include attributes such as Prescription\_ID, Patient\_ID (referencing patients), Medication\_ID (referencing medications), Clinic\_ID (referencing clinics), Prescribing\_Physician, Prescription\_Date, and Quantity.

Outside organization details regarding Clinic info or Hospital info, and Regulatory Management information should be included for compliance elements

## **SECTION 3; ENHANCED ENTITY RELATION DIAGRAM**

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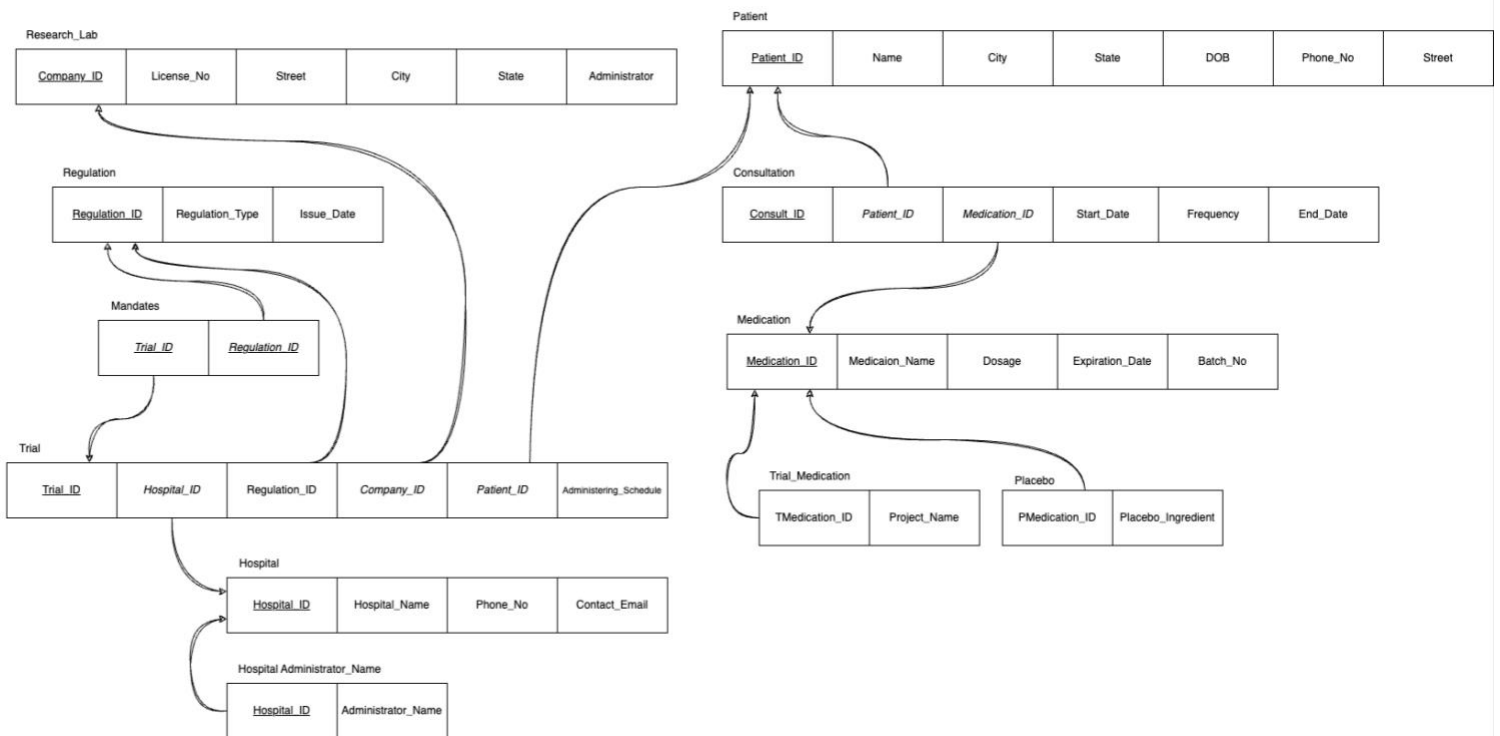


SCHEMA

Project\_Deliverable\_3

## SECTION 4; RELATIONS IN THE 3<sup>rd</sup> NORMAL FORM

FULL VIEW  
(Please Zoom In)



Project\_Deliverable\_3

## SECTION 5; SQL CODES TO CREATE TABLES AND INSERT RECORDS

### TABLES

## RESEARCH\_LAB

```
CREATE TABLE research_lab (  
  company_id          VARCHAR(45) NOT NULL ,  
  license_no          VARCHAR(60)          ,  
  street              VARCHAR(60)          ,  
  city                VARCHAR(60)          ,  
  state              VARCHAR(60)          ,  
  research_admin      VARCHAR(24)          ,  
  CONSTRAINT researchlab_pk PRIMARY KEY (company_id));
```

## REGULATION

```
CREATE TABLE regulation (  
  regulation_id        VARCHAR(45) NOT NULL ,  
  regulation_type      VARCHAR(60)          ,  
  issue_date           DATE                  ,  
  CONSTRAINT regulation_pk PRIMARY KEY (regulation_id));
```

## MEDICAL TRIAL

```
CREATE TABLE trial (  
  trial_id             VARCHAR(45) NOT NULL ,  
  hospital_id          VARCHAR(45) NOT NULL ,  
  regulation_id        VARCHAR(45) NOT NULL ,  
  company_id           VARCHAR(45) NOT NULL ,  
  patient_id           VARCHAR(45) NOT NULL ,  
  administering_scheddule VARCHAR(45)          ,  
  CONSTRAINT trial_pk  PRIMARY KEY (trial_id),  
  CONSTRAINT trial_fk1 FOREIGN KEY (hospital_id) REFERENCES hospital  
  (hospital_id),  
  CONSTRAINT trial_fk2 FOREIGN KEY (regulation_id) REFERENCES  
  regulation (regulation_id),  
  CONSTRAINT trial_fk3 FOREIGN KEY (company_id) REFERENCES  
  research_lab (company_id),  
  CONSTRAINT trial_fk4 FOREIGN KEY (patient_id) REFERENCES patient  
  (patient_id));
```

## MANDATES

```
CREATE TABLE mandates (  
  trial_id             VARCHAR(45) NOT NULL ,  
  regulation_id        VARCHAR(45) NOT NULL ,  
  CONSTRAINT mandates_pk PRIMARY KEY (trial_id, regulation_id),  
  CONSTRAINT mandates_fk1 FOREIGN KEY (trial_id) REFERENCES trial  
  (trial_id),
```



CONSTRAINT mandates\_fk2 FOREIGN KEY (regulation\_id) REFERENCES regulation (regulation\_id));

## HOSPITAL

```
CREATE TABLE hospital (  
  hospital_id      VARCHAR(45) NOT NULL ,  
  hospital_name    VARCHAR(45)          ,  
  phone_no        VARCHAR(11)         ,  
  contact_email    VARCHAR(45)         ,  
  CONSTRAINT hospital_pk PRIMARY KEY (hospital_id));
```

## HOSPITAL ADMIN

```
CREATE TABLE hospital_admin_name (  
  admin_id VARCHAR(45) NOT NULL,  
  hospital_id VARCHAR(45) NOT NULL,  
  administrator_name VARCHAR(45),  
  CONSTRAINT hospital_admin_name_pk PRIMARY KEY (admin_id),  
  CONSTRAINT hospital_admin_name_fk1 FOREIGN KEY (hospital_id)  
  REFERENCES hospital (hospital_id));
```

## PATIENT

```
CREATE TABLE patient (  
  patient_id      VARCHAR(45) NOT NULL ,  
  patient_name    VARCHAR(60)          ,  
  street          VARCHAR(60)          ,  
  city            VARCHAR(45)          ,  
  state           VARCHAR(10)          ,  
  dob             DATE                 ,  
  phone_no        VARCHAR(11)         ,  
  CONSTRAINT patient_pk PRIMARY KEY (patient_id));
```

## MEDICATION

```
CREATE TABLE medication (  
  medication_id   VARCHAR(45) NOT NULL ,  
  medication_name VARCHAR(60)          ,  
  dosage          VARCHAR(45)         ,  
  expiration_date DATE                 ,  
  batch_no        INTEGER             ,  
  CONSTRAINT medication_pk PRIMARY KEY (medication_id));
```

## TRIAL MEDICATION

```
CREATE TABLE trial_medication (  
  medication_id   VARCHAR(45) NOT NULL ,  
  project_name    VARCHAR(60)          ,  
  CONSTRAINT trial_medication_pk PRIMARY KEY (medication_id),
```

```
CONSTRAINT trial_medication_fk1 FOREIGN KEY (medication_id)
REFERENCES medication (medication_id));
```

## PLACEBO

```
CREATE TABLE placebo (
  medication_id          VARCHAR(45) NOT NULL ,
  placebo_ingredient     VARCHAR(60)
  ,
  CONSTRAINT placebo_pk PRIMARY KEY (medication_id),
  CONSTRAINT placebo_fk2 FOREIGN KEY (medication_id) REFERENCES
  medication (medication_id));
```

## CONSULTATION

```
CREATE TABLE consultation (
  consult_id            VARCHAR(45) NOT NULL
  ,
  patient_id            VARCHAR(45)   NOT NULL
  ,
  medication_id         VARCHAR(45) NOT NULL ,
  start_date            DATE
  ,
  end_date              DATE
  ,
  frequency              VARCHAR(45)
  ,
  CONSTRAINT consultation_pk PRIMARY KEY (consult_id),
  CONSTRAINT consultation_fk1 FOREIGN KEY (patient_id) REFERENCES
  patient (patient_id),
  CONSTRAINT consultation_fk2 FOREIGN KEY (medication_id) REFERENCES
  medication (medication_id));
```

<b>VALUES</b>
---------------

## PATIENTS

```
INSERT INTO patient (patient_id, patient_name, street, city, state, dob, phone_no)
VALUES ('P001', 'Homer Simpson', '742 Evergreen Terrace', 'Springfield', 'IL', '1956-05-
12', '3125550001');
INSERT INTO patient (patient_id, patient_name, street, city, state, dob, phone_no)
VALUES ('P002', 'Marge Simpson', '742 Evergreen Terrace', 'Springfield', 'IL', '1956-10-
01', '3125550002');
INSERT INTO patient (patient_id, patient_name, street, city, state, dob, phone_no)
VALUES ('P003', 'Bart Simpson', '742 Evergreen Terrace', 'Springfield', 'IL', '1980-04-01',
'3125550003');
INSERT INTO patient (patient_id, patient_name, street, city, state, dob, phone_no)
VALUES ('P004', 'Lisa Simpson', '742 Evergreen Terrace', 'Springfield', 'IL', '1982-05-09',
'3125550004');
INSERT INTO patient (patient_id, patient_name, street, city, state, dob, phone_no)
VALUES ('P005', 'Maggie Simpson', '742 Evergreen Terrace', 'Springfield', 'IL', '1989-01-
12', '3125550005');
INSERT INTO patient (patient_id, patient_name, street, city, state, dob, phone_no)
```

```
VALUES ('P006', 'Ned Flanders', '744 Evergreen Terrace', 'Springfield', 'IL', '1952-03-01', '3125550006');
INSERT INTO patient (patient_id, patient_name, street, city, state, dob, phone_no)
VALUES ('P007', 'Montgomery Burns', '1000 Mammon Lane', 'Springfield', 'IL', '1890-09-15', '3125550007');
INSERT INTO patient (patient_id, patient_name, street, city, state, dob, phone_no)
VALUES ('P008', 'Waylon Smithers', '1000 Mammon Lane', 'Springfield', 'IL', '1964-07-25', '3125550008');
```

### MEDICATIONS

```
INSERT INTO medication (medication_id, medication_name, dosage, expiration_date, batch_no)
VALUES ('MED001', 'Amoxicillin', '500mg', '2025-12-31', 1001);
INSERT INTO medication (medication_id, medication_name, dosage, expiration_date, batch_no)
VALUES ('MED002', 'Ibuprofen', '200mg', '2024-08-15', 1002);
INSERT INTO medication (medication_id, medication_name, dosage, expiration_date, batch_no)
VALUES ('MED003', 'Acetaminophen', '500mg', '2025-05-20', 1003);
INSERT INTO medication (medication_id, medication_name, dosage, expiration_date, batch_no)
VALUES ('MED004', 'Paracetamol', '500mg', '2025-10-30', 1004);
INSERT INTO medication (medication_id, medication_name, dosage, expiration_date, batch_no)
VALUES ('MED005', 'Loratadine', '10mg', '2025-09-15', 1005);
```

### TRIAL MEDICATIONS

```
INSERT INTO trial_medication (medication_id, project_name)
VALUES ('MED001', 'Project Alpha');
INSERT INTO trial_medication (medication_id, project_name)
VALUES ('MED002', 'Project Beta');
```

### PLACEBOS

```
INSERT INTO placebo (medication_id, placebo_ingredient)
VALUES ('MED003', 'Starch');
INSERT INTO placebo (medication_id, placebo_ingredient)
VALUES ('MED005', 'Cellulose');
```

### CONSULTATIONS

```
INSERT INTO consultation (consult_id, patient_id, medication_id, start_date, end_date, frequency)
VALUES ('C001', 'P001', 'MED001', '2023-10-01', '2023-12-01', 'Twice daily');
INSERT INTO consultation (consult_id, patient_id, medication_id, start_date, end_date, frequency)
VALUES ('C002', 'P002', 'MED002', '2023-11-15', '2024-01-15', 'Once daily');
```

```
INSERT INTO consultation (consult_id, patient_id, medication_id, start_date, end_date, frequency)
VALUES ('C003', 'P003', 'MED003', '2023-09-20', '2023-11-20', 'Three times a week');
INSERT INTO consultation (consult_id, patient_id, medication_id, start_date, end_date, frequency)
VALUES ('C004', 'P004', 'MED004', '2023-10-05', '2023-12-05', 'Once a week');
```

## REGULATIONS

```
INSERT INTO regulation (regulation_id, regulation_type, issue_date)
VALUES ('0000-R001', 'Federal Regulation', '2022-04-28');
INSERT INTO regulation (regulation_id, regulation_type, issue_date)
VALUES ('1111-R002', 'State Regulation', '2023-01-15');
INSERT INTO regulation (regulation_id, regulation_type, issue_date)
VALUES ('9999-R003', 'Local Ordinance', '2021-11-07');
INSERT INTO regulation (regulation_id, regulation_type, issue_date)
VALUES ('0000-R004', 'Federal Regulation', '2022-08-19');
INSERT INTO regulation (regulation_id, regulation_type, issue_date)
VALUES ('1111-R005', 'State Regulation', '2020-05-22');
```

## RESEARCH LABS

```
INSERT INTO research_lab (company_id, license_no, street, city, state, research_admin)
VALUES ('C001', 'LIC78945', '123 Elm St', 'Springfield', 'Illinois', 'Sheldon Cooper');
INSERT INTO research_lab (company_id, license_no, street, city, state, research_admin)
VALUES ('C002', 'LIC12356', '456 Maple Ave', 'Centerville', 'Ohio', 'Howard Walowitz');
INSERT INTO research_lab (company_id, license_no, street, city, state, research_admin)
VALUES ('C003', 'LIC98321', '789 Oak Blvd', 'Riverside', 'California', 'Amy Farhafowler');
INSERT INTO research_lab (company_id, license_no, street, city, state, research_admin)
VALUES ('C004', 'LIC56231', '101 Pine Road', 'Lakeview', 'Texas', 'Penny Hoffsteder');
INSERT INTO research_lab (company_id, license_no, street, city, state, research_admin)
VALUES ('C005', 'LIC20485', '202 Birch Lane', 'Hilltown', 'Florida', 'Stuart Bloom');
```

## TRIALS

```
INSERT INTO trial (trial_id, hospital_id, regulation_id, company_id, patient_id, administering_schedule)
VALUES ('T001', 'H001', '0000-R001', 'C001', 'P001', 'Daily');
INSERT INTO trial (trial_id, hospital_id, regulation_id, company_id, patient_id, administering_schedule)
VALUES ('T002', 'H002', '0000-R004', 'C002', 'P002', 'Weekly');
```

## MANDATES

```
INSERT INTO mandates (trial_id, regulation_id)
```

```
VALUES ('T001', '0000-R001');
INSERT INTO mandates (trial_id, regulation_id)
VALUES ('T002', '0000-R004');
```

## HOSPITALS

```
INSERT INTO hospital (hospital_id, hospital_name, phone_no, contact_email)
VALUES ('H001', 'Saint Mary"s Hospital', '1234567890', 'contact@smhospital.com');
INSERT INTO hospital (hospital_id, hospital_name, phone_no, contact_email)
VALUES ('H002', 'City Health Clinic', '0987654321', 'info@cityclinic.com');
INSERT INTO hospital (hospital_id, hospital_name, phone_no, contact_email)
VALUES ('H003', 'General Hospital', '1122334455', 'admin@generalhospital.com');
```

## HOSPITAL ADMINS

```
INSERT INTO hospital_admin_name (admin_id, hospital_id, administrator_name)
VALUES ('A001', 'H001', 'Dr. Julius Hibbert');
INSERT INTO hospital_admin_name (admin_id, hospital_id, administrator_name)
VALUES ('A002', 'H002', 'Dr. Nick Riviera');
INSERT INTO hospital_admin_name (admin_id, hospital_id, administrator_name)
VALUES ('A003', 'H003', 'Dr. Algernop Krieger');
INSERT INTO hospital_admin_name (admin_id, hospital_id, administrator_name)
VALUES ('A004', 'H004', 'Dr. Joan Watson');
INSERT INTO hospital_admin_name (admin_id, hospital_id, administrator_name)
VALUES ('A005', 'H005', 'Dr. Meredith Grey');
```

## SECTION 6: ALL TABLES AND RECORDS USING DESC & SELECT COMMANDS

### CONSULTATIONS

```
1 • select * from consultation
```

consult_id	patient_id	medication...	start_date	end_date	frequency
C001	P001	MED001	2023-10-01	2023-12-01	Twice daily
C002	P002	MED002	2023-11-15	2024-01-15	Once daily
C003	P003	MED003	2023-09-20	2023-11-20	Three times a week
C004	P004	MED004	2023-10-05	2023-12-05	Once a week
NULL	NULL	NULL	NULL	NULL	NULL

1 • DESC consultation



00% 18:1

Result Grid Filter Rows: Search Export:

Field	Type	Null	Key	Default	Extra
consult_id	varchar(45)	NO	PRI	NULL	
patient_id	varchar(45)	NO	MUL	NULL	
medication_id	varchar(45)	NO	MUL	NULL	
start_date	date	YES		NULL	
end_date	date	YES		NULL	
frequency	varchar(45)	YES		NULL	

## HOSPITALS

1 • SELECT \* FROM hospital



100% 23:1

Result Grid Filter Rows: Search Edit: Export/Import:

hospital_id	hospital_name	phone_no	contact_email
H001	Saint Mary's Hospital	1234567890	contact@smhospital.com
H002	City Health Clinic	0987654321	info@cityclinic.com
H003	General Hospital	1122334455	admin@generalhospital.com
NULL	NULL	NULL	NULL

1 • desc hospital

10% 5:1

Result Grid Filter Rows: Search Export:

Field	Type	Null	Key	Default	Extra
hospital_id	varchar(45)	NO	PRI	NULL	
hospital_name	varchar(45)	YES		NULL	
phone_no	varchar(11)	YES		NULL	
contact_email	varchar(45)	YES		NULL	

## HOSPITAL ADMIN NAMES

1 • `select * from hospital_admin_name`



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Result Grid



Filter Rows:

Edit:



Export/Import:



admin_id	hospital_id	administrator_name
A001	H001	Dr. Julius Hibbert
A002	H002	Dr. Nick Riviera
A003	H003	Dr. Algernop Krieger
A004	H004	Dr. Joan Watson
A005	H005	Dr. Meredith Grey
NULL	NULL	NULL

1 • `DESC hospital_admin_name`



0% 25:1

Result Grid



Filter Rows:

Export:



Field	Type	Null	Key	Default	Extra
admin_id	varchar(45)	NO	PRI	NULL	
hospital_id	varchar(45)	NO	MUL	NULL	
administrator_name	varchar(45)	YES		NULL	

## MANDATES

1 • `SELECT * FROM MANDATES`



100% 23:1

Result Grid



Filter Rows:

Edit:



Export/Import:



trial_id	regulation_...
T001	0000-R001
T002	0000-R004
NULL	NULL

1DESC MANDATES

10%

14:1

Result GridFilter Rows: SearchExport:

Field	Type	Null	Key	Default	Extra
trial_id	varchar(45)	NO	PRI	NULL	
regulation_id	varchar(45)	NO	PRI	NULL	

MEDICATIONS

1SELECT \* FROM MEDICATION

00%

25:1

Result GridFilter Rows: SearchEdit: Export/Import:

medication...	medication_na...	dosage	expiration_da...	batch_no
MED001	Amoxicillin	500mg	2025-12-31	1001
MED002	Ibuprofen	200mg	2024-08-15	1002
MED003	Acetaminophen	500mg	2025-05-20	1003
MED004	Paracetamol	500mg	2025-10-30	1004
MED005	Loratadine	10mg	2025-09-15	1005
NULL	NULL	NULL	NULL	NULL

1DESC MEDICATION

00%

16:1

Result GridFilter Rows: SearchExport:

Field	Type	Null	Key	Default	Extra
medication_id	varchar(45)	NO	PRI	NULL	
medication_name	varchar(60)	YES		NULL	
dosage	varchar(45)	YES		NULL	
expiration_date	date	YES		NULL	
batch_no	int	YES		NULL	



1 **SELECT \* FROM PATIENT**

100% 22:1

**Result Grid** Filter Rows: Search Edit: Export/Import:

	patient_id	patient_name	street	city	state	dob	phone_no
	P001	Homer Simpson	742 Evergreen Terrace	Springfield	IL	1956-05-12	3125550001
	P002	Marge Simpson	742 Evergreen Terrace	Springfield	IL	1956-10-01	3125550002
	P003	Bart Simpson	742 Evergreen Terrace	Springfield	IL	1980-04-01	3125550003
	P004	Lisa Simpson	742 Evergreen Terrace	Springfield	IL	1982-05-09	3125550004
	P005	Maggie Simpson	742 Evergreen Terrace	Springfield	IL	1989-01-12	3125550005
	P006	Ned Flanders	744 Evergreen Terrace	Springfield	IL	1952-03-01	3125550006
	P007	Montgomery Burns	1000 Mammon Lane	Springfield	IL	1890-09-15	3125550007
	P008	Waylon Smithers	1000 Mammon Lane	Springfield	IL	1964-07-25	3125550008
	NULL	NULL	NULL	NULL	NULL	NULL	NULL

1 **DESC PATIENT**

00% 13:1

**Result Grid** Filter Rows: Search Export:

Field	Type	Null	Key	Default	Extra
patient_id	varchar(45)	NO	PRI	NULL	
patient_name	varchar(60)	YES		NULL	
street	varchar(60)	YES		NULL	
city	varchar(45)	YES		NULL	
state	varchar(10)	YES		NULL	
dob	date	YES		NULL	
phone_no	varchar(11)	YES		NULL	

## PLACEBOS

1 **SELECT \* FROM PLACEBO**

00% 22:1

**Result Grid** Filter Rows: Search Edit: Export/Import:

medication...	placebo_ingredi...
MED003	Starch
MED005	Cellulose
NULL	NULL

1 DESC PLACEBO

00% 13:1

Result Grid Filter Rows: Search Export:

Field	Type	Null	Key	Default	Extra
medication_id	varchar(45)	NO	PRI	NULL	
placebo_ingredient	varchar(60)	YES		NULL	

REGULATIONS

1 SELECT \* FROM REGULATION

00% 25:1

Result Grid Filter Rows: Search Edit: Export/Import:

regulation_...	regulation_type	issue_date
0000-R001	Federal Regulation	2022-04-28
0000-R004	Federal Regulation	2022-08-19
1111-R002	State Regulation	2023-01-15
1111-R005	State Regulation	2020-05-22
9999-R003	Local Ordinance	2021-11-07
NULL	NULL	NULL

1 DESC REGULATION

100% 16:1

Result Grid Filter Rows: Search Export:

Field	Type	Null	Key	Default	Extra
regulation_id	varchar(45)	NO	PRI	NULL	
regulation_type	varchar(60)	YES		NULL	
issue_date	date	YES		NULL	

## RESEARCH\_LABS

1 `SELECT * FROM research_lab`



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Result Grid



Filter Rows:

Search

Edit:



Export/Import:



	company_id	license_no	street	city	state	research_admin
	C001	LIC78945	123 Elm St	Springfield	Illinois	Sheldon Cooper
	C002	LIC12356	456 Maple Ave	Centerville	Ohio	Howard Walowitz
	C003	LIC98321	789 Oak Blvd	Riverside	California	Amy Farhafowler
	C004	LIC56231	101 Pine Road	Lakeview	Texas	Penny Hoffsteder
	C005	LIC20485	202 Birch Lane	Hilltown	Florida	Stuart Bloom
	NULL	NULL	NULL	NULL	NULL	NULL

1 `DESC research_lab`



10% 18:1

Result Grid



Filter Rows:

Search

Export:



Field	Type	Null	Key	Default	Extra
company_id	varchar(45)	NO	PRI	NULL	
license_no	varchar(60)	YES		NULL	
street	varchar(60)	YES		NULL	
city	varchar(60)	YES		NULL	
state	varchar(60)	YES		NULL	
research_admin	varchar(24)	YES		NULL	

## TRIALS

1 `SELECT * FROM trial`



00% 20:1

Result Grid



Filter Rows:

Search

Edit:



Export/Import:



trial_id	hospital_id	regulation_...	company_id	patient_id	administering_schedd...
T001	H001	0000-R001	C001	P001	Daily
T002	H002	0000-R004	C002	P002	Weekly
NULL	NULL	NULL	NULL	NULL	NULL

1 DESC trial



00%



11:1

Result Grid



Filter Rows:



Search

Export:



Field	Type	Null	Key	Default	Extra
trial_id	varchar(45)	NO	PRI	NULL	
hospital_id	varchar(45)	NO	MUL	NULL	
regulation_id	varchar(45)	NO	MUL	NULL	
company_id	varchar(45)	NO	MUL	NULL	
patient_id	varchar(45)	NO	MUL	NULL	
administering_scheddule	varchar(45)	YES		NULL	

## TRIAL MEDICATIONS

1 SELECT \* FROM trial\_medication

00%



31:1

Result Grid



Filter Rows:



Search

Edit:



Export/Import:



medication...	project_na...
MED001	Project Alpha
MED002	Project Beta
NULL	NULL

1 desc trial\_medication

00%



22:1

Result Grid



Filter Rows:



Search

Export:



Field	Type	Null	Key	Default	Extra
medication_id	varchar(45)	NO	PRI	NULL	
project_name	varchar(60)	YES		NULL	

## SECTION 7; SQL QUERIES TESTED WITH MYSQL

## 1. SELECT ALL PATIENTS FROM SPRINGFIELD OVER 50 YEARS OLD

```
1 • SELECT *
2 FROM patient
3 WHERE city = 'Springfield'
4 AND dob <= DATE_SUB(CURDATE(), INTERVAL 50 YEAR);
```

100% 52:4

Result Grid Filter Rows: Search Edit: Export/Import:

patient_id	patient_name	street	city	state	dob	phone_no
P001	Homer Simpson	742 Evergreen Terrace	Springfield	IL	1956-05-12	3125550001
P002	Marge Simpson	742 Evergreen Terrace	Springfield	IL	1956-10-01	3125550002
P006	Ned Flanders	744 Evergreen Terrace	Springfield	IL	1952-03-01	3125550006
P007	Montgomery Burns	1000 Mammon Lane	Springfield	IL	1890-09-15	3125550007
P008	Waylon Smithers	1000 Mammon Lane	Springfield	IL	1964-07-25	3125550008
NULL	NULL	NULL	NULL	NULL	NULL	NULL

## 2. PULL THE NAMES OF ALL LAB ADMINISTRATORS

```
1 • SELECT research_admin FROM research_lab
2 WHERE research_admin IS NOT NULL;
```

100% 41:1

Result Grid Filter Rows: Search Export:

research_admin
Sheldon Cooper
Howard Walowitz
Amy Farhafowler
Penny Hoffsteder
Stuart Bloom

## 3. PULL THE LIST OF MEDICATIONS AND THEIR CORRESPONDING USAGE FREQUENCY

```
1 • SELECT c.frequency, m.medication_name, m.medication_id
2 FROM consultation c
3 JOIN medication m ON c.medication_id = m.medication_id;
```

100% 56:3

Result Grid Filter Rows: Search Export:

frequency	medication_na...	medication...
Twice daily	Amoxicillin	MED001
Once daily	Ibuprofen	MED002
Three times a week	Acetaminophen	MED003
Once a week	Paracetamol	MED004

## 4. PULL THE PATIENTS ON A MEDICATION ROUTINE OF TWICE DAILY

```
1 • SELECT p.patient_id, p.patient_name
2 FROM patient p
3 JOIN consultation c ON p.patient_id = c.patient_id
4 WHERE c.frequency = 'Twice daily';
```

100% 35:4

Result Grid Filter Rows: Search Export:

patient_id	patient_name
P001	Homer Simpson

## 5. LIST ALL THE PATIENTS WITH ACTIVE TRIALS, UNDER THE AGE OF 80

```
1 • SELECT DISTINCT p.patient_name
2 FROM patient p
3 JOIN trial t ON p.patient_id = t.patient_id
4 WHERE TIMESTAMPDIFF(YEAR, p.dob, CURDATE()) < 80;
```

00% 1:1

Result Grid Filter Rows: Search Export:

patient_name
Homer Simpson
Marge Simpson

## APPENDIX I.

**Section 1a – 1e Reference Materials:**

<https://www.striped-giraffe.com/en/blog/how-the-pharmaceutical-industry-can-meet-the-challenges-of-data-quality-management/>

<https://www.biopharmadive.com/spons/addressing-the-challenges-of-data-management-for-pharmaceutical-and-biotech/573858/>

<https://www2.deloitte.com/us/en/insights/industry/technology/challenges-in-data-management.html>

<https://www.acdlabs.com/blog/data-management-and-drug-quality-in-pharmaceutical-manufacturing/>

<https://www.technologynetworks.com/informatics/articles/data-integrity-what-are-some-of-the-key-issues-314165>