Neo4j import and Queries

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QUERIES

Get Patient by ID

```
MATCH(p:Patient {IDPATIENT: 1})
RETURN p

/* John */
```

Get all Episodes for a specific Patient

```
MATCH(p:Patient {IDPATIENT: 1})-[:HAS_EPISODE]->(e:Episode)
RETURN e

/* Displaying 3 nodes, 0 relationships.
episode: 165, 1, 180
*/
```

Get all patients with specific blood type

```
MATCH(p:Patient {BLOOD_TYPE: 'O-'})
RETURN p

/*
```

```
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│p                                                                              │
╞═══════════════════════════════════════════════════════════════════════════════╡
│(:Patient {POLICY_NUMBER: "POL002",PHONE: "987-654-3210",GENDER: "Fema│
│le",IDPATIENT: 2,PATIENT_FNAME: "Jane",BLOOD_TYPE: "O-",EMAIL: "jane.s│
│mith@example.com",PATIENT_LNAME: "Smith",BIRTHDAY: "1990-03-20"})      │
├───────────────────────────────────────────────────────────────────────────────┤
│(:Patient {POLICY_NUMBER: "POL009",PHONE: "678-901-2345",IDPATIENT: 9,│
│GENDER: "Male",PATIENT_FNAME: "Benjamin",BLOOD_TYPE: "O-",EMAIL: "benj│
│amin.gonzalez@example.com",PATIENT_LNAME: "Gonzalez",BIRTHDAY: "1980-0│
│8-08"})                                                                        │
├───────────────────────────────────────────────────────────────────────────────┤
│(:Patient {POLICY_NUMBER: "POL007",PHONE: "333-444-5555",IDPATIENT: 17│
│,GENDER: "Male",PATIENT_FNAME: "William",BLOOD_TYPE: "O-",EMAIL: "will│
│iam.smith@example.com",PATIENT_LNAME: "Smith",BIRTHDAY: "1980-03-12"})│
├───────────────────────────────────────────────────────────────────────────────┤
│(:Patient {POLICY_NUMBER: "POL008",PHONE: "890-123-4567",GENDER: "Fema│
│le",IDPATIENT: 28,PATIENT_FNAME: "Sophia",BLOOD_TYPE: "O-",EMAIL: "sop│
│hia.le@example.com",PATIENT_LNAME: "Le",BIRTHDAY: "1977-06-25"})       │
├───────────────────────────────────────────────────────────────────────────────┤
│(:Patient {POLICY_NUMBER: "POL001",PHONE: "123-456-7890",GENDER: "Male│
│",IDPATIENT: 31,PATIENT_FNAME: "Ethan",BLOOD_TYPE: "O-",EMAIL: "ethan.│
│vo@example.com",PATIENT_LNAME: "Vo",BIRTHDAY: "1978-04-22"})           │
├───────────────────────────────────────────────────────────────────────────────┤
│(:Patient {POLICY_NUMBER: "POL005",PHONE: "567-890-1234",GENDER: "Fema│
│le",IDPATIENT: 45,PATIENT_FNAME: "Scarlett",BLOOD_TYPE: "O-",EMAIL: "s│
│carlett.huynh@example.com",PATIENT_LNAME: "Huynh",BIRTHDAY: "1986-11-2│
│7"})                                                                           │
├───────────────────────────────────────────────────────────────────────────────┤
```

```
|(:Patient {POLICY_NUMBER: "POL003",PHONE: "345-098-7654",GENDER: "Fema|
|le",IDPATIENT: 53,PATIENT_FNAME: "Emma",BLOOD_TYPE: "O-",EMAIL: "emma.|
|dinh@example.com",PATIENT_LNAME: "Dinh",BIRTHDAY: "1988-07-17"})      |
|(:Patient {POLICY_NUMBER: "POL005",PHONE: "109-876-5432",GENDER: "Fema|
|le",IDPATIENT: 65,PATIENT_FNAME: "Amelia",BLOOD_TYPE: "O-",EMAIL: "ame|
|lia.le@example.com",PATIENT_LNAME: "Le",BIRTHDAY: "1988-04-15"})      |
|(:Patient {POLICY_NUMBER: "POL001",PHONE: "987-654-3210",GENDER: "Fema|
|le",IDPATIENT: 71,PATIENT_FNAME: "Olivia",BLOOD_TYPE: "O-",EMAIL: "oli|
|via.tran@example.com",PATIENT_LNAME: "Tran",BIRTHDAY: "1985-08-14"})  |
|(:Patient {POLICY_NUMBER: "POL009",PHONE: "109-876-5432",GENDER: "Fema|
|le",IDPATIENT: 79,PATIENT_FNAME: "Mia",BLOOD_TYPE: "O-",EMAIL: "mia.ng|
|uyen@example.com",PATIENT_LNAME: "Nguyen",BIRTHDAY: "1983-12-25"})    |
|(:Patient {POLICY_NUMBER: "POL005",PHONE: "543-210-9876",GENDER: "Fema|
|le",IDPATIENT: 85,PATIENT_FNAME: "Scarlett",BLOOD_TYPE: "O-",EMAIL: "s|
|carlett.dang@example.com",PATIENT_LNAME: "Dang",BIRTHDAY: "1982-10-31"|
|})                                                                    |
```

*/

Find the average age of all Patients

```
MATCH (p:Patient)
RETURN avg(date().year - p.BIRTHDAY.year) AS averageAge

/* Average age
37.96739130434784

Started streaming 1 records in less than 1 ms and completed after 2 ms.

*/
```

Get patient phone number and update it

```
MATCH (p:Patient {IDPATIENT:1})
return p.PHONE

MATCH (p:Patient {IDPATIENT:1})
SET p.PHONE = '555-6789'
RETURN p

/*
|p                                                                     |
|(:Patient {POLICY_NUMBER: "POL001",PHONE: "555-6789",IDPATIENT: 1,GEND|
|ER: "Male",PATIENT_FNAME: "John",BLOOD_TYPE: "A+",EMAIL: "john.doe@exa|
|mple.com",PATIENT_LNAME: "Doe",BIRTHDAY: "1985-07-15"})               |

*/
```

See patients medical history and add new condition to medical history

```
MATCH (p:Patient {IDPATIENT:1})-[:HAS_MEDICAL_HISTORY]->(mh)
RETURN p, mh
```

```
/*
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│p                                                                                              │mh                                                                                             │
╞═══════════════════════════════════════════════════════════════════════════════════════════════╪═══════════════════════════════════════════════════════════════════════════════════════════════╡
│(:Patient        {POLICY_NUMBER:        "POL001",PHONE:        "555-6789",IDPATIENT:           │(:Medical_History {IDPATIENT: 1,RECORD_ID: 47,RECORD_DATE: "2024-05-20"}) │
│1,GEND:"Male",PATIENT_FNAME: "John",BLOOD_TYPE: "A+",EMAIL: "john.doe@exa",CONDITION:          │                                                                               │
│"Back Pain",PATIENT_LNAME: "Doe",BIRTHDAY: "1985-07-15"})                                      │                                                                               │
├───────────────────────────────────────────────────────────────────────────────────────────────┼───────────────────────────────────────────────────────────────────────────────────────────────┤
│(:Patient        {POLICY_NUMBER:        "POL001",PHONE:        "555-6789",IDPATIENT:           │(:Medical_History {RECORD_ID: 27,RECORD_DATE: "2023-01-15",IDPATIENT: 1,CONDITION: "Flu"}) │
│1,GEND:"Male",PATIENT_FNAME: "John",BLOOD_TYPE: "A+",EMAIL: "john.doe@exa",CONDITION:          │                                                                               │
│"Flu",PATIENT_LNAME: "Doe",BIRTHDAY: "1985-07-15"})                                            │                                                                               │
├───────────────────────────────────────────────────────────────────────────────────────────────┼───────────────────────────────────────────────────────────────────────────────────────────────┤
│(:Patient        {POLICY_NUMBER:        "POL001",PHONE:        "555-6789",IDPATIENT:           │(:Medical_History {IDPATIENT: 1,RECORD_ID: 45,RECORD_DATE: "2024-07-15"}) │
│1,GEND:"Male",PATIENT_FNAME: "John",BLOOD_TYPE: "A+",EMAIL: "john.doe@exa",CONDITION:          │                                                                               │
│"Gastritis",PATIENT_LNAME: "Doe",BIRTHDAY: "1985-07-15"})                                      │                                                                               │
└───────────────────────────────────────────────────────────────────────────────────────────────┴───────────────────────────────────────────────────────────────────────────────────────────────┘
*/
```

```
MATCH (p:Patient {IDPATIENT: 1})
CREATE (mh:Medical_History {
    RECORD_ID: 47,
    CONDITION: 'Back Pain',
    RECORD_DATE: date('2024-05-20'),
    IDPATIENT: 1
})
CREATE (p)-[:HAS_MEDICAL_HISTORY]->(mh)
RETURN p, mh
```

Delete a Patient and all their Episodes

```
MATCH (p:Patient {IDPATIENT: 2}) - [:HAS_EPISODE] -> (e:Episode)
DETCH DELETE p, e
```

Remove a specific episode for a patient

```
MATCH (p:Patient {IDPATIENT: 1}) - [:HAS_EPISODE] -> (e: Episode {IDEPISODE: 180})
DETACH DELETE e
```

Find Patients who have been prescribed a specific medicine

```
MATCH (p:Patient)-[:HAS_EPISODE]->(e:Episode)<-[:PRESCRIBED_FOR]-(pr:Prescription)-
[:PRESCRIBED_MEDICINE]->(m:Medicine {M_NAME: 'Paracetamol'})
RETURN p

/* 90 patient nodes returned
*/
```

Get the total cost of all bills for a specific Patient

```
MATCH (p:Patient {IDPATIENT: 3})-[:HAS_EPISODE]->(e:Episode)<-[:BILLED_FOR]-(b:Bill)
RETURN sum(b.TOTAL) AS totalCost

/* totalCost: 7310
Started streaming 1 records after 1 ms and completed after 2 ms.
*/
```

Find all Patients who have an appointment on a specific date

```
/* Find relation between Episode and Appoitnment */
MATCH (:Episode)-[r]-(:Appointment)
RETURN type(r)

/* Once you find relation you use it */
MATCH (p:Patient)-[:HAS_EPISODE]->(e:Episode)<-[:BELONGS_TO_EPISODE]-(a:Appointment)
WHERE a.APPOINTMENT_DATE = datetime("2018-11-29T00:00:00Z")
RETURN p

/* This query gets me none */
```

Count the number of Patients by gender

```
MATCH (p:Patient)
RETURN p.GENDER, count(*) AS count

/*
"Male"  46
"Female"  44
*/
```

Find the most common medical condition among Patients

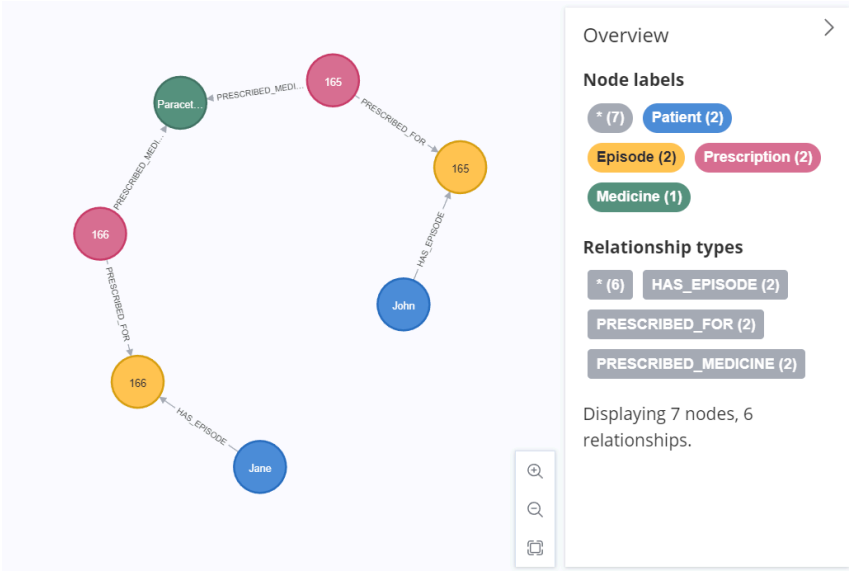
```
MATCH (mh:Medical_History)
RETURN mh.CONDITION, count(*) AS frequency
ORDER BY frequency DESC
LIMIT 1

/*
"Back Pain"

Started streaming 1 records after 1 ms and completed after 12 ms.
*/
```

Find the shortest path between two Patients through their common medical history conditions

```
MATCH (p1:Patient {IDPATIENT: 1}), (p2:Patient {IDPATIENT: 2}), path =
shortestPath((p1)-[*]-(p2))
RETURN path
```



Adding Triggers with NEO4J

Triggers are by default not part of neo4j so you need to enable them using apoc library. They are also not enabled by default

you need to enable them in apoc.conf file in same directory as neo4j with following configuration settings

```
apoc.trigger.enabled=true
apoc.trigger.refresh=60000
```

Trigger for Logging New Patient Creation

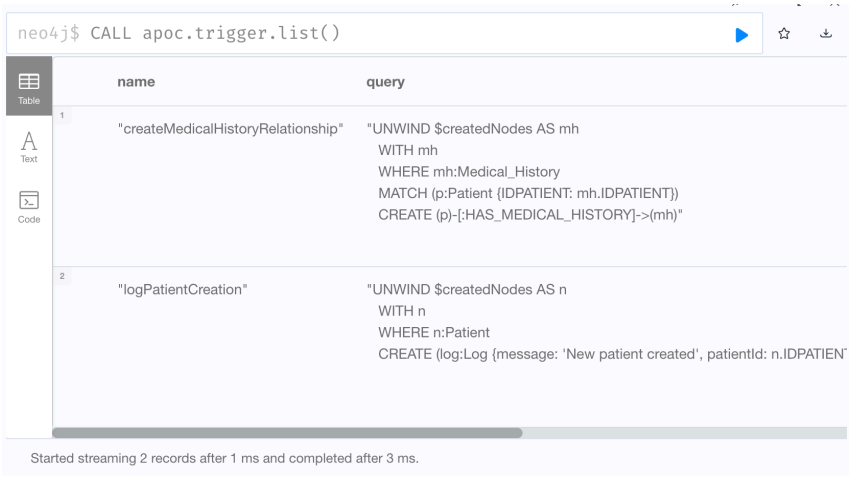
```
CALL apoc.trigger.add('logPatientCreation',
  "UNWIND $createdNodes AS n
   WITH n
   WHERE n:Patient
   CREATE (log:Log {message: 'New patient created', patientId: n.IDPATIENT, timestamp:
timestamp()})",
  {phase: 'after'}
)
```

Trigger for Ensuring Medical History Relationship

```
CALL apoc.trigger.add('createMedicalHistoryRelationship',
  "UNWIND $createdNodes AS mh
   WITH mh
   WHERE mh:Medical_History
   MATCH (p:Patient {IDPATIENT: mh.IDPATIENT})
   CREATE (p)-[:HAS_MEDICAL_HISTORY]->(mh)",
  {phase: 'after'}
)
```

Verify triggers

```
CALL apoc.trigger.list()
```



MATCH LOGS

```
MATCH (log:Log)
RETURN log
```

PROOF OF TRIGGER WORKING

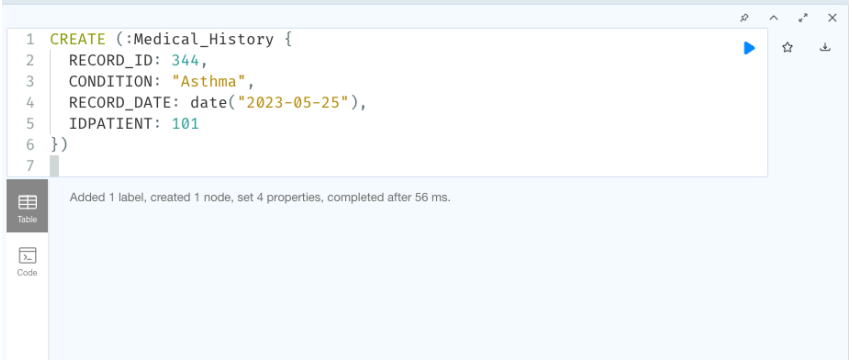
If patient has medical history COVID then he also has fever to prove this concept I created a trigger

Basically if a new medical medical history is record is added then it the trigger adds another medical history to patient record with `record + 1`

so basically trigger creates a new node

```
CALL apoc.trigger.add(
  'duplicateMedicalHistory',
  'UNWIND $createdNodes AS cNode
   MATCH (cNode:Medical_History)
   WITH cNode, cNode.RECORD_ID + 1 AS newRecordId
   CREATE (:Medical_History {
     RECORD_ID: newRecordId,
     CONDITION: cNode.CONDITION,
     RECORD_DATE: cNode.RECORD_DATE,
     IDPATIENT: cNode.IDPATIENT
   })',
  {phase: 'after'}
)
```


neo4j$ MATCH (mh:Medical_History) WHERE mh.IDPATIENT = 101 RETURN mh.RECORD…
Table
Text
Code
mh.RECORD_ID
mh.CONDITION
mh.RECORD_DATE
1 50 "Asthma" "2023-05-25"
2 344 "Asthma" "2023-05-25"
3 23 "Asthma" "2023-05-25"
4 345 "Asthma" "2023-05-25"
Started streaming 4 records after 1 ms and completed after 3 ms.


1 CREATE (:Medical_History {
2 RECORD_ID: 344,
3 CONDITION: "Asthma",
4 RECORD_DATE: date("2023-05-25"),
5 IDPATIENT: 101
6 })
7
Table
Code
Added 1 label, created 1 node, set 4 properties, completed after 56 ms.


neo4j$ CALL apoc.trigger.add('duplicateMedicalHistory', 'UNWIND $createdNo…
Table
Text
Warn
Code
name
query
selector
params
install
1 "duplicateMedicalHistory"
"UNWIND $createdNodes AS cNode
MATCH (cNode:Medical_History)
WITH cNode, cNode.RECORD_ID + 1 AS newRecordId
CREATE (:Medical_History {
RECORD_ID: newRecordId,
CONDITION: cNode.CONDITION,
RECORD_DATE: cNode.RECORD_DATE,
IDPATIENT: cNode.IDPATIENT
})"
{ "phase": "after" }
{ }
true
Started streaming 1 records after 5 ms and completed after 269 ms.