



**Data harmonization and Analytics with SNOMED CT –  
Updates, Deployment and Integration with warehouse  
&  
Enhancing user experience using intelligent query  
recommendation with SNOMED CT**

**SNOMED CT EXPO 2016**

**Wellington, 27 October 2016**

**Khalil Bouzekri, Khadzir Sheikh Ahmad, Wael Hamdan,  
Dickson Lukose, Syirahaniza Mohd Salleh and Nur Shaema  
Darus**

- 1. Data harmonization tool: Mi-Harmony**
- 2. Mi-Harmony Software Platform & Application**
- 3. Mi-Harmony in use**
  - a. National Cardiovascular Disease Database
  - b. Hospital "A"
  - c. National Heart Institute
- 4. Intelligent Query Recommendation**
- 5. Moving forward**
  - a. Pilot project
  - b. Integration into the Malaysian Health Data Warehouse



# Data harmonization tool: Mi-Harmony



MINISTRY OF HEALTH  
MALAYSIA

1. Data harmonization tool: Mi-Harmony
2. **Mi-Harmony Software Platform & Application**
3. **Mi-Harmony in use**
  - a. National Cardiovascular Disease Database
  - b. Hospital "A"
  - c. National Heart Institute
4. **Intelligent Query Recommendation**
5. **Moving forward**
  - a. Pilot project
  - b. Integration into the Malaysian Health Data Warehouse

*1<sup>st</sup> prototype*



2014



**Platform and Application**  
Requirements Analysis,  
Design, Implementation,  
Testing



2015

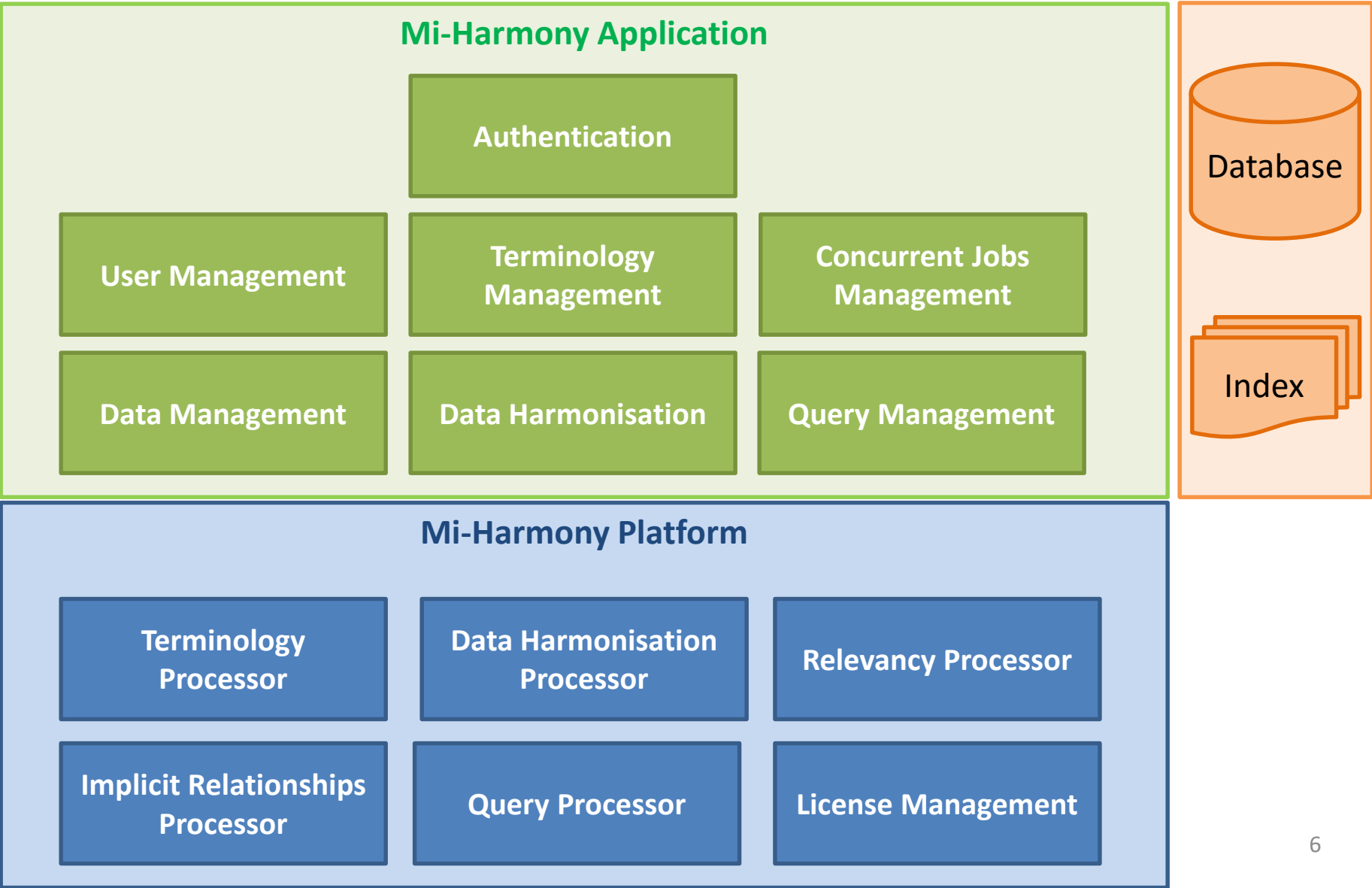


**Platform and Application**  
Deployment, Go-Live



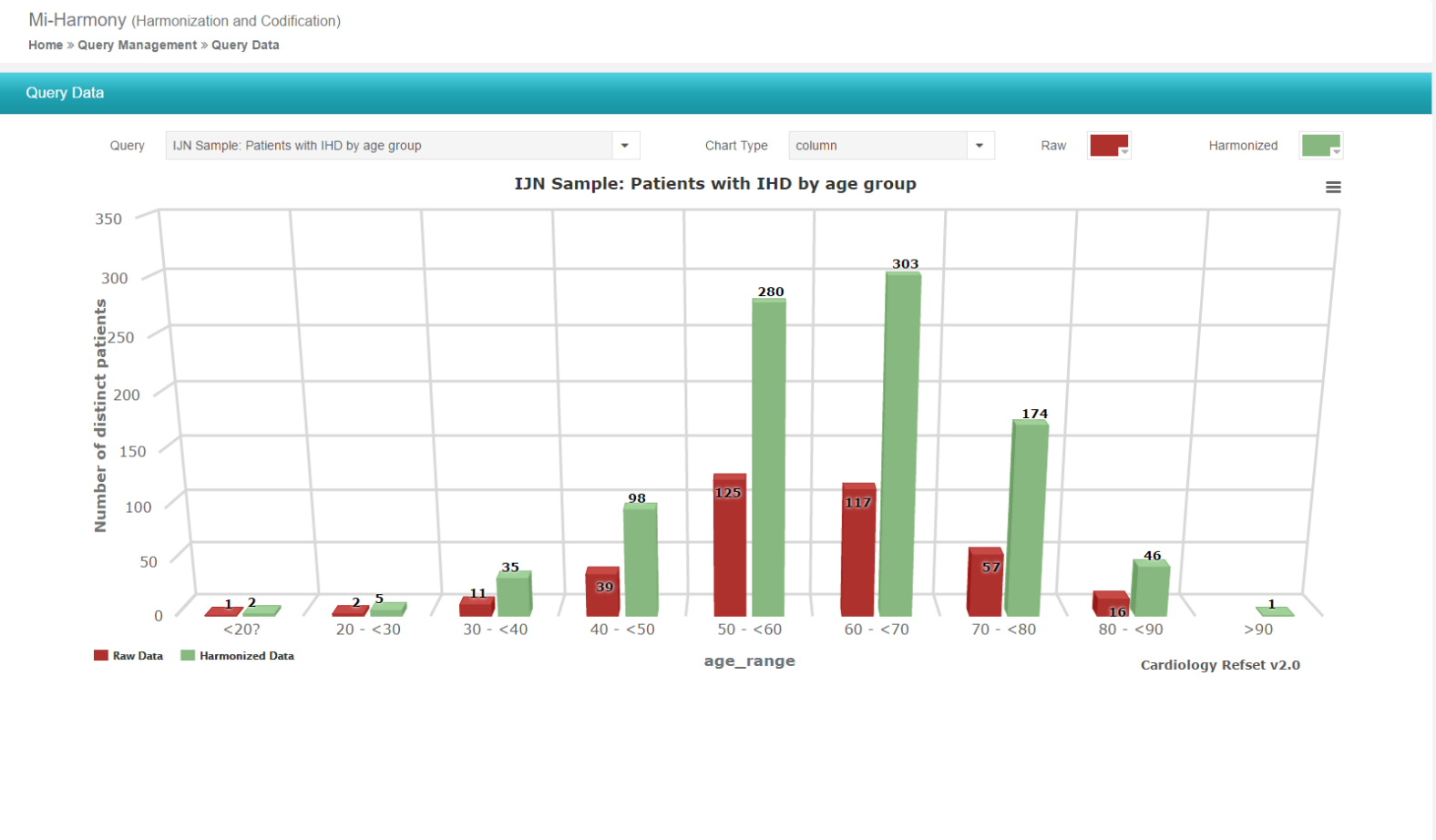
2016





**Mi-Harmony**  
KHALIL BEN ▾

- Home
- > Terminology Management
- > Data Management
- > Codification Management
- > Query Management
  - >> Add Query
  - >> View/Edit Query
  - >> Query Data
- > Job Management
- > User Management



1. Data harmonization tool: Mi-Harmony
2. Mi-Harmony Software Platform & Application
3. **Mi-Harmony in use**
  - a. National Cardiovascular Disease Database
  - b. Hospital "A"
  - c. National Heart Institute
4. Intelligent Query Recommendation
5. Moving forward
  - a. Pilot project
  - b. Integration into the Malaysian Health Data Warehouse



# Mi-Harmony in use: NCVD

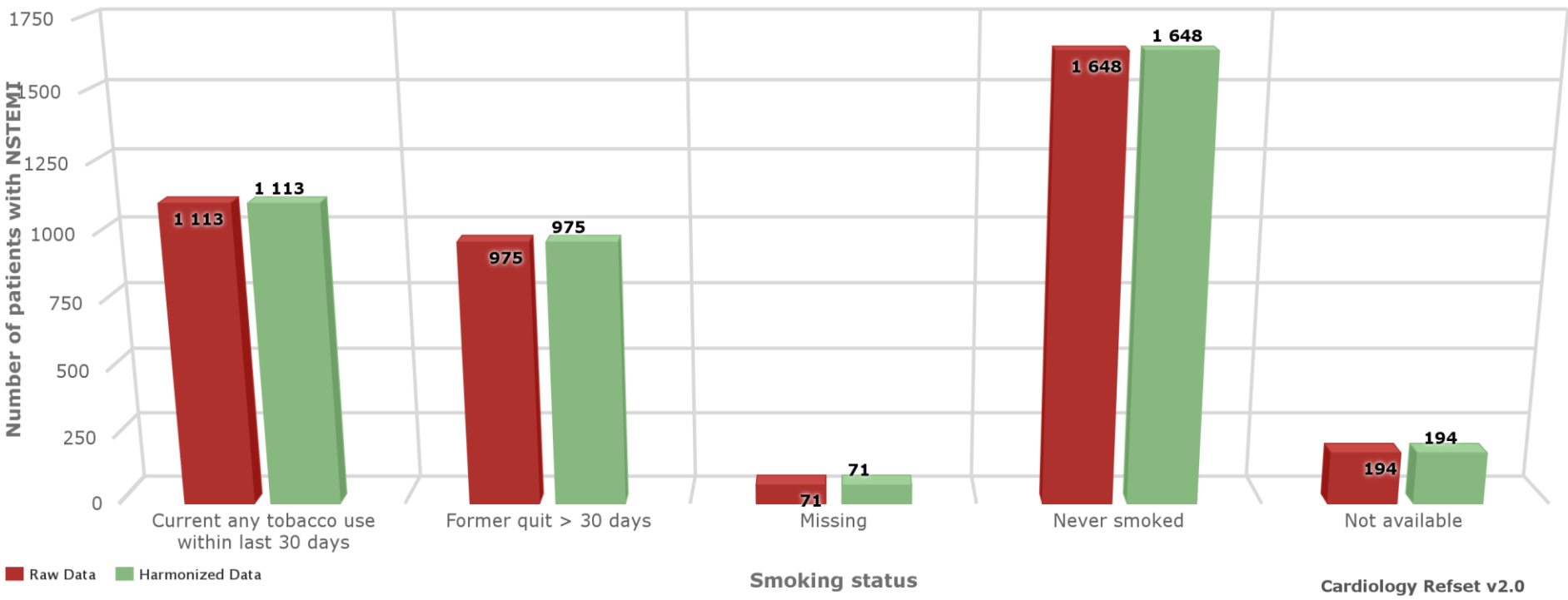
- **The National CardioVascular Disease Database (NCVD)** aggregates data from Acute Coronary Syndrome and Percutaneous Coronary Intervention **registries**.



- Acquisition of a copy of the database:
  - Excel sheet, data range from 1<sup>st</sup> January 2013 to 31<sup>st</sup> December 2014 (ACS: 15,907 records; PCI: 15,539 records)
  - 117 variables (f.i., patient\_id, date\_of\_admission, age\_on\_admission, dyslipidemia, hypertension, total\_cholesterol, hdlc)

# Mi-Harmony in use: NCVD

NCVD: Number of NSTEMI by smoking status (2)

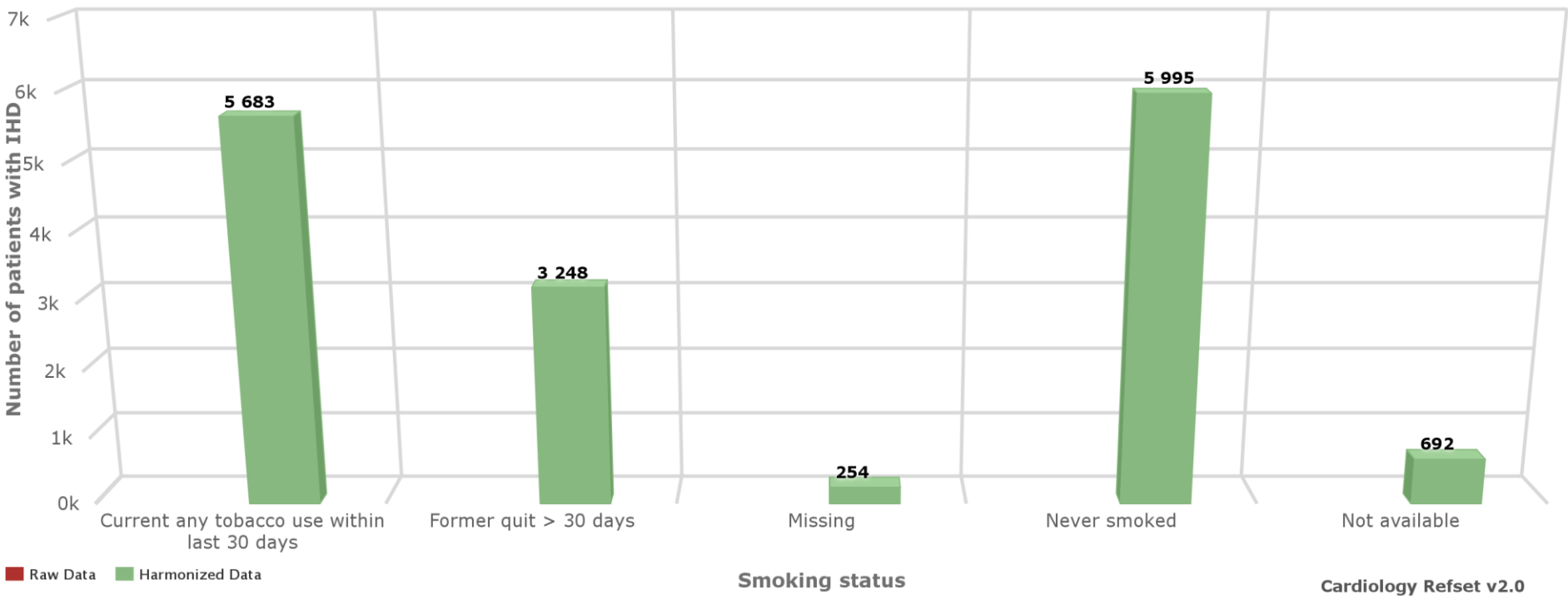


Cardiology Refset v2.0

# Mi-Harmony in use: NCVD



NCVD: Number of IHD by smoking status



Cardiology Refset v2.0

# Mi-Harmony in use: Hospital “A”



- **Hospital “A”** is a government-funded multi-specialty hospital located in Selangor, Malaysia
  
- Acquisition of Discharge summary data for cardiology cases:
  - Database dump from 21<sup>st</sup> March 2006 to 31<sup>st</sup> July 2016 (7M records)
  - 16 variables (f.i., patient\_id, date\_of\_birth, gender, discharge\_summary, discharge\_date, icd\_code)

# Mi-Harmony in use: Hospital “A”

- **Challenge:**

- All the clinical related data is in the “discharge\_summary”, which is stored in the form of HTML file

- **Issues:**

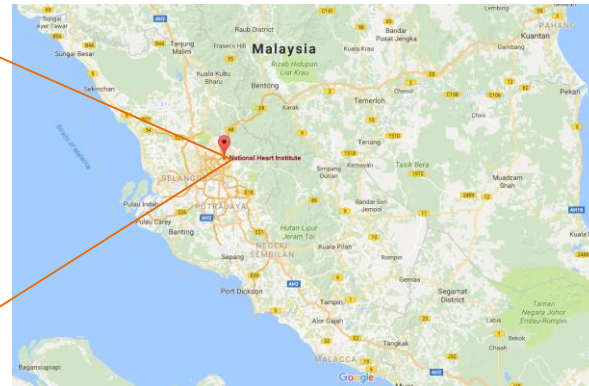
- The HTML structure differs from one discharge summary to another (additional tags, different tags, different structures, etc.)
- The data is not clean:
  - Sometimes the diagnosis, history, medications, plan are all written under the “History” section



Those data issues have been channeled to Hospital “A”, we decided to move on to the next organization

# Mi-Harmony in use: NHI

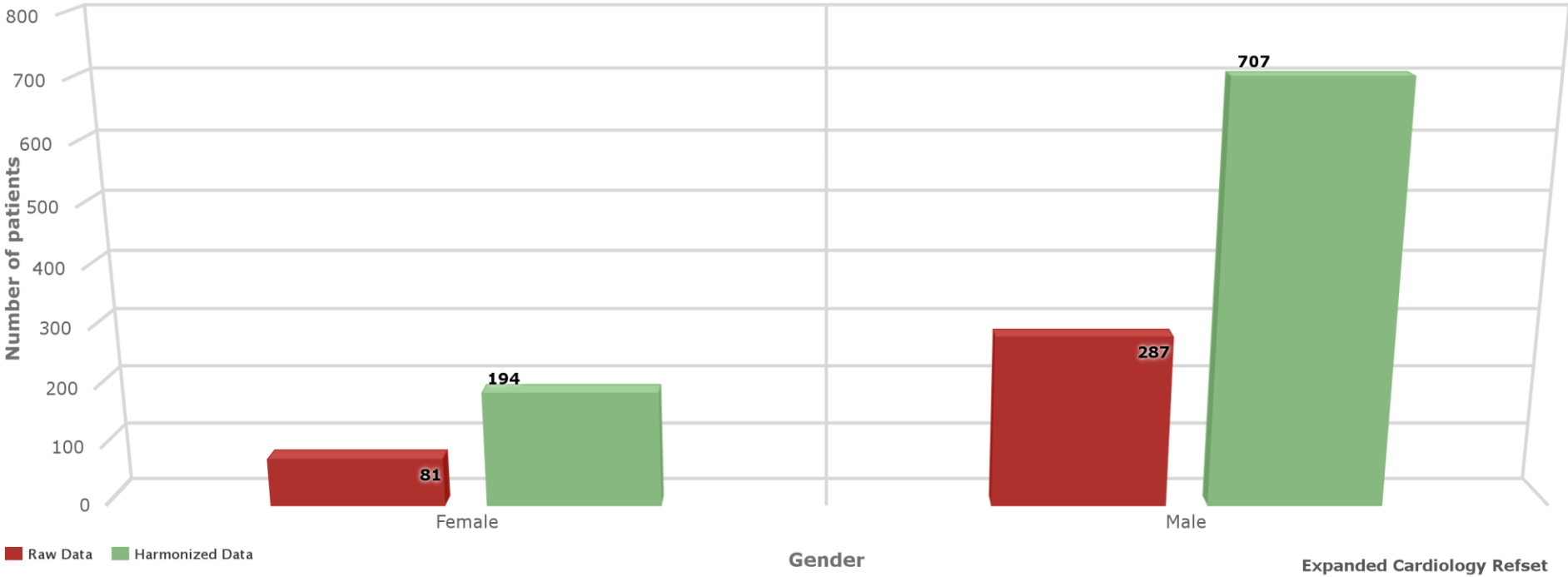
- National Heart Institute (NHI)** is a heart specialist institution in Kuala Lumpur, Malaysia.



- Acquisition of Discharge summary data:
  - Excel sheet, data range from 15<sup>th</sup> August 2015 to 31<sup>st</sup> Dec 2015 (7,039 records)
  - 19 variables (f.i., mrn, date\_of\_birth, gender, reason\_for\_admission, principal\_diagnosis, secondary\_diagnosis, discharge\_date, icd\_code)

# Mi-Harmony in use: NHI

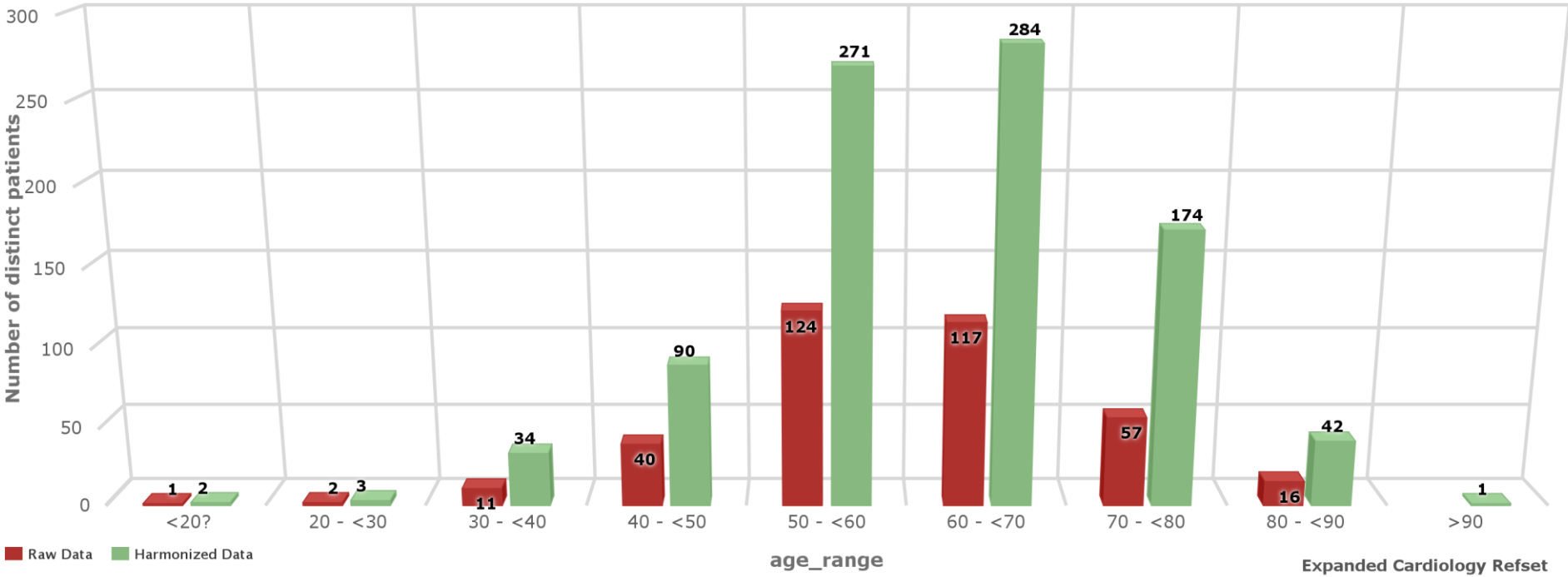
IJN Sample: Patients with IHD by gender



Expanded Cardiology Refset

# Mi-Harmony in use: NHI

IJN Sample: Patients with IHD by age group



Expanded Cardiology Refset



1. Data harmonization tool: Mi-Harmony
2. Mi-Harmony Software Platform & Application
3. Mi-Harmony in use
  - a. National Cardiovascular Disease Database
  - b. Hospital "A"
  - c. National Heart Institute
4. Intelligent Query Recommendation
5. Moving forward
  - a. Pilot project
  - b. Integration into the Malaysian Health Data Warehouse

- **Objective:** provide ad hoc queries capability using SNOMED CT

Number of distinct patients with [Ischaemic heart disease](#) per gender

- ▶ Structural disorder of heart
- ▶ Traumatic and/or non-traumatic injury of anatomical site

---

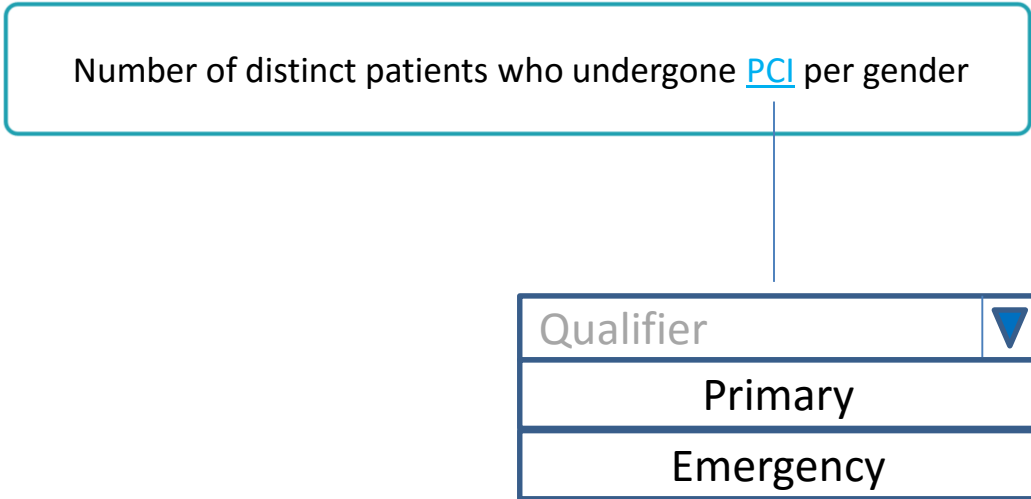
**Ischaemic heart disease**

- ▶ Acute ischaemic heart disease
- ▶ Angina pectoris
- ▶ Chronic ischaemic heart disease
- Ischaemic contracture of left ventricle syndrome
- ▶ Myocardial infarction

OK
Cancel

Only view concepts generating results (profiling of the incoming data)

- **Objective:** provide ad hoc queries capability using SNOMED CT



Only view qualifiers generating results (profiling of the incoming data)

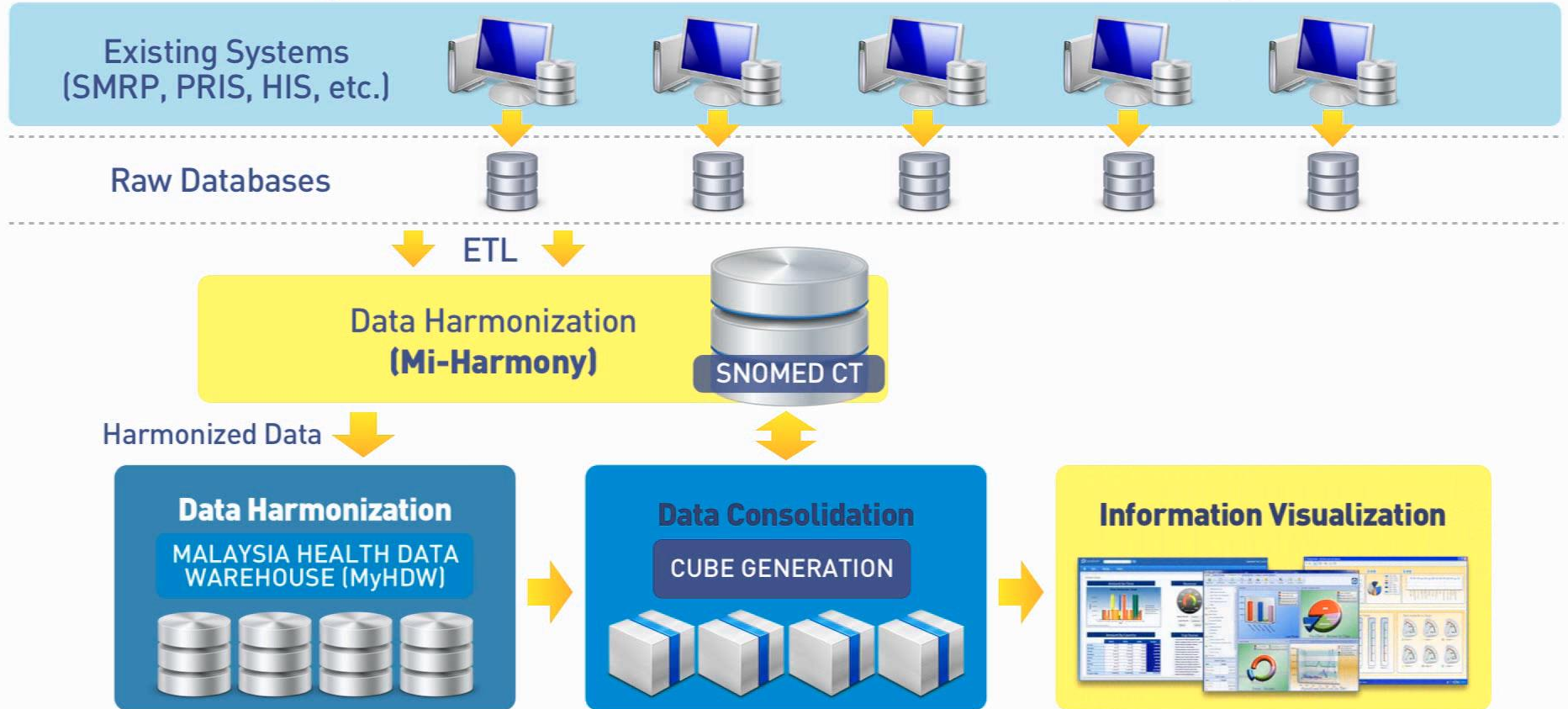
1. Data harmonization tool: Mi-Harmony
2. Mi-Harmony Software Platform & Application
3. Mi-Harmony in use
  - a. National Cardiovascular Disease Database
  - b. Hospital "A"
  - c. National Heart Institute
4. Intelligent Query Recommendation
5. Moving forward
  - a. Pilot project
  - b. Integration into the Malaysian Health Data Warehouse

# Moving forward: Pilot project

- The plan is to move forward with NHI, as their data is the most machine-friendly
  
- Discussions with NHI are on-going for a pilot project, we are now in requirements gathering phase:
  - Identify the challenges in NHI
  - Identify where Mi-Harmony could help (f.i., automation, interoperability, analytics, etc.)

# Moving forward: MyHDW

## SNOMED CT based Clinical Data Harmonization



**TERIMA KASIH**  
**THANK YOU**