Local Perspectives and Consideration on RWD/RWE

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Outline

- Department of Clinical Epidemiology and Biostatistics (CEB).
- Real-world data (RWD).
  - CEB data warehouse
  - How it was created
- Our projects.
About me

• Graduate with Ph.D. in Data Science for Healthcare from Mahidol university in 2022.

• Work as Data Analyst / Informatician for 4 years at Thai Health Information Standards Development Center (THIS) and now CEB as lecturer / Data scientist.

• Focus on Applied Research, Machine Learning, Tabular data, Computer Vision, Natural Language Processing.
Our roles

CEB’s ROLES/Responsibilities

Research

Service

Education

Data Warehouse
Our research
Our research

Evidence Syntensis

Therapeutic study

Economic evaluation study

Risk/Prognosis

Genetic association study

Diagnostic study

Economic evaluation study

Diagnostic study

Therapeutic study
Importance of RWD

• Cost efficiency.
• Rich datasets, rich set of features and datapoint.
• Generate RWE.
• Enhanced external validation and increase reliability.
• Improve patient outcome.
https://www.rama.mahidol.ac.th/ceb/CEBdatawarehouse/Overview
To form cohort data requires

- Principal investigator
  - Coordinating all participants.
- Physicians/Specialists
  - Providing content expertise.
- Epidemiologists/Biostatisticians
  - Developing research framework and statistical analysis.
- Data scientists
  - Handling big data and provide machine learning analysis.
- Data engineers
  - Designing database architecture and managing/maintaining data warehouse server for cohort data.
Form team
Applying EC
Data retrieval
Patient identification
Cohort creation
Updating

Develop Proposal
Submit Proposal
Hospital EC Committee
EC Certificate

C\&B
Data Warehouse
Form team
Applying EC
Data retrieval
Patient identification
Cohort creation
Updating

Structured Data
Demographic
Diagnosis
Procedure
Medication
Vital sign
Visit and admission
Dead
Laboratory
Billing

Unstructured Data
Signal Data
ECG
Echo
Image Data
Digital – Pathology Image
Text Data
Discharge summaries
ECG Interpret

HIS
Exact criteria for T2D patient identification

Inclusion:
- Patients identified with ICD-10 of E11*.
- Patients who were prescribed with anti-diabetic medications.
- Patients who have high glycemic level.

Exclusion:
- Patients age less than 18 years.
- Patients identified with ICD-10 of E10*.
- Patients with GDM.
Form cohort team
Applying EC
Data retrieval
Patient identification
Cohort creation
Updating

Admission and Visit
Vital sign
Diagnosis and Operation
Medication
Lab
Dead
Demographic

Cohort Data

ID | Date      | ICD10 | Gender | ……
---|-----------|-------|--------|---
001| 01-01-2011| ....  | ....   | ....
001| 26-10-2012| ....  | ....   | ....
001| 12-12-2012| ....  | ....   | ....
002| 03-01-2011| ....  | ....   | ....
002| 15-06-2011| ....  | ....   | ....
…  | ….        | …….  | …….   | …….
T2D cohort
Target subjects between 1 July 2023 to 31 December 2023

Ramathibodi Hospital Database
January 2010 - June 2023

E11*
FPG >= 126 mg/dL or HbA1c >= 6.5% morning
Biguanides, SU, TZD, DPP4, SGLT2, GLP1 or Insulin.

Dataset of T2D patients 105,201 N

Final T2D dataset (January 2010 - December 2023) 112,200 N

Ramathibodi Hospital Database
July 2023 - December 2023

E11*
FPG >= 126 mg/dL or HbA1c >= 6.5% morning

Diagnosis data

Laboratory data

Medication data

OR

Dataset of T2D patients 6,999 N

C&B Data Warehouse
Variables (Features)

- ~300 variables from various data domains (e.g., patients’ demographics, physical examinations, medications, diagnosis, laboratory tests, and etc.)
- Longitudinal data

<table>
<thead>
<tr>
<th>Laboratory tests</th>
<th>Demographic</th>
<th>Medications</th>
<th>Comorbidities / Complications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Albumin Urine, mg/dL</td>
<td>BMI, kg/m²</td>
<td>Alpha glucosidase inhibitors</td>
<td>Hypertension</td>
</tr>
<tr>
<td>Blood urea nitrogen, mg/dL</td>
<td>Height, cm</td>
<td>Beta blockers</td>
<td>Dyslipidemia</td>
</tr>
<tr>
<td>eGFR (CKD-EPI), ml/min/1.73 m²</td>
<td>Weight, kg</td>
<td>Biguanides</td>
<td>Diabetic Retinopathy (DR)</td>
</tr>
<tr>
<td>Creatinine, mg/dL</td>
<td>Insurance Scheme</td>
<td>Sulfonylureas</td>
<td>Chronic Kidney Disease (CKD)</td>
</tr>
<tr>
<td>FPG, mg/dL</td>
<td>SBP, mmHg</td>
<td>Insulin</td>
<td>Peripheral Vascular Diseases (PVD)</td>
</tr>
<tr>
<td>HbA1C (EDTA-blood), %</td>
<td>DBP, mmHg</td>
<td>SGLT-2i</td>
<td>Cardiovascular Disease (CVD)</td>
</tr>
<tr>
<td>Cholesterol, mg/dL</td>
<td></td>
<td>DPP-4i</td>
<td>Heart Failure (HF)</td>
</tr>
<tr>
<td>HDL Cholesterol, mg/dL</td>
<td></td>
<td>GLP1-RA</td>
<td>Fracture</td>
</tr>
<tr>
<td>LDL Cholesterol, mg/dL</td>
<td></td>
<td>Meglitinides</td>
<td>Death</td>
</tr>
<tr>
<td>Triglyceride, mg/dL</td>
<td></td>
<td>Thiazolidinediones</td>
<td></td>
</tr>
<tr>
<td>Troponin T, ng/L</td>
<td></td>
<td>Calcium channel blocker</td>
<td></td>
</tr>
<tr>
<td>Uric acid, mg/dL</td>
<td></td>
<td>Calcium phosphate binders</td>
<td></td>
</tr>
<tr>
<td>AST, U/L</td>
<td></td>
<td>Diuretics</td>
<td></td>
</tr>
<tr>
<td>ALT, U/L</td>
<td></td>
<td>Statins</td>
<td></td>
</tr>
<tr>
<td>GGT, U/L</td>
<td></td>
<td>ACE inhibitor</td>
<td></td>
</tr>
</tbody>
</table>
T2D = 112,200

CKD = 71,267
HT = 293,905

Migraine = 17,637

Prostate Cancer = 9,261

Abdominal Surgery = 17,530*

Stroke = 30,521
AF = 23,424
HF = 10,048

All cohorts = 352,101 subjects Jan 2010 - Dec 2023
Our productivity

Clinical effectiveness of second-line antihyperglycemic drugs on major adverse cardiovascular events: An emulation of a target trial

Sukanya Siriyotha, Thitiya Lukkunaprasit, Teeranan Angkananard, Panu Looareesuwan, Gareth J McKay, John Attia, Ammarin Thakkinstian

Effects of second-line antihyperglycemic drugs on the risk of chronic kidney disease: applying a target trial approach to a hospital-based cohort of Thai patients with type 2 diabetes

Sukanya Siriyotha, Thitiya Lukkunaprasit, Panu Looareesuwan, Hatakan Nimithpong, Gareth J McKay, John Attia, Ammarin Thakkinstian

A multicentre retrospective study of characterization of treatment intensified (add on to metformin) real world adult population with type 2 diabetes mellitus in India, Pakistan, and Thailand

Retinopathy prediction in type 2 diabetes: Time-varying Cox proportional hazards and machine learning models

Panu Looareesuwan, Suparee Boonmanunt, Sukanya Sirivotha, Thitiya Lukkunaprasit
Our productivity

• Collaboration between Siriraj, Khon Kaen University and Ramathibodi hospital, multicenter study.
Our team
Additional information

https://www.rama.mahidol.ac.th/ceb/
Thank you