ICD-9 to ICD-10 Mapping for Database Research in Originator Biologics and Biosimilars

Mengdong He[1], MHS; Adrian J. Santiago Ortiz[1], BS; Aaron B. Mendelsohn[3], PhD, MPH; Charles E. Barr[2], MD, MPH; Catherine M. Lockhart[2], PharmD, PhD; James Marshall[3], MPH; Seoyoung C. Kim[1], MD, ScD, MSCE

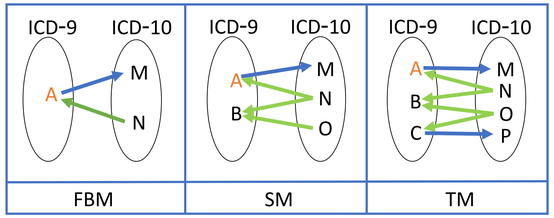
1. Division of Pharmacoepidemiology and Pharmacoeconomics, Brigham and Women's Hospital and Harvard Medical School, Boston, MA; 2. AMCP Biologics and Biosimilars Collective Intelligence Consortium, Alexandria, VA; 3. Harvard Pilgrim Health Care Institute and Harvard Medical School, Boston, MA

INTRODUCTION

- As of October 1st, 2015, the Centers for Medicare and Medicaid Services (CMS) mandated the transition from ICD-9 to ICD-10 codes.
- Many differences between the two coding systems such as the level of detail and number of codes complicate analysis of data across this transition period.
- The Biologics & Biosimilars Collective Intelligence Consortium (BBCIC) uses a distributed research network (DRN) to generate post-marketing evidence for novel biologics and biosimilars.
- Active surveillance of products' safety and effectiveness in DRNs requires a robust approach for converting ICD-9 to ICD-10 codes used in defining study populations, covariates and outcomes.
- The objective of this study is to convert from ICD-9 to ICD-10 diagnostic and procedure codes for various health conditions in clinical areas of BBCIC's interest and determine the incidence of these health conditions before and after October 1, 2015.

METHODS

- Using the General Equivalence Mappings (GEMs) developed by CMS, we applied 3 mapping methods for conditions in the interested disease areas:
  - Forward Backward Mapping (FBM): The simplest, using the direct links of forward and backward GEMs.
  - Secondary Mapping (SM): Based on the ICD-10 codes identified by FBM combined with other associated ICD-9 codes, i.e., secondary codes.
  - Tertiary mapping (TM): The most complicated method based on an iteration of the SM.



- Physician expert (S.C. Kim) reviewed the relevance of ICD-10 codes from the 3 mapping methods.
- Incidence of ICD-9 and ICD-10 codes from FBM were calculated in the pre- and post- ICD-10 implementation period (9/1/2012-3/31/2018).
- Harvard Pilgrim Health Care Institute team conducted the analyses in distributed databases of 5 data partners and provided pooled results.

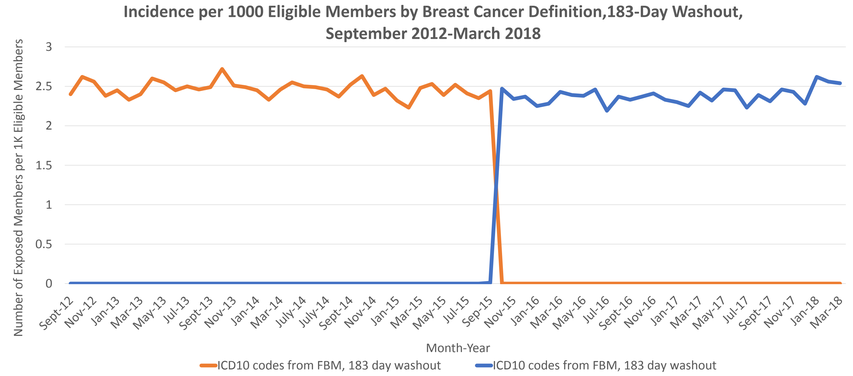
RESULTS

- We used FMB for all the 110 conditions and explored SM and TM for 7 conditions.
- Overall, we observed a marked increase in the number of codes mapped by SM and TM in addition to FBM. However, for conditions that were distinct diseases (e.g., myocardial infarction, rheumatoid arthritis and breast cancer), no additional ICD-10 codes were identified by SM or TM. (See table below)
  - A great proportion of the additional codes identified by SM and TM were unrelated to the conditions of interest, or too non-specific to be used alone. In the example of type 1 diabetes, additional ICD-10 codes were identified for other types of diabetes and atherosclerosis.
  - While SM and TM may potentially identify more useful ICD-10 codes, the number of incorrect codes coming along with it also grows quickly.
- 51 (46%) of 110 conditions were identified with incorrectly mapped ICD-10 codes by FBM during manual review. Common reasons for these incorrect ICD-10 conversion were:
  - ICD-10 codes were too broad/non-specific or unrelated to a given condition.
  - ICD-10 codes for relevant conditions/procedures were missing.
- Incidence trends of ICD-9 and ICD-10 (FBM) codes (See figure below for the example of breast cancer)

Condition	N of ICD-9 codes in the algorithm	N of ICD-10 codes from FBM	N of ICD-10 codes from SM*	N of ICD-10 codes from TM*
Type 1 Diabetes	20	84	327	281
Hypoglycemia	5	17	34	54
Tuberculosis	426	57	54	80
IBD	13	78	16	26
MI	30	17	0	0
RA	11	451	0	0
Breast Cancer	11	54	0	0

* Unique addition of ICD-10 codes beyond codes identified by FBM

Acronyms: IBD = Inflammatory Bowel Disease; MI = Myocardial Infarction; RA = Rheumatoid Arthritis.



DISCLOSURES AND ACKNOWLEDGEMENTS

- Dr. Seoyoung Kim received research grants to the Brigham and Women's Hospital from Pfizer, Bristol-Myers Squibb and Roche for unrelated studies. Other authors have no conflict interest to disclose. This project is fully funded by the BBCIC.
- Aetna, Healthcore, Health Partners, Harvard Pilgrim, and Kaiser Permanente Washington all contributed data.
- Jeffrey R. Curtis, Katie King, Annemarie Kline, Kevin Walsh, and Sophie Zhang are members of ICD-10 mapping workgroup.

CONCLUSIONS

- Depending on how distinct the conditions of interest are and their role in the study design and analysis (e.g., covariates versus outcomes), the optimal choice of mapping methods may vary.
- FBM would provide ICD-10 codes with higher specificity and be most efficient, while SM and TM could identify ICD-10 codes with higher sensitivity but be labor intensive.
- Manual review of the converted codes is necessary for all 3 methods.

Presented At: AMCP Nexus, Orlando FL, Oct 24, 2018