**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 robust methods for conditions in the interested disease areas:
  - Tertiary Mapping (TM): The most complicated method based on an iteration of the SM.
  - Secondary Mapping (SM): Based on the ICD-9 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.

**METHODS**

- Using the General Equivalence Mappings (GEMs) developed by CMS, we applied 3 mapping methods for conditions in the interested disease areas:
  1. Forward Backward Mapping (FBM): The simplest, using the direct links of forward and backward GEMs.
  2. Secondary Mapping (SM): Based on the ICD-10 codes identified by FBM combined with other associated ICD-9 codes, i.e., secondary codes.
  3. Tertiary mapping (TM): The most complicated method based on an iteration of the SM.
- Physician expert (S.C. Kim) reviewed the relevance of ICD-9 codes from FBM, 183 day washout.
- Incident 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 FBM 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 overall 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:
  - O 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).

**DISCLOSURES AND ACKNOWLEDGEMENTS**

- Other authors have no conflict interest to disclose. This project is fully funded by the BBCIC.
- 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.