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# Updating and Validating the Rheumatic Disease Comorbidity Index to ICD-10-CM

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Summer Undergraduate Research Program

## Introduction

- Comorbidities such as lung disease, stroke, and diabetes have been shown to contribute to increased mortality and disability risk in individuals with rheumatoid arthritis (RA)<sup>1,2</sup>
- The Rheumatic Disease Comorbidity Index (RDCI) assesses 11 comorbidity categories and produces a weighted score (0-9) to predict several health outcomes<sup>3</sup>
- The RDCI was developed with self-report data and later validated using ICD-9-CM codes to collect administrative comorbidity data<sup>3,4</sup>
- In October 2015, the United States healthcare systems transitioned to ICD-10-CM, which resulted in a nearly five-fold increase in the number of codes available for classifying health conditions<sup>5</sup>
- Objective: update and validate the RDCI by translating it into ICD-10-CM

## Methods

- Cohort study using Veterans Affairs Rheumatoid Arthritis Registry (VARA)
- ICD-10 codes generated by converting ICD-9 codes using tools that provide suggested crosswalks, and the codes were reviewed by a physician to assess clinical relevance
- National VA administrative databases were sources for ICD-9 and ICD-10 comorbidity data

Figure 1. Study design overview

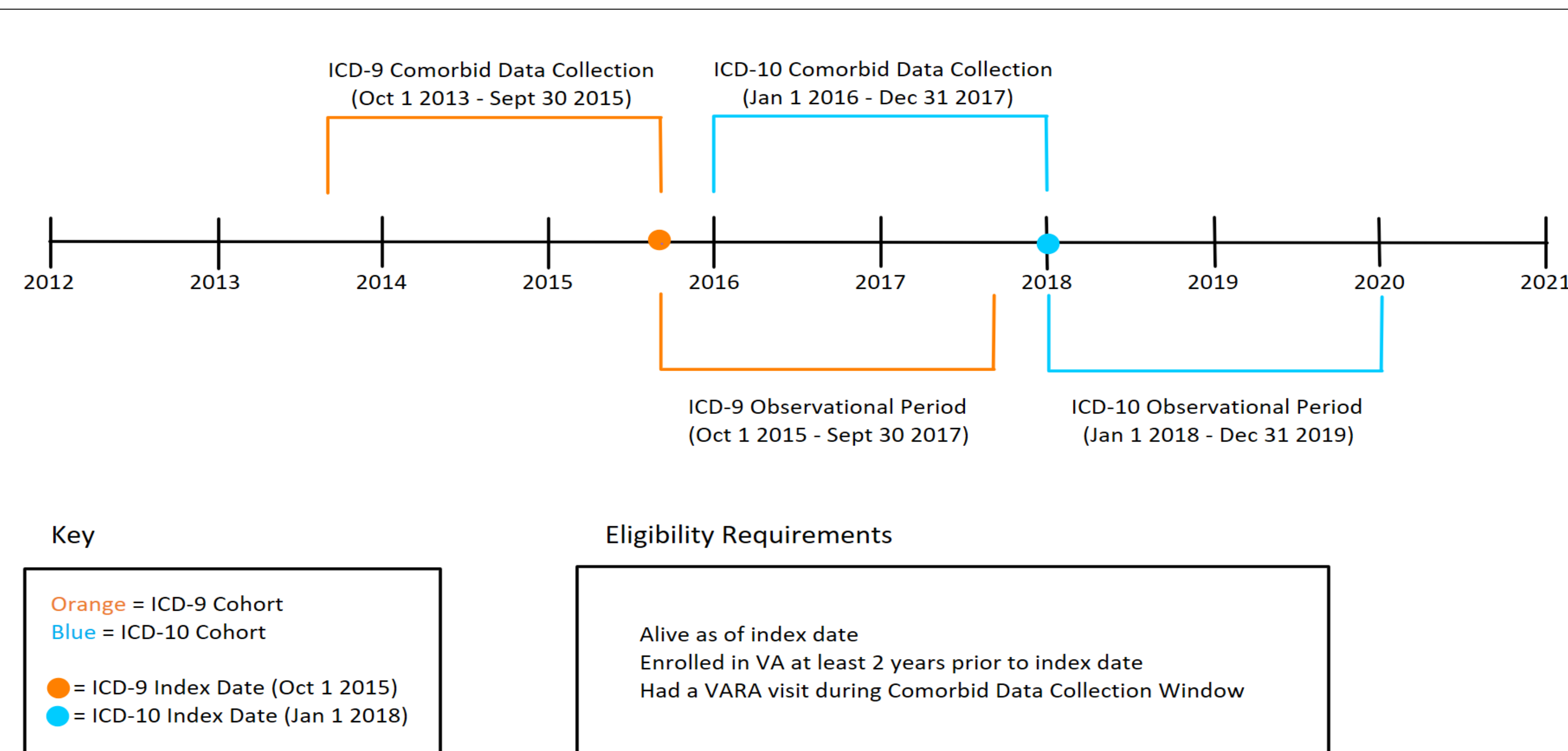


Table 1. Example of ICD-9 to ICD-10 mapping for comorbidity category (Diabetes Mellitus)

Comorbidity Condition	ICD-9 Diagnosis Code	ICD-10 Diagnosis Code
Diabetes Mellitus	Secondary diabetes mellitus 249.x (Secondary diabetes mellitus)	E08.x (Diabetes mellitus due to underlying condition) E09.x (Drug or chemical induced diabetes mellitus) E13.x (Other specified diabetes mellitus)
	Diabetes mellitus 250.x (Diabetes mellitus)	E10.x (Type 1 diabetes mellitus) E11.x (Type 2 diabetes mellitus)

Table 2. Characteristics of ICD-9 and ICD-10 cohorts from VARA registry

Characteristics	ICD-9-CM Cohort (N = 1,082)	ICD-10-CM Cohort (N = 1,446)
Age, years	67.3 ± 10.2	68.2 ± 10.0
Male, no. (%)	965 (89.2)	1260 (87.1)
White, no. (%)	823 (76.1)	1060 (73.3)
Smoking Status, no. (%)		
Current	263 (24.3)	341 (23.6)
Former	548 (50.6)	739 (51.1)
Never	229 (21.2)	293 (20.3)
DAS28	3.28 ± 1.38	3.15 ± 1.35
Duration of RA Disease, years	15.24 ± 11.00	16.38 ± 11.16
RA Treatment, no. (%)		
csDMARDs	566 (52.3)	758 (52.4)
b/tsDMARDs	260 (24.0)	359 (24.8)
Glucocorticoids	284 (26.2)	315 (21.8)
Anti-CCP antibody, no. (%)	756 (69.9)	1066 (73.7)

Values are reported as mean ± standard deviation unless stated otherwise

VARA = Veterans Affairs Rheumatoid Arthritis Registry; DAS28 = Disease Activity Score; RA = Rheumatoid Arthritis; csDMARDs = conventional synthetic disease-modifying antirheumatic drug; b/tsDMARDs = biologic or targeted synthetic disease-modifying antirheumatic drug; Anti-CCP = Anti-cyclic citrullinated peptide

## Results

Table 3. RDCI scores and agreement for ICD-9 and ICD-10 Cohorts

RDCI Score	All Patients		Patient in both cohorts (N=862)		ICC Value <sup>6</sup> (95% CI)
	ICD-9-CM (N=1,082)	ICD-10-CM (N=1,446)	ICD-9-CM	ICD-10-CM	
	2.95 ± 1.73	2.93 ± 1.75	2.89 ± 1.70	3.02 ± 1.76	0.71 (0.68-0.74)

Table 4. Comorbidity frequency and agreement for ICD-9 and ICD-10 cohorts

Comorbidity Condition	All Patients		Patients in both cohorts (N=862)		Cohen's Kappa <sup>7,8</sup>
	ICD-9-CM % (N=1,082)	ICD-10-CM % (N=1,446)	ICD-9-CM %	ICD-10-CM %	
Myocardial Infarction	7.2	5.0	6.5	5.6	0.47
Hypertension	65.3	63.5	65.1	63.2	0.71
Diabetes Mellitus	29.1	28.5	27.8	31.2	0.84
Depression	27.6	23.7	28.3	25.8	0.61
Ulcer or Stomach Problem	8.2	8.0	6.8	8.0	0.27
Stroke	5.2	6.5	4.5	6.3	0.49
Fracture spine, hip, or leg	1.8	2.7	1.3	2.0	0.13
Other Cardiovascular	35.0	36.9	32.1	37.8	0.63
Lung Disease	29.9	32.4	29.4	33.1	0.62
Cancer	20.9	20.1	20.3	21.8	0.58

Green = moderate agreement or higher ( $\kappa \geq 0.41$ ); Red = less than moderate agreement ( $\kappa \leq 0.40$ )

## Conclusions

- Mapping RDCI from ICD-9 to ICD-10 generates comparable scores
- More chronic conditions (e.g. diabetes and hypertension) had higher agreement, while more acute conditions (e.g. fractures and ulcers) had lower agreement
- Updated RDCI can be used in research with ICD-10-CM era data

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