

The Impact of Continuity of Care on Medication Adherence

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Background:

Objectives: Continuity of care (COC) is considered an important determinant of medication adherence based on measures such as the usual provider continuity index (UPCI) that are derived exclusively from physician visit claims. This study aimed to: a) determine if high UPCI values predict physicians who deliver different clinical services; and b) compare UPCI with an integrated COC measure in a multivariable model of patients receiving statin medications.

Methods:

This was a retrospective cohort study of new statin users between 2012 and 2017 in Saskatchewan, Canada. We calculated sensitivity/specificity of a high UPCI value for predicting physicians who were prescribers of statins and/or providers of complete medical examinations. Next, we used logistic regression models to test two measures of COC (high UPCI value or an integrated COC measure) on the outcome of optimal statin adherence (proportion of days covered $\geq 80\%$). The DeLong test was used to compare predictive performance of the two models.

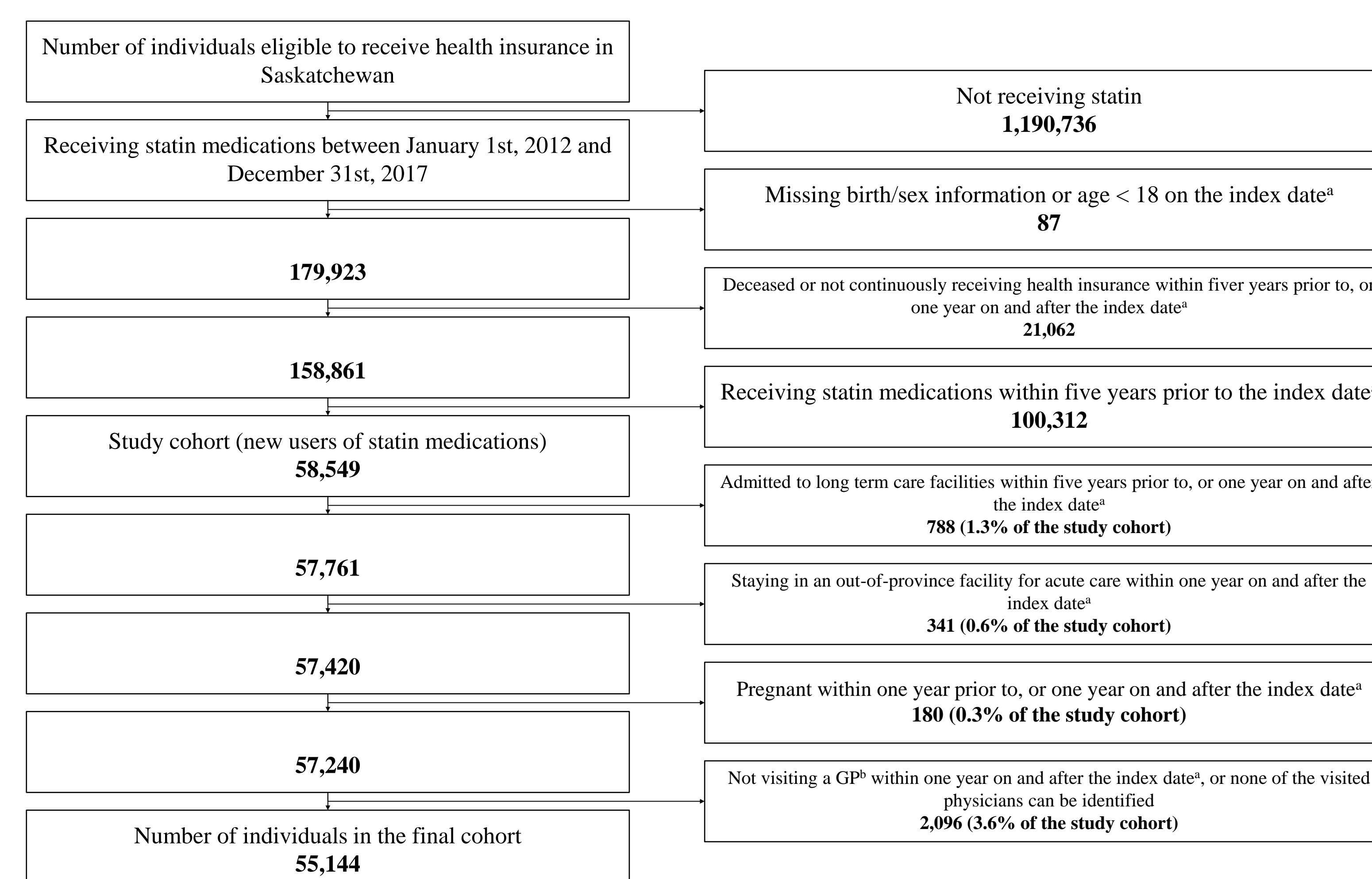
Results:

Among 55,144 new statin users, a high UPCI was neither a sensitive or specific marker of physicians who prescribed statins or performed a complete medical exam. The integrated COC measure had a stronger association with optimal adherence (adjusted odds ratio [OR] =1.56, 95% confidence interval [CI] 1.50 to 1.63) than UPCI (adjusted OR =1.23, 95% CI 1.19 to 1.28), and improved predictive performance of the adherence model.

Conclusion:

The number of physician visits alone appears to be insufficient to represent COC. An integrated measure improves predictive performance for optimal medication adherence in patients initiating statins.

Figure 1. Cohort flow chart



^aIndex date = the earliest date receiving a statin medication between January 1st, 2012 and December 31st, 2017;
^bGP = general practitioner.

Table 1. Baseline characteristics^a of the final cohort.

	All n=55,144	Patients grouped by UPCI ^b		Patients grouped by integrated COC ^c	
		High(≥ 0.82) n=27,859	Low(<0.82) n=27,285	Yes n=15,579	No n=39,565
Median age (Q25, Q75)	59.0 (51.0, 67.0)	59.0 (52.0, 68.0)	58.0 (50.0, 67.0)	59.0 (51.0, 67.0)	59.0 (51.0, 67.0)
Females (n, %)	24,385 (44.2%)	11,635 (41.8%)	12,750 (46.7%)	6,840 (43.9%)	17,545 (44.3%)
Patients with one or more hospitalizations for acute care (n, %)	12,528 (22.7%)	6,203 (22.3%)	6,325 (23.2%)	2,626 (16.9%)	9,902 (25.0%)
Median number of visits to GPs ^d (Q25, Q75 ^e)	6.0 (3.0, 9.0)	5.0 (3.0, 9.0)	6.0 (3.0, 10.0)	6.0 (3.0, 9.0)	5.0 (3.0, 9.0)
Median number of visits to specialists (Q25, Q75 ^e)	2.0 (0.0, 6.0)	2.0 (0.0, 6.0)	2.0 (0.0, 6.0)	2.0 (0.0, 5.0)	2.0 (0.0, 7.0)
Patients with one or more visits to emergency department (n, %)	11,450 (20.8%)	5,519 (19.8%)	5,931 (21.7%)	2,739 (17.6%)	8,711 (22.0%)
Patients by income level (n, %)					
1 (lowest)	10,339 (18.7%)	4,787 (17.2%)	5,552 (20.3%)	2,675 (17.2%)	7,664 (19.4%)
2	10,207 (18.5%)	5,058 (18.2%)	5,149 (18.9%)	2,761 (17.7%)	7,446 (18.8%)
3	10,093 (18.3%)	5,182 (18.6%)	4,911 (18.0%)	2,942 (18.9%)	7,151 (18.1%)
4	11,289 (20.5%)	5,897 (21.2%)	5,392 (19.8%)	3,251 (20.9%)	8,038 (20.3%)
5 (highest)	10,268 (18.6%)	5,456 (19.6%)	4,812 (17.6%)	3,052 (19.6%)	7,216 (18.2%)
missing	2,948 (5.3%)	1,479 (5.3%)	1,469 (5.4%)	898 (5.8%)	2,050 (5.2%)
Patients by residence location (n, %)					
Rural	17,811 (32.3%)	8,666 (31.1%)	9,145 (33.5%)	4,364 (28.0%)	13,447 (34.0%)
Urban	37,333 (67.7%)	19,193 (68.9%)	18,140 (66.5%)	11,215 (72.0%)	26,118 (66.0%)

^aMedian age, number of females, residence (rural/urban), and patient income level were measured on the index date; Number of patients with one or more hospitalizations, median visits to GPs/specialists, patients with one or more visits to emergency departments were measured within one year prior to the index date;
^bUPCI = Usual Provider Continuity index; ^cCOC = continuity of care;
^dQ25 = 25% percentile, Q75 = 75% percentile; ^eGP = general practitioners.

Table 2. Measures of accuracy using UPCI^a to predict USP^b, CMEP^c, and integrated COC^d status.

	Sensitivity (95% CI ^e)	Specificity (95% CI ^e)	PPV ^f (95% CI ^e)	NPV ^g (95% CI ^e)	Kappa (95% CI ^e)
UPCI ^a to predict the usual statin prescriber	0.55 (0.55, 0.56)	0.61 (0.60, 0.62)	0.78 (0.77, 0.78)	0.35 (0.35, 0.36)	0.13 (0.13, 0.14)
UPCI ^a to predict a CMEP ^c	0.55 (0.54, 0.56)	0.52 (0.51, 0.52)	0.39 (0.39, 0.40)	0.67 (0.66, 0.68)	0.06 (0.05, 0.07)
UPCI ^a to predict integrated COC ^d	0.58 (0.58, 0.59)	0.53 (0.52, 0.53)	0.33 (0.32, 0.33)	0.76 (0.76, 0.77)	0.09 (0.08, 0.09)

^aUPCI = usual provider continuity index; ^bUSP=usual statin prescriber; ^cCMEP = complete medical examination provider; ^dCOC = continuity of care; ^eCI = confidence interval; ^fPPV=positive predictive value; ^gNPV=negative predictive value.

Table 3: Odds ratios (OR^a) and 95% confidence intervals (95% CI^b) for the association of measures of COC^c with optimal adherence (PDC^d $\geq 80\%$)

	Unadjusted model OR ^a (95% CI ^b)	Adjusted model ^e OR ^a (95% CI ^b)
Integrated COC ^c	1.45 (1.40, 1.51)	1.56 (1.50, 1.63)
Among patients with high UPCI ^f		1.48 (1.40, 1.56)
Among patients with low UPCI ^f		1.60 (1.51, 1.70)
UPCI ^f	1.28 (1.24, 1.32)	1.23 (1.19, 1.28)
Patients presenting integrated COC ^c		1.13 (1.06, 1.21)
Patients not presenting integrated COC ^c		1.22 (1.17, 1.27)

^aOR = odds ratio; ^bCI = confidence interval; ^cCOC = continuity of care; ^dPDC = proportion of days covered; ^eIntegrated COC = having a single physician identified as the usual care provider, the usual statin prescriber, and the complete medical examination provider; ^fUPCI = usual provider continuity index;
^gCovariates in the adjusted model included 1) age, sex, residence (rural/urban), and income level (i.e., the neighborhood median household income quintile lowest=1, highest=5) on the index date; 2) the following measured within 365 days prior to the index date: number of hospitalizations, number of out-patient visits (to GPs and to specialists, respectively), number of emergency department visits, Charlson comorbidity score, number of distinct prescription medications (by drug identification numbers), and percentage of prescription medication cost paid by government health insurance; and 3) a list of chronic conditions identified between January 1st, 1996, and the index date, including osteoporosis, rheumatoid arthritis, hypertension, stroke, ischemic heart disease, acute myocardial infarction, heart failure, multiple sclerosis, Parkinson's disease, Alzheimer's disease and dementia, epilepsy, asthma, chronic obstructive pulmonary disease, diabetes, mood and anxiety diseases, schizophrenia, and cancer.

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