

Patient–Physician Relational Continuity and Health System Utilization among Patients in Alberta

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Appendix 1: Classification of variables used in statistical analysis

The current population of Alberta is 4.3 million, and most (80%) Albertans receive their primary care from clinics in the community setting (Alberta Health 2016). The majority of these clinics belong to primary care networks (PCNs), which provide care to meet the health needs of about 3.2 million Albertans in local communities (Government of Alberta 2019).

The main goal of this study was to evaluate the association between continuity of care and emergency department (ED) visits and in-patient hospitalizations. The relationship between patient and physician was calculated using the Usual Provider Continuity (UPC) Index, which is a proxy for relational continuity (Breslau and Reeb 1975). The UPC Index was calculated at the physician and clinic levels for individuals who had at least three visits to a primary care provider or primary care clinic from April 1, 2014 to March 31, 2017. Association between relational continuity and utilization included visits to the ED and urgent unplanned in-patient hospitalizations from April 1, 2017 to March 31, 2018. Variables used in this study were derived from Alberta Health Services' (AHS) administrative databases and are presented in Table 1. AHS maintains a comprehensive database that includes patients' demographic information, comorbidities, health services utilization data and socio-economic deprivation status.

The Statistical Analysis System (SAS) was used to perform regression analysis to identify the risk of ED visits and urgent hospitalization based on continuity of care while adjusting for other factors (Barros and Hirakata 2003; Spiegelman and Hertzmark 2005). As the outcomes in this study were binary (i.e., yes = 1 and no = 0), an adjusted log-binomial regression was used, and two separate models were run for both ED visit and urgent hospitalization. Descriptive and univariate analyses were conducted to determine the influence of each covariate on the outcomes and best predictive mode. Further information regarding statistical analysis can be found in Table A1.

TABLE A1.
Classification of variables used in statistical analysis

Variable	Description	Variable values
Demographic information	Patient sex, date of birth and postal code were derived from the AHCIP provincial registry between April 1, 2014 and March 31, 2017	Sex Female Male Age groups (yr) 18–29 30–39 40–49 50–59 60–69 70+
Area of residence (AHS 2018)	Patient postal codes were used to identify area of residence using functional geographic areas defined by AHS for surveillance and reporting of population health outcomes and planning of health support and services	Urban (>25,000 population) Rural (<25,000 population and up to 200 km from urban centres) Remote (>200 km from urban centres)
Deprivation Index (Pampalon et al. 2009)	Deprivation indices were calculated using patient postal code at dissemination area level and were based on the methodology of the Pampalon Index. The material component of the index is most relevant in the Alberta context and includes three components within an area: those with no high school diploma, average income and the employment/population ratio.	Categorized into quintiles: 1 = least deprived quintile 2 3 4 5 = most deprived quintile N/A = Deprivation Index was not calculated
Clinical risk groupers (CRGs) (3M™ 2004; Carreras et al. 2013)	Patient health status and comorbidities were identified using historical demographic and healthcare utilization data. Nine health status categories were defined using a three-year roll-up (April 1, 2014–March 31, 2017) of the method 2 CRG for each patient.	The nine categories of CRG were grouped into six based on methodology used by Carreras et al. (2013): Healthy/healthcare non-users Significant acute disease Minor chronic disease Significant chronic disease in one or two organ systems Significant chronic disease in three or more organ systems – catastrophic conditions Dominant and metastatic malignancies
Usual Provider Continuity (UPC) Index (Breslau and Reeb 1975; CIHI 2015)	Alberta practitioner claims data were used to identify individuals who had at least three visits to a primary care provider or primary care clinic from April 1, 2014 to March 31, 2017. The index was used as a proxy for relational continuity between the patient and the physician. Visits by the same patient on the same day with the same physician were considered a single visit.	The UPC Index score ranges from 0 (all visits to different providers/clinic) to 1 (all visits to same provider/clinic) and is categorized as follows: Low (0.0 to <0.39) Moderate (0.40 to <0.79) High (0.80 to 1.00)
ED visits	ED visits from April 1, 2017, to March 31, 2018, were identified using the National Ambulatory Care Reporting System (NACRS), and those identified as scheduled visits were excluded	A binary variable was created for this outcome: 0 = no ED visit 1 = at least one ED visit
In-patient hospitalizations (urgent/unplanned)	Hospitalizations from April 1, 2017 to March 31, 2018 were identified using the Discharge Abstract Database (DAD), and scheduled hospitalizations were excluded	A binary variable was created for this outcome: 0 = no hospitalization 1 = at least one hospitalization

ACHIP = Alberta Health Care Insurance Plan; ED = emergency department.