

## Data Impact Challenge

Challenge Question: **Does prompt access to a discharge summary (within 2-4 days) by primary care providers reduce the rate of readmissions and/or emergency department (ED) visits?**

Team: Ottawa Hospital Performance Measurement

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### DATA

**Data custodian:** The Ottawa Hospital (TOH)

**Data sources:** The data were extracted from The Ottawa Hospital Data Warehouse (TOHDW). The Ottawa Hospital is a 1,117-bed tertiary-care teaching hospital in Ottawa, Ontario with five campuses. TOHDW pulls together information from many different operational databases into a single repository with a clearly defined structure.

**List of Datasets:** Discharge Abstract Database (DAD)

**Data Quality:** The TOHDW contains high quality data. TOHDW incorporates administrative, clinical, and patient information from various source systems, thus capturing **complete** information for each hospital encounter. The diagnostic and procedural coding is **consistent** with international classifications. The datasets have a normalized data structure, with **standard** naming conventions and formats across systems. Each record is **time-stamped** and updated on a nightly basis. The data is highly **accurate** and has been used extensively to support decision-making, report to the Ministry of Health, and in several high-impact research publications.

**Inclusions:** Acute inpatient discharges from The Ottawa Hospital

**Exclusions:**

- Encounters ending in death, transfers to continuing care or transfer to another acute care institution
- Encounters within the obstetrics, gynecology, and newborn care and ophthalmology departments.

**Nature of cohort:**

**Size of cohort:** 10,636 discharges

**Data timeframe:** October 15 2014 – March 15 2015

**Representativeness:** TOH is one of the largest academic health sciences centres in Canada and serves a population of 1.2 million residents. The hospital and its associated institutes provide a number of acute care services, including cardiovascular, surgical and trauma programs. The hospital is the main referral centre for those requiring complex care in the region, and therefore the patient population is representative of other tertiary care centres.

### ANALYSIS

Communication and collaboration between the different parties of the health care system are critical elements for patient outcomes and an efficient health care system. In order to evaluate this key component between the primary care provider and the acute care environment, we evaluate the relationship between unplanned hospital readmissions and prompt delivery of the hospital discharge summary to the primary care provider.

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**Crude rates:** We compare the crude rates of readmission for discharges with a prompt delivery of the hospital discharge summary to the primary care provider, to discharges without a prompt delivery of the discharge summary using the two-tailed 2 proportion z-test.

Since there are many factors that impact the readmission rate, crude proportion comparison should not be the basis of the final results and conclusion. Therefore: two additional quantitative methods are used to capture the effects of other covariates in the form of: (1) a logistic regression model and (2) a propensity score matched cohort study.

**Adjusted rates:** A multivariable analysis using a logistic regression is performed to determine the independent effects of multiple factors, including the prompt delivery of the hospital discharge summary to the primary care provider on readmission. The dependent variable of the model is readmission (binary) and independent variables are as follows:

*Categorical variables:* Prompt access to discharge summary (defined as hospital discharge summary received by the primary care provider  $\leq$  3 days), Gender, Admission category (Elective vs Emergency), Marital Status (Married vs Single), Admission type (Surgical vs Medical vs Other)

*Numerical variables:* Age, Acute Length of Stay, Number of previous ED visits, Number of previous inpatient admissions, Resource intensive weight (RIW), LACE score (which predicts the probability of readmission or death within 30 days).

**Propensity score matched cohort:** A logistic regression model is used to calculate the probability of prompt delivery of discharge summary also known as the propensity score. Two comparable groups are then created using the caliper matching technique. A caliper of 0.029, representing 0.2 of the pooled standard deviation of the logit of the propensity score, is used in this matching process. In addition, the propensity-score matching without replacement is employed where control cases are removed from further matching after being matched to a treatment case. This method allows us to match the treatment and control groups based on a large number of factors without losing a large number of observations. Discharges with the summary received within 3 days or less with its higher number of observations was chosen as the control group

**Innovation:** The logistic regression is designed to capture the effect of multiple factors on probability of readmission. Adding the propensity score matched cohort study analysis to create two comparable groups is an innovative approach to reducing bias between the groups.

### FINDINGS

**Crude rates:** In total, 1237 unplanned readmissions were identified (out of 10,636 discharges), representing 11.63% of hospital discharges. The readmission rate for discharges with a prompt delivery of the hospital discharge summary to the primary care provider was 12.98%. The discharges without a prompt delivery of the hospital discharge summary had a readmission rate of 8.59%. Using two-tailed 2 proportion z-test, we reject the null hypothesis that sample proportions are equal with a confidence level of 99.5%.

**Table 1 – Rates of readmission**

Group	# and rate of 30 day readmission
Discharge summary received within 3 days or less	956 (12.98%)
Discharge summary received in greater than 3 days or not received	281 (8.59%)
Total, regardless of when discharge summary received	1237 (11.63%)

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**Adjusted rates:** Based on our logistic regression, the prompt access to discharge summaries is not significant, with 90% confidence level (P-value =0.13). Therefore, we conclude that this variable does not have any effect on decreasing/increasing the probability of readmission. It should be noted that our conclusion is based on the preliminary analysis and might be biased. Residual confounding could be caused by independent variables affecting readmission that were not included in the model. Further analysis is also needed to test the robustness of the model.

**Propensity score:** The propensity score matching resulted in two groups of 2895 hospital discharges (representing 90% of discharges) where (1) the discharge summary was received  $\leq 3$  days and (2) the discharge summary was received  $> 3$  days or not received at all. The first group consists of discharges with prompt delivery of the hospital discharge summary to the primary care provider. The second group consists of 2288 discharges with no discharge summary at all and 607 cases who received a discharge summary after the 3 day limit. The results of the two-tailed 2 proportion z-test indicate a p-value of 0.473 for readmission rate between the two groups.

**Conclusion:** We conclude that prompt delivery of the hospital discharge summary to the primary care provider does not have a significant impact on hospital readmission. For discharges where the primary care provider did not receive the hospital discharge summary promptly, the majority of these providers did not receive a discharge summary at all. Therefore, further analysis is required to determine the effects of prompt access to discharge summary versus access to discharge summary altogether on hospital readmission.

**Limitations:** The key limitation of these analyses is the availability of data for non-TOH readmissions (i.e. readmissions to other acute care institutions are not captured in our data source). It would also be valuable to see if the results are consistent throughout different time-periods or a longer period of time. In addition, following the propensity score matching process, there are differences between the two groups. While the LACE score between the two groups is not statistically different, there is a difference in the Charlson score and length of stay. Discharges with prompt delivery of the hospital discharge summary to the primary care provider had a significantly lower LOS and Charlson score. Another limitation of this methodology is related to the probable unmeasured characteristics of the cases which are missing in the initial logistic regression used for predicting the propensity scores.