

Improving diabetes drug adherence using accurate information delivery to patients using drug dispensing history while securing patients' identity anonymity

(Phase1) Nakamura R¹, Ishijima T¹, Igarashi A², Maeda S¹

¹CMIC Healthcare Co., Ltd., Tokyo, Japan ²The University of Tokyo, Tokyo, Japan



Introduction

- In the healthcare field, the use of patient-oriented big data has attracted attention.
- harmo™, an electronic medicine notebook system reveals its usefulness as a tool for conducting surveys on patients who were prescribed specific drugs while maintaining their anonymity (Ref2).
- It is possible to improve the adherence by applying the Customer Relationship Management technique to dropout analysis, clarifying the patient profile and taking appropriate measures for the patients.

Objective

- To create a patient profile using retention analysis methods on harmo's prescription history and survey data. The profile will identify and predict type II diabetes patients who are prone to drug non-adherence.

Method 1.

Calculates the optimal evaluation criteria for poor adherence (medication dropout)

- Target patients prescribed Type II oral diabetes medicines indicated in the diabetes guidelines were extracted (n=13,086).
- A survey web link was sent to the target patients who are harmo™ smart phone application users (n=5,084).
- The survey has 12 questions and 5 choices each which measures on a medication adherence scale (Ref1).
- Response data are aggregated into 4 medication adherence scales (n=472)(Ref1).
 - Scale1: Medication adherence
 - Scale2: Cooperation with healthcare professionals in medication
 - Scale3: Aggressiveness in obtaining and using knowledge and information about medication
 - Scale4: Medication satisfaction and quality of life
- Based on the evaluation results of the medication adherence scale and the dispensing history, the evaluation period (monthly) and non-prescription period (10 days) were varied to calculate the optimal evaluation criteria for poor adherence (medication dropout).

Method2.

Prediction of patient dropout and clarifying their profile

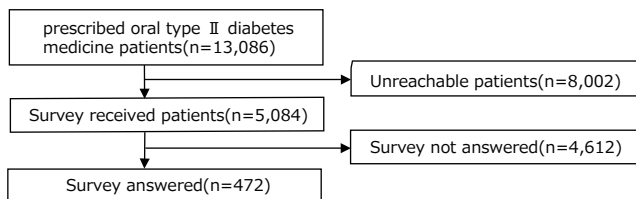
- Predicted patient dropout in decision tree using dropout data definition, 26 variables including age and gender were used as dependent variables.
- The patient profile of each segment of the decision tree was clarified from the results of survey on harmo's prescription history data and medication adherence scale.

Table1.Target population by process

- Patients who have been prescribed oral type II diabetes medication (n=13,086)
- Deliver survey → Patients who answered (n=472)
- Using A) and B) to calculate standard dropout
- Patients who can be evaluated using C) standard to predict dropouts in the decision tree (n=10,525)
- Analyze patients who completed the survey and meet criteria in D) (n=399)

Figure1. Attrition Diagram for Survey

Prescription history period : May 1, 2018 - Aug 31, 2019



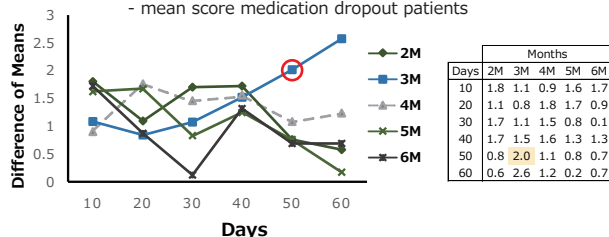
Result 1

Calculation of the optimal evaluation criteria for poor adherence (medication dropout)

- The definition of dropout patients suitable for the medication adherence scale was a dropout determination period of 3 months and a period of no dispensing history from the end of the dispensed medication period to 50 days or more. (Fig2)

Figure2. Data definition of patients on adherence scale

Difference of Means = mean score patients who continuously taking medicine - mean score medication dropout patients



Result 2.

Prediction of patients dropout and clarifying their profile

- Seg4: The dropout rate for patients with only one prescription is 28.68%, Seg3: Dropout rate for patients with 2-3 prescriptions is 16.67%, Seg2: The dropout rate for patients with more than 4 prescriptions and less than 2 drugs on average is 7.5%, Seg1: The dropout rate for patients with 4 or more prescriptions and 2 or more average drugs per dose is 4.83% (Fig3)
- The score of the medication adherence scale by segment is not statistically significant p-value, but the Seg4 score is low compared to other segments (Table2)
- Scale3 scores tend to be low in all segments (Table2)

Figure3.Decision Tree :Data definition to predict patients who will dropout of treatment in the next three months

<Data Definition>

- Drop out judgment period** : Jun 1, 2019 - Aug 31, 2019 (3 months)
- Prescription history period** : Jun 1, 2018 - May 31, 2019 (1 year)
- BASE** :From 13,086 patients who were prescribed oral type II diabetes medication during the prescription history period, 2,561 patients were excluded due to dropout before the dropout judgement period, 10,525 patients remained.
- Drop out judgement** : On the 50th day of the period when there is no dispensing history from the end date of the dispensed medication period is in the dropout judgment period.
- Prediction** : Predict what kind of patients will dropout using drug dispensing history behavior and patients' attributes.

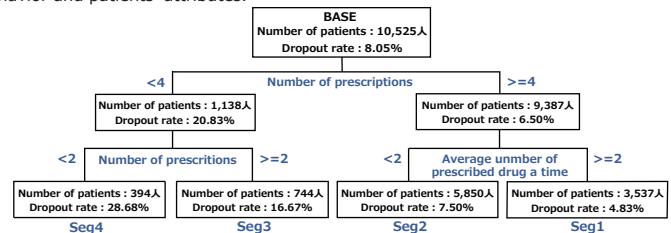


Table2. Survey result analysis :Score of medication adherence scale by segment

	N	Mean	SD	Overall Adherence Score		p-value
				Lclm	Uclm	
Overall	399	47.2	6.2	46.6	47.9	
Age group						
<=39	14	45.3	9.0	40.1	50.5	0.191
40-49	58	46.7	6.6	44.9	48.4	
50-59	116	47.3	5.9	46.2	48.4	
60-69	126	46.9	5.8	45.9	47.9	
70-79	69	48.0	6.2	46.5	49.5	
80<=	16	50.2	6.8	46.6	53.8	
Gender						
Male	291	46.9	6.2	46.2	47.6	0.018
Female	108	48.3	6.3	47.1	49.4	
Total (60)						
Seg1	131	47.1	5.9	46.1	48.2	0.3406
Seg2	215	47.5	6.6	46.6	48.4	
Seg3	37	47.1	4.9	45.5	48.8	
Seg4	16	45.3	7.0	41.6	49.0	
Scale1 (15)						
Seg1	131	14.2	1.4	14.0	14.5	0.6877
Seg2	215	14.3	1.4	14.1	14.5	
Seg3	37	14.3	1.2	13.9	14.7	
Seg4	16	13.8	2.6	12.4	15.1	
Scale2 (15)						
Seg1	131	11.0	2.9	10.6	11.5	0.5534
Seg2	215	11.0	2.8	10.7	11.4	
Seg3	37	11.3	2.2	10.6	12.0	
Seg4	16	10.6	2.6	9.2	12.0	
Scale3 (15)						
Seg1	131	9.8	2.9	9.3	10.3	0.3774
Seg2	215	10.0	2.8	9.6	10.4	
Seg3	37	9.9	2.4	9.1	10.7	
Seg4	16	9.4	3.1	7.7	11.0	
Scale4 (15)						
Seg1	131	12.0	1.8	11.7	12.3	0.3443
Seg2	215	12.1	1.9	11.9	12.4	
Seg3	37	11.6	1.9	11.0	12.3	
Seg4	16	11.6	2.2	10.4	12.7	

Discussion & Conclusions

- Based on the patient profile derived from the features of 4 segments, Scale3, age and gender, medication adherence can be improved by giving suitable medication guidance to patients.
- By combining the prescription data analysis and survey results, we can create a patient profile and identify the reasons for dropout. A hypothesis on various interventions can be made and implemented.
- In Pilot study (Phase2), we will take measures based on these results and verify the results.

References

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