Predicting readmission probability for diabetes inpatients

Modern Data Mining

Contents

Diabetes Project Executive Summary

Background

Diabetes is a chronic medical condition affecting millions of Americans, but if managed well, with good diet, exercise and medication, patients can lead relatively normal lives. However, if improperly managed, diabetes can lead to patients being continuously admitted and readmitted to hospitals. Readmissions are especially serious - they represent a failure of the health system to provide adequate support to the patient and are extremely costly to the system. As a result, the Centers for Medicare and Medicaid Services announced in 2012 that they would no longer reimburse hospitals for services rendered if a patient was readmitted with complications within 30 days of discharge.

Given these policy changes, being able to identify and predict those patients most at risk for costly readmission has become a pressing priority for hospital administrators.

Data Summary

The dataset analyzed in this study contains data from 130 US hospitals, collected over the years 1999-2008 (10 years) pertaining to patients with diabetes. The data includes each patient that was admitted to a hospital with some kind of diabetes. The length of stay of patients was at least 1 day and at most 14. The data contains any tests performed and medications administered. Attributes recorded are: patient number, race, age, gender, admission type, time, medical specialty of admitting physician, number of labs performed, HbA1c test result, diagnosis, number of medications, diabetic medications, number of outpatient, inpatient, and emergency visits in the year before the hospitalization.

Methods and Main Findings

For classification, MCE was used. We estimate that **it costs twice as much** to mislabel a readmission than it does to mislabel a non-readmission, so the loss function is:

$a_{1,0} = L(Y = 1, \hat{Y} = 0),$ the loss of a false negative:not readmitting the patient when the patient should have been readmitte

$a_{0,1} = L(Y = 0, \hat{Y} = 1),$ the loss of a false positive:readmitting the patient when the patient should not have been readmitte

Using weighted misclassification error using the Bayes Rule, the classifier was

$$\hat{Y} = 1 \text{ if P(Y = 1 | X)} > \frac{0.5}{1 + 0.5} = 0.33$$
$$\hat{Y} = 0 \text{ otherwise}$$

and misclassified 22.37% of samples across all classes.

We then trained, tested, and validated data to check accuracy of final model, where the variables we included were: encounter_id, number_emergency, number_inpatient, number_diagnoses, insulin, diabetesMed, disch_disp_modified, age_mod, diag1_mod, diag2_mod, diag3_mod. The conclusion was that our model was better because of the larger testing AUC score of 0.6574.

Issues and concerns

1. Logistic regressions can only consider a limited set of factors that are including in the model. It is highly likely that there are other factors that are not recorded that influence readmissions greatly.

2. Lack of causality: logistic regression is able to identify associations between predictors and outcomes but we cannot establish causality/ dsay that any particular factor directly causes readmissions.

3. It is entirely possible that are findings are not generalizable because the data may not be representative of all hospitals/care centers.

4. Logistic regression models are prone to overfitting, and so our model may fit the noise in the data rather than give truly accurate predictions.

Detailed Workflow and Analysis

Goal of the study

In this project, we shall explore how to use the techniques we have learned in order to help better manage diabetes patients who have been admitted to a hospital. Our goal is to avoid patients being readmitted within 30 days of discharge, which reduces costs for the hospital and improves outcomes for patients. If we could identify important factors relating to the chance of a patient being readmitted within 30 days of discharge, effective intervention could be done to reduce the chance of being readmitted. Also if we could predict one's chance being readmitted well, actions can be taken.

The data

The original data is from the Center for Clinical and Translational Research at Virginia Commonwealth University. It covers data on diabetes patients across 130 U.S. hospitals from 1999 to 2008. There are over 100,000 unique hospital admissions in this dataset, from ~70,000 unique patients. The data includes demographic elements, such as age, gender, and race, as well as clinical attributes such as tests conducted, emergency/inpatient visits, etc. Refer to the original documentation for more details on the dataset. Three former students Spencer Luster, Matthew Lesser and Mridul Ganesh, brought this data set into the class and did a wonderful final project. We will use a subset processed by the group but with a somewhat different objective. Detailed information on diabetic.data.csv and readmission.csv in appendix.

Data needed (see detailed information in appendix below):

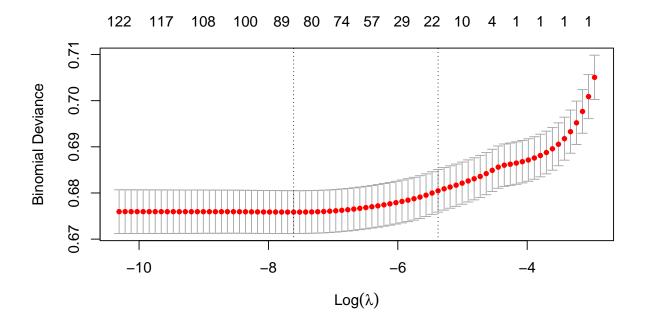- **diabetic.data.csv**
- **readmission.csv**
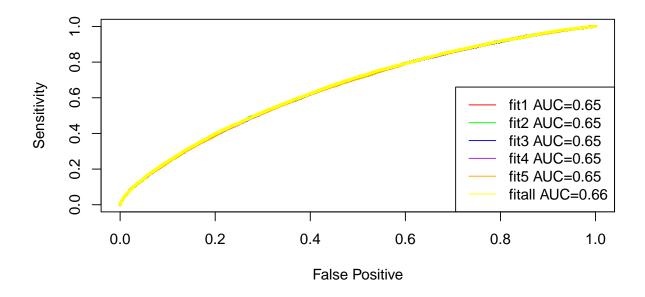
Research approach

Analyses

1) In this section we identify important factors that capture the chance of a readmission within 30 days.

Here we fit our first logistic model on all the available features and run ANOVA to see the importance of features (in appendix).

We then use LASSO for regularization/model selection to narrow down what features we consider for the final logistic regression model.

Here we fit a model based on the features deemed important after LASSO. From here, we do backwards selection and sequentially remove 4 features: time_in_hospital, A1Cresult, num_medications, metformin. We then plot the AUC curves to assess each model (fitall is the model with all features, fit.logit.1 is the model right after LASSO, 2 is removal of time_in_hospital, 3 is removal of A1Cresult, etc.). (ANOVAs in appendix)

2) For the purpose of classification, we propose a model that can be used to predict whether a patient will be a readmit within 30 days. We justify this choice using a decision criterion to choose among our

candidate models.

For the purpose of classification we decided to use a LASSO followed by multiple logistic regression. The AUC, which is a metric used to evaluate binary classification models, output very similar scores across the four models that varied in the combination of factors (0.66/0.65). Our final model is thus the most parsimonious one, where we include the following 11 factors, as they have very significant p-values after testing models with ANOVA:

encounter_id, number_emergency, number_inpatient, number_diagnoses, insulin, diabetesMed, disch_disp_modified, age_mod, diag1_mod, diag2_mod, diag3_mod

3) Based on a quick and somewhat arbitrary guess, we estimate **it costs twice as much** to mislabel a readmission than it does to mislabel a non-readmission. Based on this risk ratio, we propose a specific classification rule to minimize the cost.

$$\hat{P}(Y = 1|x) = \frac{0.5}{1 + 0.5}$$
$$= 0.3333$$
$$(\hat{<30}) = 1 \text{ if } logit > log(\frac{0.3333}{0.6667}) = -0.3011$$

Optimal rule:

$$\hat{Y} = 1 \text{ if P(Y = 1 | X) } > \frac{0.5}{1 + 0.5} = 0.33$$

Weighted MCE of the classifier is 0.2237, meaning the classifier, on average, misclassifies 22.37% of all samples actoss the classes

4) We then split the data first to Training/Testing/Validation data before doing the following:

- Use training/testing data to land a final model

- Evaluate the final model with the validation data to give an honest assessment of your final model.
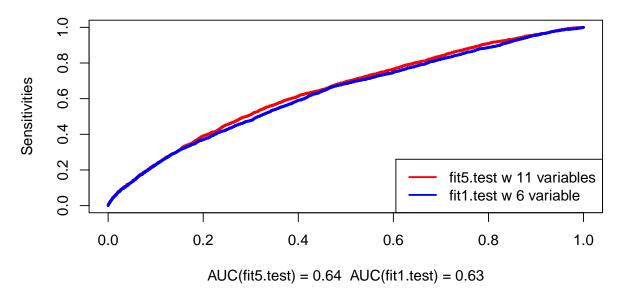
Fit 2 models using the data:

Getting fitted probabilities using test data:

```
##       fit1.fitted.test fit5.fitted.test
## 92377       0.06903495       0.05904428
## 64590       0.09757723       0.10112821
## 85089       0.15483081       0.20971065
## 49835       0.07338051       0.03861896
## 47433       0.12109902       0.08627007
## 15529       0.13846769       0.16749599
## 48478       0.09773090       0.10492421
## 15086       0.13060007       0.15375818
## 47385       0.09852159       0.10383492
## 43028       0.10173348       0.08204632
```

The probabilities in each row is different based on the fitted model. We will use the testing data to compare performances:

Comparison of two models using testing data

AUC(fit5.test) = 0.64 AUC(fit1.test) = 0.63

```
## [1] 41
```

We choose fit5 because it has a larger area under AUC. Reporting honest AUC for fit5:

```
## Setting levels: control = 0, case = 1
```

```
## Setting direction: controls < cases
```

```
## Area under the curve: 0.6574
```

$AUC(\text{test data}) = 0.6574 > AUC(\text{validation data}) = 0.644$

Conclusion

After model selection and multiple logistic regressions followed by classification, we were able to pinpoint specific features of the dataset that were highly associated with readmission. In the end, we settled on a model with the following 11 features taken into account for prediction: encounter_id, number_emergency, number_inpatient, number_diagnoses, insulin, diabetesMed, disch_disp_modified, age_mod, diag1_mod, diag2_mod, diag3_mod.

Using weighted misclassification error using the Bayes Rule, the classifier was

$$\hat{Y} = 1 \text{ if P}(Y = 1 \mid X) > \frac{0.5}{1 + 0.5} = 0.33$$
$$\hat{Y} = 0 \text{ otherwise}$$

and misclassified 22.37% of samples across all classes.

We then trained, tested, and validated data to check accuracy of final model, where the variables we included were: encounter_id, number_emergency, number_inpatient, number_diagnoses, insulin, diabetesMed, disch_disp_modified, age_mod, diag1_mod, diag2_mod, diag3_mod. The conclusion was that our model was better because of the larger testing AUC score of 0.6574.

In particular, we see factors like insulin prescriptions, diabetes medications, older ages, and emergency visits as some of the features of the dataset that were strongly associated with readmissions. As for final recommendations, we ask that hospitals administrators pay especial attention to patients admitted that may identify with some of these categories, as they may be at higher risk for readmission and thus lead to a lack of hospital reimbursements. We say this not to discourage hospitals from treating such patients, but to acknowledge that these patients may require more specialized or attentive care so that hospital readmission rates can decrease in the future.

Appendix

Characteristics of the Data Set

All observations have five things in common:

1. They are all hospital admissions
2. Each patient had some form of diabetes
3. The patient stayed for between 1 and 14 days.
4. The patient had laboratory tests performed on him/her.
5. The patient was given some form of medication during the visit.

The data was collected during a ten-year period from 1999 to 2008. There are over 100,000 unique hospital admissions in the data set, with ~70,000 unique patients.

Description of variables

The dataset used covers ~50 different variables to describe every hospital diabetes admission. In this section we give an overview and brief description of the variables in this dataset.

1) Patient identifiers:

a. `encounter_id`: unique identifier for each admission
b. `patient_nbr`: unique identifier for each patient

2) Patient Demographics:

`race`, `age`, `gender`, `weight` cover the basic demographic information associated with each patient. `Payer_code` is an additional variable that identifies which health insurance (Medicare /Medicaid / Commercial) the patient holds.

3) Admission and discharge details:

a. `admission_source_id` and `admission_type_id` identify who referred the patient to the hospital (e.g. physician vs. emergency dept.) and what type of admission this was (Emergency vs. Elective vs. Urgent).
b. `discharge_disposition_id` indicates where the patient was discharged to after treatment.

4) Patient Medical History:

a. `num_outpatient`: number of outpatient visits by the patient in the year prior to the current encounter
b. `num_inpatient`: number of inpatient visits by the patient in the year prior to the current encounter
c. `num_emergency`: number of emergency visits by the patient in the year prior to the current encounter

5) Patient admission details:

a. `medical_specialty`: the specialty of the physician admitting the patient
b. `diag_1`, `diag_2`, `diag_3`: ICD9 codes for the primary, secondary and tertiary diagnoses of the patient. ICD9 are the universal codes that all physicians use to record diagnoses. There are various easy to use tools to lock up what individual codes mean (Wikipedia is pretty decent on its own)
c. `time_in_hospital`: the patient's length of stay in the hospital (in days)
d. `number_diagnoses`: Total no. of diagnosis entered for the patient

e. `num_lab_procedures`: No. of lab procedures performed in the current encounter
f. `num_procedures`: No. of non-lab procedures performed in the current encounter
g. `num_medications`: No. of distinct medications prescribed in the current encounter

6) Clinical Results:

a. `max_glu_serum`: indicates results of the glucose serum test
b. `A1Cresult`: indicates results of the A1c test

7) Medication Details:

a. `diabetesMed`: indicates if any diabetes medication was prescribed
b. `change`: indicates if there was a change in diabetes medication
c. `24 medication variables`: indicate whether the dosage of the medicines was changed in any manner during the encounter

8) Readmission indicator:

Indicates whether a patient was readmitted after a particular admission. There are 3 levels for this variable: "NO" = no readmission, "< 30" = readmission within 30 days and "> 30" = readmission after more than 30 days. The 30 day distinction is of practical importance to hospitals because federal regulations penalize hospitals for an excessive proportion of such readmissions.

To save your time we are going to use some data sets cleaned by the group. Thus, we provide two datasets:

diabetic.data.csv is the original data. You may use it for the purpose of summary if you wish. You will see that the original data can't be used directly for your analysis, yet.

readmission.csv is a cleaned version and they are modified in the following ways:

1) `Payer code`, `weight` and `Medical Specialty` are not included since they have a large number of missing values.

2) Variables such as `acetohexamide`, `glimepiride.pioglitazone`, `metformin.rosiglitazone`, `metformin.pioglitazone` have little variability, and are as such excluded. This also includes the following variables: `chlorpropamide`, `acetohexamide`, `tolbutamide`, `acarbose`, `miglitor`, `troglitazone`, `tolazamide`, `examide`, `citoglipton`, `glyburide.metformin`, `glipizide.metformin`, and `glimepiride.pioglitazone`.

3) Some categorical variables have been regrouped. For example, `Diag1_mod` keeps some original levels with large number of patients and aggregates other patients as `others`. This process is known as 'binning.'

4) The event of interest is **readmitted within < 30 days**. Note that you need to create this response first by regrouping **Readmission indicator**!

The following is a list of outputs from commands used for EDA over the course of the study.

Summary of diabetic_data, readmission_data, and then summary of models (in order: fitall, fit1, fit2, fit3, fit4, fit5, fit1train, fit5train, glm_fit2)

```
## 'data.frame':    101766 obs. of  50 variables:
##  $ encounter_id          : int  2278392 149190 64410 500364 16680 35754 55842 63768 12522 15738 ..
##  $ patient_nbr           : int  8222157 55629189 86047875 82442376 42519267 82637451 84259809 11488
##  $ race                  : chr  "Caucasian" "Caucasian" "AfricanAmerican" "Caucasian" ...
##  $ gender                : chr  "Female" "Female" "Female" "Male" ...
```

```
##  $ age                     : chr  "[0-10)" "[10-20)" "[20-30)" "[30-40)" ...
##  $ weight                  : chr  NA NA NA NA ...
##  $ admission_type_id       : int  6 1 1 1 1 2 3 1 2 3 ...
##  $ discharge_disposition_id: int  25 1 1 1 1 1 1 1 1 3 ...
##  $ admission_source_id     : int  1 7 7 7 7 2 2 7 4 4 ...
##  $ time_in_hospital        : int  1 3 2 2 1 3 4 5 13 12 ...
##  $ payer_code              : chr  NA NA NA NA ...
##  $ medical_specialty       : chr  "Pediatrics-Endocrinology" NA NA NA ...
##  $ num_lab_procedures      : int  41 59 11 44 51 31 70 73 68 33 ...
##  $ num_procedures          : int  0 0 5 1 0 6 1 0 2 3 ...
##  $ num_medications         : int  1 18 13 16 8 16 21 12 28 18 ...
##  $ number_outpatient       : int  0 0 2 0 0 0 0 0 0 0 ...
##  $ number_emergency        : int  0 0 0 0 0 0 0 0 0 0 ...
##  $ number_inpatient        : int  0 0 1 0 0 0 0 0 0 0 ...
##  $ diag_1                  : chr  "250.83" "276" "648" "8" ...
##  $ diag_2                  : chr  NA "250.01" "250" "250.43" ...
##  $ diag_3                  : chr  NA "255" "V27" "403" ...
##  $ number_diagnoses        : int  1 9 6 7 5 9 7 8 8 8 ...
##  $ max_glu_serum           : chr  "None" "None" "None" "None" ...
##  $ A1Cresult               : chr  "None" "None" "None" "None" ...
##  $ metformin               : chr  "No" "No" "No" "No" ...
##  $ repaglinide             : chr  "No" "No" "No" "No" ...
##  $ nateglinide             : chr  "No" "No" "No" "No" ...
##  $ chlorpropamide          : chr  "No" "No" "No" "No" ...
##  $ glimepiride             : chr  "No" "No" "No" "No" ...
##  $ acetohexamide           : chr  "No" "No" "No" "No" ...
##  $ glipizide               : chr  "No" "No" "Steady" "No" ...
##  $ glyburide               : chr  "No" "No" "No" "No" ...
##  $ tolbutamide             : chr  "No" "No" "No" "No" ...
##  $ pioglitazone            : chr  "No" "No" "No" "No" ...
##  $ rosiglitazone           : chr  "No" "No" "No" "No" ...
##  $ acarbose                : chr  "No" "No" "No" "No" ...
##  $ miglitol                : chr  "No" "No" "No" "No" ...
##  $ troglitazone            : chr  "No" "No" "No" "No" ...
##  $ tolazamide              : chr  "No" "No" "No" "No" ...
##  $ examide                 : chr  "No" "No" "No" "No" ...
##  $ citoglipton             : chr  "No" "No" "No" "No" ...
##  $ insulin                 : chr  "No" "Up" "No" "Up" ...
##  $ glyburide.metformin     : chr  "No" "No" "No" "No" ...
##  $ glipizide.metformin     : chr  "No" "No" "No" "No" ...
##  $ glimepiride.pioglitazone: chr  "No" "No" "No" "No" ...
##  $ metformin.rosiglitazone : chr  "No" "No" "No" "No" ...
##  $ metformin.pioglitazone  : chr  "No" "No" "No" "No" ...
##  $ change                  : chr  "No" "Ch" "No" "Ch" ...
##  $ diabetesMed             : chr  "No" "Yes" "Yes" "Yes" ...
##  $ readmitted              : chr  "NO" ">30" "NO" "NO" ...


##  [1] "encounter_id"          "patient_nbr"
##  [3] "race"                  "gender"
##  [5] "age"                   "weight"
##  [7] "admission_type_id"     "discharge_disposition_id"
##  [9] "admission_source_id"   "time_in_hospital"
## [11] "payer_code"            "medical_specialty"
## [13] "num_lab_procedures"    "num_procedures"
```

```
## [15] "num_medications"           "number_outpatient"
## [17] "number_emergency"          "number_inpatient"
## [19] "diag_1"                     "diag_2"
## [21] "diag_3"                     "number_diagnoses"
## [23] "max_glu_serum"              "A1Cresult"
## [25] "metformin"                  "repaglinide"
## [27] "nateglinide"                "chlorpropamide"
## [29] "glimepiride"                "acetohexamide"
## [31] "glipizide"                  "glyburide"
## [33] "tolbutamide"                "pioglitazone"
## [35] "rosiglitazone"              "acarbose"
## [37] "miglitol"                   "troglitazone"
## [39] "tolazamide"                 "examide"
## [41] "citoglipton"                "insulin"
## [43] "glyburide.metformin"        "glipizide.metformin"
## [45] "glimepiride.pioglitazone"   "metformin.rosiglitazone"
## [47] "metformin.pioglitazone"     "change"
## [49] "diabetesMed"                "readmitted"


##   encounter_id patient_nbr            race gender    age weight
## 1      2278392     8222157       Caucasian Female  [0-10)   <NA>
## 2       149190    55629189       Caucasian Female [10-20)   <NA>
## 3        64410    86047875 AfricanAmerican Female [20-30)   <NA>
## 4       500364    82442376       Caucasian   Male [30-40)   <NA>
## 5        16680    42519267       Caucasian   Male [40-50)   <NA>
## 6        35754    82637451       Caucasian   Male [50-60)   <NA>
##   admission_type_id discharge_disposition_id admission_source_id
## 1                 6                       25                   1
## 2                 1                        1                   7
## 3                 1                        1                   7
## 4                 1                        1                   7
## 5                 1                        1                   7
## 6                 2                        1                   2
##   time_in_hospital payer_code      medical_specialty num_lab_procedures
## 1                1       <NA> Pediatrics-Endocrinology                 41
## 2                3       <NA>                   <NA>                 59
## 3                2       <NA>                   <NA>                 11
## 4                2       <NA>                   <NA>                 44
## 5                1       <NA>                   <NA>                 51
## 6                3       <NA>                   <NA>                 31
##   num_procedures num_medications number_outpatient number_emergency
## 1              0               1                 0                0
## 2              0              18                 0                0
## 3              5              13                 2                0
## 4              1              16                 0                0
## 5              0               8                 0                0
## 6              6              16                 0                0
##   number_inpatient diag_1 diag_2 diag_3 number_diagnoses max_glu_serum
## 1                0 250.83   <NA>   <NA>                1          None
## 2                0    276 250.01    255                9          None
## 3                1    648    250    V27                6          None
## 4                0      8 250.43    403                7          None
## 5                0    197    157    250                5          None
## 6                0    414    411    250                9          None
```

```
##    A1Cresult metformin repaglinide nateglinide chlorpropamide glimepiride
## 1      None        No         No          No             No          No
## 2      None        No         No          No             No          No
## 3      None        No         No          No             No          No
## 4      None        No         No          No             No          No
## 5      None        No         No          No             No          No
## 6      None        No         No          No             No          No
##   acetohexamide glipizide glyburide tolbutamide pioglitazone rosiglitazone
## 1            No        No        No          No           No            No
## 2            No        No        No          No           No            No
## 3            No    Steady        No          No           No            No
## 4            No        No        No          No           No            No
## 5            No    Steady        No          No           No            No
## 6            No        No        No          No           No            No
##   acarbose miglitol troglitazone tolazamide examide citoglipton insulin
## 1       No       No           No         No      No          No      No
## 2       No       No           No         No      No          No      Up
## 3       No       No           No         No      No          No      No
## 4       No       No           No         No      No          No      Up
## 5       No       No           No         No      No          No  Steady
## 6       No       No           No         No      No          No  Steady
##   glyburide.metformin glipizide.metformin glimepiride.pioglitazone
## 1                  No                  No                       No
## 2                  No                  No                       No
## 3                  No                  No                       No
## 4                  No                  No                       No
## 5                  No                  No                       No
## 6                  No                  No                       No
##   metformin.rosiglitazone metformin.pioglitazone change diabetesMed readmitted
## 1                      No                     No     No          No         NO
## 2                      No                     No     Ch         Yes        >30
## 3                      No                     No     No         Yes         NO
## 4                      No                     No     Ch         Yes         NO
## 5                      No                     No     Ch         Yes         NO
## 6                      No                     No     No         Yes        >30


##   encounter_id       patient_nbr          race             gender
##   Min.   :    12522  Min.   :      135  Length:98144      Length:98144
##   1st Qu.: 85328602  1st Qu.: 23502339  Class :character  Class :character
##   Median :153303417  Median : 46791675  Mode  :character  Mode  :character
##   Mean   :165826579  Mean   : 54835183
##   3rd Qu.:230458316  3rd Qu.: 87979966
##   Max.   :443867222  Max.   :189502619
##   time_in_hospital num_lab_procedures num_procedures num_medications
##   Min.   : 1.000   Min.   :  1.00     Min.   :0.00   Min.   : 1.00
##   1st Qu.: 2.000   1st Qu.: 31.00     1st Qu.:0.00   1st Qu.:11.00
##   Median : 4.000   Median : 44.00     Median :1.00   Median :15.00
##   Mean   : 4.421   Mean   : 43.15     Mean   :1.35   Mean   :16.12
##   3rd Qu.: 6.000   3rd Qu.: 57.00     3rd Qu.:2.00   3rd Qu.:20.00
##   Max.   :14.000   Max.   :132.00     Max.   :6.00   Max.   :81.00
##   number_outpatient number_emergency  number_inpatient  number_diagnoses
##   Min.   : 0.0000   Min.   : 0.0000   Min.   : 0.0000   Min.   : 3.000
##   1st Qu.: 0.0000   1st Qu.: 0.0000   1st Qu.: 0.0000   1st Qu.: 6.000
##   Median : 0.0000   Median : 0.0000   Median : 0.0000   Median : 8.000
```

```
##   Mean    : 0.3762   Mean    : 0.2024   Mean    : 0.6469   Mean    : 7.511
##   3rd Qu.: 0.0000   3rd Qu.: 0.0000   3rd Qu.: 1.0000   3rd Qu.: 9.000
##   Max.   :42.0000   Max.   :76.0000   Max.   :21.0000   Max.   :16.000
##   max_glu_serum       A1Cresult          metformin         glimepiride
##   Length:98144       Length:98144       Length:98144       Length:98144
##   Class :character   Class :character   Class :character   Class :character
##   Mode  :character   Mode  :character   Mode  :character   Mode  :character
##
##
##
##    glipizide          glyburide         pioglitazone        rosiglitazone
##   Length:98144       Length:98144       Length:98144       Length:98144
##   Class :character   Class :character   Class :character   Class :character
##   Mode  :character   Mode  :character   Mode  :character   Mode  :character
##
##
##
##     insulin            change           diabetesMed       disch_disp_modified
##   Length:98144       Length:98144       Length:98144       Length:98144
##   Class :character   Class :character   Class :character   Class :character
##   Mode  :character   Mode  :character   Mode  :character   Mode  :character
##
##
##
##   adm_src_mod        adm_typ_mod         age_mod            diag1_mod
##   Length:98144       Length:98144       Length:98144       Length:98144
##   Class :character   Class :character   Class :character   Class :character
##   Mode  :character   Mode  :character   Mode  :character   Mode  :character
##
##
##
##    diag2_mod          diag3_mod         readmitted
##   Length:98144       Length:98144       <30:11082
##   Class :character   Class :character   >30:34681
##   Mode  :character   Mode  :character   NO :52381
##
##
##


##   encounter_id patient_nbr             race gender time_in_hospital
## 1        12522    48330783        Caucasian Female               13
## 2        15738    63555939        Caucasian Female               12
## 3        16680    42519267        Caucasian   Male                1
## 4        28236    89869032 AfricanAmerican Female                9
## 5        35754    82637451        Caucasian   Male                3
## 6        36900    77391171 AfricanAmerican   Male                7
##   num_lab_procedures num_procedures num_medications number_outpatient
## 1                 68              2              28                 0
## 2                 33              3              18                 0
## 3                 51              0               8                 0
## 4                 47              2              17                 0
## 5                 31              6              16                 0
## 6                 62              0              11                 0
##   number_emergency number_inpatient number_diagnoses max_glu_serum A1Cresult
```

```
## 1               0               0       8           None       None
## 2               0               0       8           None       None
## 3               0               0       5           None       None
## 4               0               0       9           None       None
## 5               0               0       9           None       None
## 6               0               0       7           None       None
##   metformin glimepiride glipizide glyburide pioglitazone rosiglitazone insulin
## 1       No          No    Steady        No           No            No  Steady
## 2       No          No        No        No           No        Steady  Steady
## 3       No          No    Steady        No           No            No  Steady
## 4       No          No        No        No           No            No  Steady
## 5       No          No        No        No           No            No  Steady
## 6       No          No        No        Up           No            No  Steady
##   change diabetesMed          disch_disp_modified      adm_src_mod adm_typ_mod
## 1     Ch         Yes            Discharged to home            Other     Urgent
## 2     Ch         Yes Discharged/Transferred to SNF            Other   Elective
## 3     Ch         Yes            Discharged to home Emergency Room   Emergency
## 4     No         Yes            Discharged to home Emergency Room   Emergency
## 5     No         Yes            Discharged to home            Other     Urgent
## 6     Ch         Yes            Discharged to home            Other     Urgent
##   age_mod diag1_mod diag2_mod diag3_mod readmitted
## 1     80+     Other       427     Other         NO
## 2     80+       434     Other     Other         NO
## 3   20-59     Other     Other       250         NO
## 4   20-59     Other       403     Other        >30
## 5   20-59       414       411       250        >30
## 6   60-79     Other     Other     Other        <30


##
## Call:
## glm(formula = `<30` ~ ., family = binomial(logit), data = encoded_data)
##
## Deviance Residuals:
##     Min       1Q   Median       3Q      Max
## -2.4107  -0.5096  -0.4332  -0.3668   2.6807
##
## Coefficients:
##                                                         Estimate
## (Intercept)                                            -3.120e+00
## encounter_id                                           -1.059e-09
## patient_nbr                                             1.528e-09
## raceAsian                                               2.909e-02
## raceCaucasian                                           1.614e-02
## raceHispanic                                            1.076e-02
## raceOther                                              -9.731e-02
## genderMale                                              2.381e-02
## genderUnknown/Invalid                                  -5.974e+00
## time_in_hospital                                        9.772e-04
## num_lab_procedures                                      3.138e-05
## num_procedures                                         -2.176e-02
## num_medications                                         6.539e-03
## number_outpatient                                      -3.905e-03
## number_emergency                                        4.181e-02
## number_inpatient                                        2.475e-01
```

```
## number_diagnoses                                                    2.455e-02
## max_glu_serum>300                                                   -2.349e-02
## max_glu_serumNone                                                   -1.779e-01
## max_glu_serumNorm                                                   -2.263e-02
## A1Cresult>8                                                         -5.319e-03
## A1CresultNone                                                        9.242e-02
## A1CresultNorm                                                        4.983e-03
## metforminNo                                                         -1.763e-01
## metforminSteady                                                     -2.537e-01
## metforminUp                                                         -3.998e-01
## glimepirideNo                                                       -1.309e-01
## glimepirideSteady                                                   -2.451e-01
## glimepirideUp                                                       -1.393e-01
## glipizideNo                                                         -3.187e-01
## glipizideSteady                                                     -2.974e-01
## glipizideUp                                                         -1.369e-01
## glyburideNo                                                          2.199e-01
## glyburideSteady                                                      2.067e-01
## glyburideUp                                                          1.962e-01
## pioglitazoneNo                                                      -2.218e-01
## pioglitazoneSteady                                                  -2.667e-01
## pioglitazoneUp                                                      -1.697e-01
## rosiglitazoneNo                                                      7.028e-01
## rosiglitazoneSteady                                                  6.342e-01
## rosiglitazoneUp                                                      5.536e-01
## insulinNo                                                           -1.291e-01
## insulinSteady                                                       -1.475e-01
## insulinUp                                                           -6.379e-02
## changeNo                                                             2.540e-02
## diabetesMedYes                                                       2.129e-01
## disch_disp_modifiedDischarged to home with Home Health Service       1.850e-01
## disch_disp_modifiedDischarged/Transferred to SNF                     3.608e-01
## disch_disp_modifiedOther                                             3.834e-01
## adm_src_modOther                                                    -1.003e-01
## adm_src_modPhysician Referral                                        4.421e-02
## adm_src_modTransfer from Home Health                                -2.042e-01
## adm_typ_modEmergency                                                 5.994e-02
## adm_typ_modOther                                                    -3.982e-02
## adm_typ_modUrgent                                                    3.064e-02
## age_mod20-59                                                         5.057e-01
## age_mod60-79                                                         6.272e-01
## age_mod80+                                                           6.020e-01
## diag1_mod250.8                                                      -5.278e-01
## diag1_mod276                                                        -2.336e-01
## diag1_mod38                                                         -5.482e-01
## diag1_mod410                                                        -3.243e-01
## diag1_mod414                                                        -3.423e-01
## diag1_mod427                                                        -4.644e-01
## diag1_mod428                                                        -2.306e-01
## diag1_mod434                                                         7.466e-02
## diag1_mod435                                                        -6.132e-01
## diag1_mod486                                                        -7.030e-01
## diag1_mod491                                                        -3.474e-01
## diag1_mod493                                                        -4.860e-01
```

```
## diag1_mod518                                     -7.630e-01
## diag1_mod577                                     -1.722e-01
## diag1_mod584                                     -3.359e-01
## diag1_mod599                                     -5.525e-01
## diag1_mod682                                     -6.173e-01
## diag1_mod715                                     -2.998e-01
## diag1_mod780                                     -5.139e-01
## diag1_mod786                                     -5.905e-01
## diag1_mod820                                     -7.014e-02
## diag1_mod996                                     -3.395e-01
## diag1_modOther                                   -3.367e-01
## diag2_mod250.01                                   3.184e-01
## diag2_mod250.02                                   1.361e-01
## diag2_mod276                                      1.505e-01
## diag2_mod285                                     -1.289e-01
## diag2_mod401                                     -8.767e-02
## diag2_mod403                                      1.862e-01
## diag2_mod411                                      7.907e-02
## diag2_mod413                                     -7.564e-02
## diag2_mod414                                      1.275e-02
## diag2_mod424                                      5.854e-02
## diag2_mod425                                      1.424e-01
## diag2_mod427                                      6.521e-02
## diag2_mod428                                      1.469e-01
## diag2_mod486                                     -8.095e-02
## diag2_mod491                                      2.311e-01
## diag2_mod496                                      2.969e-02
## diag2_mod518                                     -1.381e-01
## diag2_mod584                                      2.653e-02
## diag2_mod585                                      2.138e-01
## diag2_mod599                                      4.331e-03
## diag2_mod682                                      1.932e-01
## diag2_mod707                                      1.858e-01
## diag2_mod780                                     -4.010e-02
## diag2_modOther                                    1.349e-01
## diag3_mod250.02                                   2.469e-01
## diag3_mod250.6                                    5.382e-01
## diag3_mod272                                     -8.295e-02
## diag3_mod276                                      6.427e-02
## diag3_mod285                                     -2.535e-02
## diag3_mod401                                     -1.641e-02
## diag3_mod403                                      3.301e-01
## diag3_mod414                                     -2.064e-02
## diag3_mod424                                     -6.513e-04
## diag3_mod425                                      6.917e-02
## diag3_mod427                                      6.986e-02
## diag3_mod428                                      8.660e-02
## diag3_mod496                                      1.916e-01
## diag3_mod585                                      3.385e-01
## diag3_mod599                                      6.278e-02
## diag3_mod707                                      2.116e-01
## diag3_mod780                                      1.015e-01
## diag3_modOther                                    1.465e-01
## diag3_modV45                                     -8.091e-02
```

```
##                                                              Std. Error
## (Intercept)                                                  6.845e-01
## encounter_id                                                 1.319e-10
## patient_nbr                                                  3.251e-10
## raceAsian                                                    1.362e-01
## raceCaucasian                                                2.780e-02
## raceHispanic                                                 7.856e-02
## raceOther                                                    9.341e-02
## genderMale                                                   2.119e-02
## genderUnknown/Invalid                                        4.395e+01
## time_in_hospital                                             4.214e-03
## num_lab_procedures                                           6.315e-04
## num_procedures                                               7.970e-03
## num_medications                                              1.718e-03
## number_outpatient                                            7.741e-03
## number_emergency                                             8.716e-03
## number_inpatient                                             6.743e-03
## number_diagnoses                                             7.371e-03
## max_glu_serum>300                                            1.174e-01
## max_glu_serumNone                                            9.394e-02
## max_glu_serumNorm                                            1.026e-01
## A1Cresult>8                                                  6.808e-02
## A1CresultNone                                                5.728e-02
## A1CresultNorm                                                7.412e-02
## metforminNo                                                  1.342e-01
## metforminSteady                                              1.346e-01
## metforminUp                                                  1.746e-01
## glimepirideNo                                                2.251e-01
## glimepirideSteady                                            2.291e-01
## glimepirideUp                                                2.877e-01
## glipizideNo                                                  1.247e-01
## glipizideSteady                                              1.252e-01
## glipizideUp                                                  1.630e-01
## glyburideNo                                                  1.525e-01
## glyburideSteady                                              1.532e-01
## glyburideUp                                                  1.886e-01
## pioglitazoneNo                                               2.685e-01
## pioglitazoneSteady                                           2.706e-01
## pioglitazoneUp                                               3.371e-01
## rosiglitazoneNo                                              4.655e-01
## rosiglitazoneSteady                                          4.670e-01
## rosiglitazoneUp                                              5.290e-01
## insulinNo                                                    5.420e-02
## insulinSteady                                                4.139e-02
## insulinUp                                                    4.003e-02
## changeNo                                                     3.900e-02
## diabetesMedYes                                               3.846e-02
## disch_disp_modifiedDischarged to home with Home Health Service  3.243e-02
## disch_disp_modifiedDischarged/Transferred to SNF             3.248e-02
## disch_disp_modifiedOther                                     3.018e-02
## adm_src_modOther                                             4.589e-02
## adm_src_modPhysician Referral                                3.697e-02
## adm_src_modTransfer from Home Health                         6.727e-02
## adm_typ_modEmergency                                         4.303e-02
```

```
## adm_typ_modOther                                          5.602e-02
## adm_typ_modUrgent                                         3.785e-02
## age_mod20-59                                              1.867e-01
## age_mod60-79                                              1.869e-01
## age_mod80+                                                1.882e-01
## diag1_mod250.8                                            1.145e-01
## diag1_mod276                                              1.067e-01
## diag1_mod38                                               1.140e-01
## diag1_mod410                                              1.016e-01
## diag1_mod414                                              1.013e-01
## diag1_mod427                                              1.061e-01
## diag1_mod428                                              8.945e-02
## diag1_mod434                                              1.028e-01
## diag1_mod435                                              1.459e-01
## diag1_mod486                                              1.021e-01
## diag1_mod491                                              1.054e-01
## diag1_mod493                                              1.366e-01
## diag1_mod518                                              1.343e-01
## diag1_mod577                                              1.246e-01
## diag1_mod584                                              1.129e-01
## diag1_mod599                                              1.158e-01
## diag1_mod682                                              1.132e-01
## diag1_mod715                                              1.144e-01
## diag1_mod780                                              1.125e-01
## diag1_mod786                                              1.029e-01
## diag1_mod820                                              1.201e-01
## diag1_mod996                                              1.063e-01
## diag1_modOther                                            8.165e-02
## diag2_mod250.01                                           9.710e-02
## diag2_mod250.02                                           9.200e-02
## diag2_mod276                                              6.974e-02
## diag2_mod285                                              1.078e-01
## diag2_mod401                                              8.743e-02
## diag2_mod403                                              8.191e-02
## diag2_mod411                                              1.000e-01
## diag2_mod413                                              1.325e-01
## diag2_mod414                                              9.323e-02
## diag2_mod424                                              1.183e-01
## diag2_mod425                                              1.018e-01
## diag2_mod427                                              7.375e-02
## diag2_mod428                                              6.977e-02
## diag2_mod486                                              1.087e-01
## diag2_mod491                                              1.003e-01
## diag2_mod496                                              8.073e-02
## diag2_mod518                                              1.096e-01
## diag2_mod584                                              9.874e-02
## diag2_mod585                                              9.073e-02
## diag2_mod599                                              8.167e-02
## diag2_mod682                                              1.007e-01
## diag2_mod707                                              8.981e-02
## diag2_mod780                                              1.060e-01
## diag2_modOther                                            5.887e-02
## diag3_mod250.02                                           9.150e-02
## diag3_mod250.6                                            9.120e-02
```

```
## diag3_mod272                                       9.917e-02
## diag3_mod276                                       6.001e-02
## diag3_mod285                                       1.045e-01
## diag3_mod401                                       5.621e-02
## diag3_mod403                                       7.135e-02
## diag3_mod414                                       6.995e-02
## diag3_mod424                                       1.103e-01
## diag3_mod425                                       1.030e-01
## diag3_mod427                                       6.435e-02
## diag3_mod428                                       6.122e-02
## diag3_mod496                                       7.105e-02
## diag3_mod585                                       7.612e-02
## diag3_mod599                                       8.189e-02
## diag3_mod707                                       8.942e-02
## diag3_mod780                                       9.651e-02
## diag3_modOther                                     4.094e-02
## diag3_modV45                                       1.034e-01
##                                         z value Pr(>|z|)
## (Intercept)                              -4.557 5.18e-06
## encounter_id                             -8.033 9.53e-16
## patient_nbr                               4.700 2.60e-06
## raceAsian                                 0.214 0.830866
## raceCaucasian                             0.581 0.561443
## raceHispanic                              0.137 0.891065
## raceOther                                -1.042 0.297539
## genderMale                                1.124 0.261010
## genderUnknown/Invalid                    -0.136 0.891885
## time_in_hospital                          0.232 0.816602
## num_lab_procedures                        0.050 0.960364
## num_procedures                           -2.730 0.006326
## num_medications                           3.806 0.000141
## number_outpatient                        -0.504 0.613917
## number_emergency                          4.797 1.61e-06
## number_inpatient                         36.708  < 2e-16
## number_diagnoses                          3.331 0.000866
## max_glu_serum>300                        -0.200 0.841367
## max_glu_serumNone                        -1.893 0.058315
## max_glu_serumNorm                        -0.220 0.825485
## A1Cresult>8                              -0.078 0.937728
## A1CresultNone                             1.613 0.106689
## A1CresultNorm                             0.067 0.946405
## metforminNo                              -1.314 0.188923
## metforminSteady                          -1.885 0.059386
## metforminUp                              -2.290 0.022010
## glimepirideNo                            -0.581 0.561050
## glimepirideSteady                        -1.070 0.284801
## glimepirideUp                            -0.484 0.628224
## glipizideNo                              -2.555 0.010630
## glipizideSteady                          -2.375 0.017535
## glipizideUp                              -0.840 0.400807
## glyburideNo                               1.442 0.149201
## glyburideSteady                           1.349 0.177292
## glyburideUp                               1.040 0.298225
## pioglitazoneNo                           -0.826 0.408810
```

```
## pioglitazoneSteady                                          -0.986 0.324330
## pioglitazoneUp                                              -0.503 0.614670
## rosiglitazoneNo                                              1.510 0.131085
## rosiglitazoneSteady                                          1.358 0.174453
## rosiglitazoneUp                                              1.046 0.295342
## insulinNo                                                   -2.382 0.017238
## insulinSteady                                               -3.564 0.000365
## insulinUp                                                   -1.594 0.110998
## changeNo                                                     0.651 0.514826
## diabetesMedYes                                               5.536 3.09e-08
## disch_disp_modifiedDischarged to home with Home Health Service  5.705 1.16e-08
## disch_disp_modifiedDischarged/Transferred to SNF            11.109  < 2e-16
## disch_disp_modifiedOther                                    12.702  < 2e-16
## adm_src_modOther                                            -2.187 0.028779
## adm_src_modPhysician Referral                                1.196 0.231802
## adm_src_modTransfer from Home Health                        -3.036 0.002399
## adm_typ_modEmergency                                         1.393 0.163582
## adm_typ_modOther                                            -0.711 0.477197
## adm_typ_modUrgent                                            0.810 0.418152
## age_mod20-59                                                 2.710 0.006737
## age_mod60-79                                                 3.355 0.000793
## age_mod80+                                                   3.199 0.001377
## diag1_mod250.8                                              -4.609 4.05e-06
## diag1_mod276                                                -2.190 0.028559
## diag1_mod38                                                 -4.807 1.53e-06
## diag1_mod410                                                -3.193 0.001410
## diag1_mod414                                                -3.379 0.000727
## diag1_mod427                                                -4.375 1.22e-05
## diag1_mod428                                                -2.578 0.009935
## diag1_mod434                                                 0.726 0.467817
## diag1_mod435                                                -4.202 2.64e-05
## diag1_mod486                                                -6.886 5.76e-12
## diag1_mod491                                                -3.294 0.000986
## diag1_mod493                                                -3.558 0.000374
## diag1_mod518                                                -5.682 1.33e-08
## diag1_mod577                                                -1.382 0.166837
## diag1_mod584                                                -2.974 0.002943
## diag1_mod599                                                -4.771 1.83e-06
## diag1_mod682                                                -5.453 4.97e-08
## diag1_mod715                                                -2.620 0.008792
## diag1_mod780                                                -4.568 4.91e-06
## diag1_mod786                                                -5.739 9.51e-09
## diag1_mod820                                                -0.584 0.559086
## diag1_mod996                                                -3.193 0.001406
## diag1_modOther                                              -4.123 3.73e-05
## diag2_mod250.01                                              3.279 0.001041
## diag2_mod250.02                                              1.479 0.139200
## diag2_mod276                                                 2.157 0.030990
## diag2_mod285                                                -1.196 0.231783
## diag2_mod401                                                -1.003 0.315950
## diag2_mod403                                                 2.273 0.023013
## diag2_mod411                                                 0.791 0.429139
## diag2_mod413                                                -0.571 0.568122
## diag2_mod414                                                 0.137 0.891233
```

```
## diag2_mod424                                         0.495 0.620726
## diag2_mod425                                         1.398 0.162068
## diag2_mod427                                         0.884 0.376620
## diag2_mod428                                         2.106 0.035243
## diag2_mod486                                        -0.745 0.456343
## diag2_mod491                                         2.304 0.021209
## diag2_mod496                                         0.368 0.713029
## diag2_mod518                                        -1.261 0.207466
## diag2_mod584                                         0.269 0.788178
## diag2_mod585                                         2.357 0.018430
## diag2_mod599                                         0.053 0.957707
## diag2_mod682                                         1.919 0.055005
## diag2_mod707                                         2.069 0.038587
## diag2_mod780                                        -0.378 0.705130
## diag2_modOther                                       2.292 0.021903
## diag3_mod250.02                                      2.699 0.006956
## diag3_mod250.6                                       5.900 3.62e-09
## diag3_mod272                                        -0.836 0.402881
## diag3_mod276                                         1.071 0.284185
## diag3_mod285                                        -0.243 0.808229
## diag3_mod401                                        -0.292 0.770332
## diag3_mod403                                         4.627 3.71e-06
## diag3_mod414                                        -0.295 0.767887
## diag3_mod424                                        -0.006 0.995290
## diag3_mod425                                         0.672 0.501776
## diag3_mod427                                         1.086 0.277644
## diag3_mod428                                         1.415 0.157175
## diag3_mod496                                         2.697 0.007004
## diag3_mod585                                         4.447 8.71e-06
## diag3_mod599                                         0.767 0.443339
## diag3_mod707                                         2.366 0.017990
## diag3_mod780                                         1.052 0.292822
## diag3_modOther                                       3.579 0.000345
## diag3_modV45                                        -0.783 0.433756
##
## (Intercept)                               ***
## encounter_id                              ***
## patient_nbr                               ***
## raceAsian
## raceCaucasian
## raceHispanic
## raceOther
## genderMale
## genderUnknown/Invalid
## time_in_hospital
## num_lab_procedures
## num_procedures                            **
## num_medications                           ***
## number_outpatient
## number_emergency                          ***
## number_inpatient                          ***
## number_diagnoses                          ***
## max_glu_serum>300
## max_glu_serumNone                          .
```

```
## max_glu_serumNorm
## A1Cresult>8
## A1CresultNone
## A1CresultNorm
## metforminNo
## metforminSteady                                                  .
## metforminUp                                                      *
## glimepirideNo
## glimepirideSteady
## glimepirideUp
## glipizideNo                                                      *
## glipizideSteady                                                  *
## glipizideUp
## glyburideNo
## glyburideSteady
## glyburideUp
## pioglitazoneNo
## pioglitazoneSteady
## pioglitazoneUp
## rosiglitazoneNo
## rosiglitazoneSteady
## rosiglitazoneUp
## insulinNo                                                        *
## insulinSteady                                                    ***
## insulinUp
## changeNo
## diabetesMedYes                                                   ***
## disch_disp_modifiedDischarged to home with Home Health Service ***
## disch_disp_modifiedDischarged/Transferred to SNF                ***
## disch_disp_modifiedOther                                         ***
## adm_src_modOther                                                 *
## adm_src_modPhysician Referral
## adm_src_modTransfer from Home Health                             **
## adm_typ_modEmergency
## adm_typ_modOther
## adm_typ_modUrgent
## age_mod20-59                                                     **
## age_mod60-79                                                     ***
## age_mod80+                                                       **
## diag1_mod250.8                                                   ***
## diag1_mod276                                                     *
## diag1_mod38                                                      ***
## diag1_mod410                                                     **
## diag1_mod414                                                     ***
## diag1_mod427                                                     ***
## diag1_mod428                                                     **
## diag1_mod434
## diag1_mod435                                                     ***
## diag1_mod486                                                     ***
## diag1_mod491                                                     ***
## diag1_mod493                                                     ***
## diag1_mod518                                                     ***
## diag1_mod577
## diag1_mod584                                                     **
```

```
## diag1_mod599                                        ***
## diag1_mod682                                        ***
## diag1_mod715                                        **
## diag1_mod780                                        ***
## diag1_mod786                                        ***
## diag1_mod820
## diag1_mod996                                        **
## diag1_modOther                                      ***
## diag2_mod250.01                                     **
## diag2_mod250.02
## diag2_mod276                                        *
## diag2_mod285
## diag2_mod401
## diag2_mod403                                        *
## diag2_mod411
## diag2_mod413
## diag2_mod414
## diag2_mod424
## diag2_mod425
## diag2_mod427
## diag2_mod428                                        *
## diag2_mod486
## diag2_mod491                                        *
## diag2_mod496
## diag2_mod518
## diag2_mod584
## diag2_mod585                                        *
## diag2_mod599
## diag2_mod682                                        .
## diag2_mod707                                        *
## diag2_mod780
## diag2_modOther                                      *
## diag3_mod250.02                                     **
## diag3_mod250.6                                      ***
## diag3_mod272
## diag3_mod276
## diag3_mod285
## diag3_mod401
## diag3_mod403                                        ***
## diag3_mod414
## diag3_mod424
## diag3_mod425
## diag3_mod427
## diag3_mod428
## diag3_mod496                                        **
## diag3_mod585                                        ***
## diag3_mod599
## diag3_mod707                                        *
## diag3_mod780
## diag3_modOther                                      ***
## diag3_modV45
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
```

```
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 69205  on 98143  degrees of freedom
## Residual deviance: 66063  on 98020  degrees of freedom
## AIC: 66311
##
## Number of Fisher Scoring iterations: 7


##
## Call:
## glm(formula = '<30' ~ encounter_id + time_in_hospital + num_medications +
##     number_emergency + number_inpatient + number_diagnoses +
##     A1Cresult + metformin + insulin + diabetesMed + disch_disp_modified +
##     age_mod + diag1_mod + diag2_mod + diag3_mod, family = binomial(logit),
##     data = encoded_data)
##
## Deviance Residuals:
##     Min       1Q   Median       3Q      Max
## -2.4345  -0.5091  -0.4337  -0.3705   2.6197
##
## Coefficients:
##                                                             Estimate
## (Intercept)                                                -2.957e+00
## encounter_id                                               -6.486e-10
## time_in_hospital                                            8.969e-04
## num_medications                                             4.113e-03
## number_emergency                                            4.051e-02
## number_inpatient                                            2.502e-01
## number_diagnoses                                            2.715e-02
## A1Cresult>8                                                -4.870e-03
## A1CresultNone                                               8.565e-02
## A1CresultNorm                                               1.240e-02
## metforminNo                                                -1.550e-01
## metforminSteady                                            -2.387e-01
## metforminUp                                                -3.956e-01
## insulinNo                                                  -1.198e-01
## insulinSteady                                              -1.384e-01
## insulinUp                                                  -6.853e-02
## diabetesMedYes                                              1.935e-01
## disch_disp_modifiedDischarged to home with Home Health Service  1.861e-01
## disch_disp_modifiedDischarged/Transferred to SNF            3.582e-01
## disch_disp_modifiedOther                                    3.754e-01
## age_mod20-59                                                4.872e-01
## age_mod60-79                                                6.083e-01
## age_mod80+                                                  5.886e-01
## diag1_mod250.8                                             -5.278e-01
## diag1_mod276                                               -2.280e-01
## diag1_mod38                                                -5.403e-01
## diag1_mod410                                               -3.679e-01
## diag1_mod414                                               -4.061e-01
## diag1_mod427                                               -4.763e-01
## diag1_mod428                                               -2.207e-01
## diag1_mod434                                                7.835e-02
## diag1_mod435                                               -6.079e-01
```

```
## diag1_mod486                                                   -6.921e-01
## diag1_mod491                                                   -3.211e-01
## diag1_mod493                                                   -4.680e-01
## diag1_mod518                                                   -7.675e-01
## diag1_mod577                                                   -1.679e-01
## diag1_mod584                                                   -3.345e-01
## diag1_mod599                                                   -5.474e-01
## diag1_mod682                                                   -6.038e-01
## diag1_mod715                                                   -3.076e-01
## diag1_mod780                                                   -5.131e-01
## diag1_mod786                                                   -5.980e-01
## diag1_mod820                                                   -7.049e-02
## diag1_mod996                                                   -3.627e-01
## diag1_modOther                                                 -3.449e-01
## diag2_mod250.01                                                 3.181e-01
## diag2_mod250.02                                                 1.456e-01
## diag2_mod276                                                    1.582e-01
## diag2_mod285                                                   -1.467e-01
## diag2_mod401                                                   -8.649e-02
## diag2_mod403                                                    1.775e-01
## diag2_mod411                                                    8.883e-02
## diag2_mod413                                                   -6.943e-02
## diag2_mod414                                                   -4.105e-03
## diag2_mod424                                                    4.844e-02
## diag2_mod425                                                    1.327e-01
## diag2_mod427                                                    6.572e-02
## diag2_mod428                                                    1.521e-01
## diag2_mod486                                                   -7.395e-02
## diag2_mod491                                                    2.498e-01
## diag2_mod496                                                    3.971e-02
## diag2_mod518                                                   -1.462e-01
## diag2_mod584                                                    3.136e-02
## diag2_mod585                                                    2.008e-01
## diag2_mod599                                                    4.849e-03
## diag2_mod682                                                    1.993e-01
## diag2_mod707                                                    1.810e-01
## diag2_mod780                                                   -3.336e-02
## diag2_modOther                                                  1.308e-01
## diag3_mod250.02                                                 2.580e-01
## diag3_mod250.6                                                  5.455e-01
## diag3_mod272                                                   -8.650e-02
## diag3_mod276                                                    7.366e-02
## diag3_mod285                                                   -3.808e-02
## diag3_mod401                                                   -1.852e-02
## diag3_mod403                                                    3.224e-01
## diag3_mod414                                                   -2.477e-02
## diag3_mod424                                                   -2.735e-03
## diag3_mod425                                                    6.957e-02
## diag3_mod427                                                    7.502e-02
## diag3_mod428                                                    9.394e-02
## diag3_mod496                                                    2.011e-01
## diag3_mod585                                                    3.432e-01
## diag3_mod599                                                    6.637e-02
## diag3_mod707                                                    2.042e-01
```

```
## diag3_mod780                                                  9.930e-02
## diag3_modOther                                                1.469e-01
## diag3_modV45                                                  -7.791e-02
##                                                              Std. Error
## (Intercept)                                                   2.627e-01
## encounter_id                                                  1.132e-10
## time_in_hospital                                              4.061e-03
## num_medications                                               1.582e-03
## number_emergency                                              8.673e-03
## number_inpatient                                              6.678e-03
## number_diagnoses                                              7.210e-03
## A1Cresult>8                                                   6.798e-02
## A1CresultNone                                                 5.682e-02
## A1CresultNorm                                                 7.403e-02
## metforminNo                                                   1.326e-01
## metforminSteady                                               1.341e-01
## metforminUp                                                   1.742e-01
## insulinNo                                                     3.686e-02
## insulinSteady                                                 3.352e-02
## insulinUp                                                     3.992e-02
## diabetesMedYes                                                3.352e-02
## disch_disp_modifiedDischarged to home with Home Health Service 3.223e-02
## disch_disp_modifiedDischarged/Transferred to SNF             3.213e-02
## disch_disp_modifiedOther                                      2.993e-02
## age_mod20-59                                                  1.865e-01
## age_mod60-79                                                  1.868e-01
## age_mod80+                                                    1.880e-01
## diag1_mod250.8                                                1.144e-01
## diag1_mod276                                                  1.065e-01
## diag1_mod38                                                   1.138e-01
## diag1_mod410                                                  1.004e-01
## diag1_mod414                                                  9.905e-02
## diag1_mod427                                                  1.059e-01
## diag1_mod428                                                  8.922e-02
## diag1_mod434                                                  1.026e-01
## diag1_mod435                                                  1.456e-01
## diag1_mod486                                                  1.018e-01
## diag1_mod491                                                  1.049e-01
## diag1_mod493                                                  1.362e-01
## diag1_mod518                                                  1.340e-01
## diag1_mod577                                                  1.244e-01
## diag1_mod584                                                  1.127e-01
## diag1_mod599                                                  1.156e-01
## diag1_mod682                                                  1.129e-01
## diag1_mod715                                                  1.130e-01
## diag1_mod780                                                  1.122e-01
## diag1_mod786                                                  1.026e-01
## diag1_mod820                                                  1.198e-01
## diag1_mod996                                                  1.058e-01
## diag1_modOther                                                8.149e-02
## diag2_mod250.01                                               9.693e-02
## diag2_mod250.02                                               9.179e-02
## diag2_mod276                                                  6.951e-02
## diag2_mod285                                                  1.076e-01
```

```
## diag2_mod401                                              8.731e-02
## diag2_mod403                                              8.163e-02
## diag2_mod411                                              9.948e-02
## diag2_mod413                                              1.323e-01
## diag2_mod414                                              9.297e-02
## diag2_mod424                                              1.182e-01
## diag2_mod425                                              1.016e-01
## diag2_mod427                                              7.363e-02
## diag2_mod428                                              6.959e-02
## diag2_mod486                                              1.085e-01
## diag2_mod491                                              9.997e-02
## diag2_mod496                                              8.059e-02
## diag2_mod518                                              1.094e-01
## diag2_mod584                                              9.848e-02
## diag2_mod585                                              9.055e-02
## diag2_mod599                                              8.141e-02
## diag2_mod682                                              1.006e-01
## diag2_mod707                                              8.965e-02
## diag2_mod780                                              1.058e-01
## diag2_modOther                                            5.876e-02
## diag3_mod250.02                                           9.129e-02
## diag3_mod250.6                                            9.109e-02
## diag3_mod272                                              9.907e-02
## diag3_mod276                                              5.982e-02
## diag3_mod285                                              1.044e-01
## diag3_mod401                                              5.613e-02
## diag3_mod403                                              7.115e-02
## diag3_mod414                                              6.979e-02
## diag3_mod424                                              1.102e-01
## diag3_mod425                                              1.028e-01
## diag3_mod427                                              6.422e-02
## diag3_mod428                                              6.109e-02
## diag3_mod496                                              7.092e-02
## diag3_mod585                                              7.599e-02
## diag3_mod599                                              8.165e-02
## diag3_mod707                                              8.928e-02
## diag3_mod780                                              9.637e-02
## diag3_modOther                                            4.086e-02
## diag3_modV45                                              1.033e-01
##                                                 z value Pr(>|z|)
## (Intercept)                                     -11.255  < 2e-16
## encounter_id                                     -5.732 9.95e-09
## time_in_hospital                                  0.221 0.825194
## num_medications                                   2.600 0.009325
## number_emergency                                  4.671 3.00e-06
## number_inpatient                                 37.472  < 2e-16
## number_diagnoses                                  3.765 0.000166
## A1Cresult>8                                      -0.072 0.942885
## A1CresultNone                                     1.507 0.131722
## A1CresultNorm                                     0.167 0.867004
## metforminNo                                      -1.169 0.242374
## metforminSteady                                  -1.780 0.075136
## metforminUp                                      -2.270 0.023202
## insulinNo                                        -3.249 0.001160
```

```
## insulinSteady                                                       -4.128 3.66e-05
## insulinUp                                                           -1.717 0.086006
## diabetesMedYes                                                       5.773 7.77e-09
## disch_disp_modifiedDischarged to home with Home Health Service       5.773 7.77e-09
## disch_disp_modifiedDischarged/Transferred to SNF                    11.148  < 2e-16
## disch_disp_modifiedOther                                            12.542  < 2e-16
## age_mod20-59                                                         2.612 0.008996
## age_mod60-79                                                         3.257 0.001125
## age_mod80+                                                           3.132 0.001738
## diag1_mod250.8                                                      -4.614 3.94e-06
## diag1_mod276                                                        -2.141 0.032241
## diag1_mod38                                                         -4.749 2.05e-06
## diag1_mod410                                                        -3.665 0.000248
## diag1_mod414                                                        -4.100 4.13e-05
## diag1_mod427                                                        -4.497 6.89e-06
## diag1_mod428                                                        -2.474 0.013362
## diag1_mod434                                                         0.764 0.444992
## diag1_mod435                                                        -4.174 2.99e-05
## diag1_mod486                                                        -6.797 1.07e-11
## diag1_mod491                                                        -3.060 0.002210
## diag1_mod493                                                        -3.436 0.000590
## diag1_mod518                                                        -5.725 1.03e-08
## diag1_mod577                                                        -1.350 0.177076
## diag1_mod584                                                        -2.969 0.002987
## diag1_mod599                                                        -4.737 2.17e-06
## diag1_mod682                                                        -5.346 8.99e-08
## diag1_mod715                                                        -2.722 0.006495
## diag1_mod780                                                        -4.573 4.82e-06
## diag1_mod786                                                        -5.827 5.65e-09
## diag1_mod820                                                        -0.589 0.556122
## diag1_mod996                                                        -3.429 0.000606
## diag1_modOther                                                      -4.232 2.32e-05
## diag2_mod250.01                                                      3.281 0.001033
## diag2_mod250.02                                                      1.586 0.112632
## diag2_mod276                                                         2.276 0.022851
## diag2_mod285                                                        -1.363 0.172806
## diag2_mod401                                                        -0.991 0.321882
## diag2_mod403                                                         2.175 0.029664
## diag2_mod411                                                         0.893 0.371884
## diag2_mod413                                                        -0.525 0.599686
## diag2_mod414                                                        -0.044 0.964779
## diag2_mod424                                                         0.410 0.681882
## diag2_mod425                                                         1.307 0.191201
## diag2_mod427                                                         0.893 0.372087
## diag2_mod428                                                         2.185 0.028887
## diag2_mod486                                                        -0.682 0.495401
## diag2_mod491                                                         2.499 0.012457
## diag2_mod496                                                         0.493 0.622207
## diag2_mod518                                                        -1.337 0.181354
## diag2_mod584                                                         0.318 0.750169
## diag2_mod585                                                         2.217 0.026593
## diag2_mod599                                                         0.060 0.952497
## diag2_mod682                                                         1.981 0.047550
## diag2_mod707                                                         2.018 0.043551
```

```
## diag2_mod780                                                 -0.315 0.752525
## diag2_modOther                                                2.226 0.025999
## diag3_mod250.02                                               2.826 0.004714
## diag3_mod250.6                                                5.989 2.11e-09
## diag3_mod272                                                 -0.873 0.382624
## diag3_mod276                                                  1.231 0.218184
## diag3_mod285                                                 -0.365 0.715185
## diag3_mod401                                                 -0.330 0.741407
## diag3_mod403                                                  4.532 5.84e-06
## diag3_mod414                                                 -0.355 0.722659
## diag3_mod424                                                 -0.025 0.980198
## diag3_mod425                                                  0.677 0.498520
## diag3_mod427                                                  1.168 0.242729
## diag3_mod428                                                  1.538 0.124074
## diag3_mod496                                                  2.836 0.004569
## diag3_mod585                                                  4.516 6.30e-06
## diag3_mod599                                                  0.813 0.416277
## diag3_mod707                                                  2.288 0.022161
## diag3_mod780                                                  1.030 0.302828
## diag3_modOther                                                3.595 0.000325
## diag3_modV45                                                 -0.754 0.450914
##
## (Intercept)                                                  ***
## encounter_id                                                 ***
## time_in_hospital
## num_medications                                              **
## number_emergency                                            ***
## number_inpatient                                            ***
## number_diagnoses                                            ***
## A1Cresult>8
## A1CresultNone
## A1CresultNorm
## metforminNo
## metforminSteady                                              .
## metforminUp                                                  *
## insulinNo                                                    **
## insulinSteady                                               ***
## insulinUp                                                    .
## diabetesMedYes                                              ***
## disch_disp_modifiedDischarged to home with Home Health Service ***
## disch_disp_modifiedDischarged/Transferred to SNF            ***
## disch_disp_modifiedOther                                    ***
## age_mod20-59                                                 **
## age_mod60-79                                                 **
## age_mod80+                                                   **
## diag1_mod250.8                                              ***
## diag1_mod276                                                 *
## diag1_mod38                                                 ***
## diag1_mod410                                                ***
## diag1_mod414                                                ***
## diag1_mod427                                                ***
## diag1_mod428                                                 *
## diag1_mod434
## diag1_mod435                                                ***
```

```
## diag1_mod486                                    ***
## diag1_mod491                                    **
## diag1_mod493                                    ***
## diag1_mod518                                    ***
## diag1_mod577
## diag1_mod584                                    **
## diag1_mod599                                    ***
## diag1_mod682                                    ***
## diag1_mod715                                    **
## diag1_mod780                                    ***
## diag1_mod786                                    ***
## diag1_mod820
## diag1_mod996                                    ***
## diag1_modOther                                  ***
## diag2_mod250.01                                 **
## diag2_mod250.02
## diag2_mod276                                    *
## diag2_mod285
## diag2_mod401
## diag2_mod403                                    *
## diag2_mod411
## diag2_mod413
## diag2_mod414
## diag2_mod424
## diag2_mod425
## diag2_mod427
## diag2_mod428                                    *
## diag2_mod486
## diag2_mod491                                    *
## diag2_mod496
## diag2_mod518
## diag2_mod584
## diag2_mod585                                    *
## diag2_mod599
## diag2_mod682                                    *
## diag2_mod707                                    *
## diag2_mod780
## diag2_modOther                                  *
## diag3_mod250.02                                 **
## diag3_mod250.6                                  ***
## diag3_mod272
## diag3_mod276
## diag3_mod285
## diag3_mod401
## diag3_mod403                                    ***
## diag3_mod414
## diag3_mod424
## diag3_mod425
## diag3_mod427
## diag3_mod428
## diag3_mod496                                    **
## diag3_mod585                                    ***
## diag3_mod599
## diag3_mod707                                    *
```

```
## diag3_mod780
## diag3_modOther                                             ***
## diag3_modV45
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 69205  on 98143  degrees of freedom
## Residual deviance: 66158  on 98055  degrees of freedom
## AIC: 66336
##
## Number of Fisher Scoring iterations: 5


##
## Call:
## glm(formula = '<30' ~ encounter_id + num_medications + number_emergency +
##     number_inpatient + number_diagnoses + A1Cresult + metformin +
##     insulin + diabetesMed + disch_disp_modified + age_mod + diag1_mod +
##     diag2_mod + diag3_mod, family = binomial(logit), data = encoded_data)
##
## Deviance Residuals:
##     Min       1Q   Median       3Q      Max
## -2.4352  -0.5091  -0.4337  -0.3705   2.6202
##
## Coefficients:
##                                                            Estimate
## (Intercept)                                               -2.955e+00
## encounter_id                                              -6.524e-10
## num_medications                                            4.263e-03
## number_emergency                                           4.046e-02
## number_inpatient                                           2.503e-01
## number_diagnoses                                           2.724e-02
## A1Cresult>8                                               -4.846e-03
## A1CresultNone                                              8.523e-02
## A1CresultNorm                                              1.248e-02
## metforminNo                                               -1.553e-01
## metforminSteady                                           -2.390e-01
## metforminUp                                               -3.953e-01
## insulinNo                                                 -1.196e-01
## insulinSteady                                             -1.384e-01
## insulinUp                                                 -6.835e-02
## diabetesMedYes                                             1.934e-01
## disch_disp_modifiedDischarged to home with Home Health Service  1.868e-01
## disch_disp_modifiedDischarged/Transferred to SNF          3.593e-01
## disch_disp_modifiedOther                                   3.761e-01
## age_mod20-59                                               4.868e-01
## age_mod60-79                                               6.081e-01
## age_mod80+                                                 5.886e-01
## diag1_mod250.8                                            -5.281e-01
## diag1_mod276                                              -2.286e-01
## diag1_mod38                                               -5.402e-01
## diag1_mod410                                              -3.685e-01
## diag1_mod414                                              -4.075e-01
```

```
## diag1_mod427                                               -4.769e-01
## diag1_mod428                                               -2.210e-01
## diag1_mod434                                                7.867e-02
## diag1_mod435                                               -6.084e-01
## diag1_mod486                                               -6.921e-01
## diag1_mod491                                               -3.215e-01
## diag1_mod493                                               -4.681e-01
## diag1_mod518                                               -7.675e-01
## diag1_mod577                                               -1.674e-01
## diag1_mod584                                               -3.343e-01
## diag1_mod599                                               -5.479e-01
## diag1_mod682                                               -6.037e-01
## diag1_mod715                                               -3.093e-01
## diag1_mod780                                               -5.137e-01
## diag1_mod786                                               -5.995e-01
## diag1_mod820                                               -7.133e-02
## diag1_mod996                                               -3.633e-01
## diag1_modOther                                             -3.449e-01
## diag2_mod250.01                                             3.181e-01
## diag2_mod250.02                                             1.459e-01
## diag2_mod276                                                1.582e-01
## diag2_mod285                                               -1.467e-01
## diag2_mod401                                               -8.656e-02
## diag2_mod403                                                1.776e-01
## diag2_mod411                                                8.882e-02
## diag2_mod413                                               -6.968e-02
## diag2_mod414                                               -4.336e-03
## diag2_mod424                                                4.841e-02
## diag2_mod425                                                1.328e-01
## diag2_mod427                                                6.583e-02
## diag2_mod428                                                1.522e-01
## diag2_mod486                                               -7.333e-02
## diag2_mod491                                                2.500e-01
## diag2_mod496                                                3.953e-02
## diag2_mod518                                               -1.456e-01
## diag2_mod584                                                3.202e-02
## diag2_mod585                                                2.007e-01
## diag2_mod599                                                5.090e-03
## diag2_mod682                                                2.000e-01
## diag2_mod707                                                1.816e-01
## diag2_mod780                                               -3.325e-02
## diag2_modOther                                              1.312e-01
## diag3_mod250.02                                             2.584e-01
## diag3_mod250.6                                              5.457e-01
## diag3_mod272                                               -8.659e-02
## diag3_mod276                                                7.392e-02
## diag3_mod285                                               -3.801e-02
## diag3_mod401                                               -1.861e-02
## diag3_mod403                                                3.227e-01
## diag3_mod414                                               -2.488e-02
## diag3_mod424                                               -2.636e-03
## diag3_mod425                                                6.991e-02
## diag3_mod427                                                7.533e-02
## diag3_mod428                                                9.418e-02
```

```
## diag3_mod496                                                  2.011e-01
## diag3_mod585                                                  3.433e-01
## diag3_mod599                                                  6.698e-02
## diag3_mod707                                                  2.051e-01
## diag3_mod780                                                  9.949e-02
## diag3_modOther                                                1.472e-01
## diag3_modV45                                                 -7.806e-02
##                                                              Std. Error
## (Intercept)                                                   2.626e-01
## encounter_id                                                  1.119e-10
## num_medications                                               1.427e-03
## number_emergency                                              8.670e-03
## number_inpatient                                              6.676e-03
## number_diagnoses                                              7.198e-03
## A1Cresult>8                                                   6.798e-02
## A1CresultNone                                                 5.679e-02
## A1CresultNorm                                                 7.403e-02
## metforminNo                                                   1.326e-01
## metforminSteady                                               1.341e-01
## metforminUp                                                   1.742e-01
## insulinNo                                                     3.686e-02
## insulinSteady                                                 3.352e-02
## insulinUp                                                     3.991e-02
## diabetesMedYes                                                3.352e-02
## disch_disp_modifiedDischarged to home with Home Health Service 3.205e-02
## disch_disp_modifiedDischarged/Transferred to SNF             3.177e-02
## disch_disp_modifiedOther                                      2.979e-02
## age_mod20-59                                                  1.865e-01
## age_mod60-79                                                  1.868e-01
## age_mod80+                                                    1.879e-01
## diag1_mod250.8                                                1.144e-01
## diag1_mod276                                                  1.065e-01
## diag1_mod38                                                   1.138e-01
## diag1_mod410                                                  1.004e-01
## diag1_mod414                                                  9.885e-02
## diag1_mod427                                                  1.059e-01
## diag1_mod428                                                  8.921e-02
## diag1_mod434                                                  1.026e-01
## diag1_mod435                                                  1.456e-01
## diag1_mod486                                                  1.018e-01
## diag1_mod491                                                  1.049e-01
## diag1_mod493                                                  1.362e-01
## diag1_mod518                                                  1.340e-01
## diag1_mod577                                                  1.244e-01
## diag1_mod584                                                  1.127e-01
## diag1_mod599                                                  1.155e-01
## diag1_mod682                                                  1.129e-01
## diag1_mod715                                                  1.127e-01
## diag1_mod780                                                  1.122e-01
## diag1_mod786                                                  1.024e-01
## diag1_mod820                                                  1.197e-01
## diag1_mod996                                                  1.057e-01
## diag1_modOther                                                8.149e-02
## diag2_mod250.01                                               9.693e-02
```

```
## diag2_mod250.02                                     9.179e-02
## diag2_mod276                                        6.951e-02
## diag2_mod285                                        1.076e-01
## diag2_mod401                                        8.731e-02
## diag2_mod403                                        8.163e-02
## diag2_mod411                                        9.947e-02
## diag2_mod413                                        1.323e-01
## diag2_mod414                                        9.296e-02
## diag2_mod424                                        1.182e-01
## diag2_mod425                                        1.016e-01
## diag2_mod427                                        7.363e-02
## diag2_mod428                                        6.959e-02
## diag2_mod486                                        1.084e-01
## diag2_mod491                                        9.997e-02
## diag2_mod496                                        8.058e-02
## diag2_mod518                                        1.093e-01
## diag2_mod584                                        9.843e-02
## diag2_mod585                                        9.054e-02
## diag2_mod599                                        8.140e-02
## diag2_mod682                                        1.005e-01
## diag2_mod707                                        8.960e-02
## diag2_mod780                                        1.058e-01
## diag2_modOther                                      5.873e-02
## diag3_mod250.02                                     9.128e-02
## diag3_mod250.6                                      9.109e-02
## diag3_mod272                                        9.907e-02
## diag3_mod276                                        5.981e-02
## diag3_mod285                                        1.044e-01
## diag3_mod401                                        5.613e-02
## diag3_mod403                                        7.113e-02
## diag3_mod414                                        6.978e-02
## diag3_mod424                                        1.102e-01
## diag3_mod425                                        1.028e-01
## diag3_mod427                                        6.420e-02
## diag3_mod428                                        6.108e-02
## diag3_mod496                                        7.092e-02
## diag3_mod585                                        7.599e-02
## diag3_mod599                                        8.160e-02
## diag3_mod707                                        8.921e-02
## diag3_mod780                                        9.637e-02
## diag3_modOther                                      4.083e-02
## diag3_modV45                                        1.033e-01
##                                                 z value Pr(>|z|)
## (Intercept)                                     -11.254  < 2e-16
## encounter_id                                     -5.830 5.53e-09
## num_medications                                   2.987 0.002819
## number_emergency                                  4.667 3.06e-06
## number_inpatient                                 37.487  < 2e-16
## number_diagnoses                                  3.785 0.000154
## A1Cresult>8                                      -0.071 0.943165
## A1CresultNone                                     1.501 0.133397
## A1CresultNorm                                     0.169 0.866164
## metforminNo                                      -1.171 0.241622
## metforminSteady                                  -1.782 0.074671
```

```
## metforminUp                                               -2.269 0.023284
## insulinNo                                                  -3.245 0.001173
## insulinSteady                                              -4.128 3.66e-05
## insulinUp                                                  -1.713 0.086773
## diabetesMedYes                                              5.771 7.88e-09
## disch_disp_modifiedDischarged to home with Home Health Service  5.830 5.53e-09
## disch_disp_modifiedDischarged/Transferred to SNF           11.307  < 2e-16
## disch_disp_modifiedOther                                   12.623  < 2e-16
## age_mod20-59                                                2.610 0.009051
## age_mod60-79                                                3.256 0.001129
## age_mod80+                                                  3.132 0.001738
## diag1_mod250.8                                             -4.618 3.87e-06
## diag1_mod276                                               -2.148 0.031746
## diag1_mod38                                                -4.748 2.05e-06
## diag1_mod410                                               -3.671 0.000242
## diag1_mod414                                               -4.123 3.75e-05
## diag1_mod427                                               -4.504 6.67e-06
## diag1_mod428                                               -2.478 0.013225
## diag1_mod434                                                0.767 0.443057
## diag1_mod435                                               -4.179 2.93e-05
## diag1_mod486                                               -6.798 1.06e-11
## diag1_mod491                                               -3.064 0.002183
## diag1_mod493                                               -3.437 0.000588
## diag1_mod518                                               -5.726 1.03e-08
## diag1_mod577                                               -1.346 0.178210
## diag1_mod584                                               -2.967 0.003003
## diag1_mod599                                               -4.742 2.12e-06
## diag1_mod682                                               -5.346 9.01e-08
## diag1_mod715                                               -2.744 0.006076
## diag1_mod780                                               -4.579 4.67e-06
## diag1_mod786                                               -5.853 4.83e-09
## diag1_mod820                                               -0.596 0.551246
## diag1_mod996                                               -3.436 0.000590
## diag1_modOther                                             -4.232 2.32e-05
## diag2_mod250.01                                             3.282 0.001032
## diag2_mod250.02                                             1.589 0.111987
## diag2_mod276                                                2.277 0.022807
## diag2_mod285                                               -1.364 0.172701
## diag2_mod401                                               -0.991 0.321481
## diag2_mod403                                                2.176 0.029561
## diag2_mod411                                                0.893 0.371902
## diag2_mod413                                               -0.527 0.598342
## diag2_mod414                                               -0.047 0.962795
## diag2_mod424                                                0.410 0.682028
## diag2_mod425                                                1.308 0.191036
## diag2_mod427                                                0.894 0.371222
## diag2_mod428                                                2.187 0.028759
## diag2_mod486                                               -0.676 0.498901
## diag2_mod491                                                2.501 0.012401
## diag2_mod496                                                0.491 0.623753
## diag2_mod518                                               -1.331 0.183051
## diag2_mod584                                                0.325 0.744943
## diag2_mod585                                                2.216 0.026658
## diag2_mod599                                                0.063 0.950135
```

```
## diag2_mod682                                                   1.990 0.046637
## diag2_mod707                                                   2.027 0.042666
## diag2_mod780                                                  -0.314 0.753313
## diag2_modOther                                                 2.233 0.025517
## diag3_mod250.02                                                2.831 0.004646
## diag3_mod250.6                                                 5.991 2.09e-09
## diag3_mod272                                                  -0.874 0.382123
## diag3_mod276                                                   1.236 0.216503
## diag3_mod285                                                  -0.364 0.715673
## diag3_mod401                                                  -0.332 0.740227
## diag3_mod403                                                   4.537 5.70e-06
## diag3_mod414                                                  -0.357 0.721403
## diag3_mod424                                                  -0.024 0.980920
## diag3_mod425                                                   0.680 0.496339
## diag3_mod427                                                   1.173 0.240654
## diag3_mod428                                                   1.542 0.123063
## diag3_mod496                                                   2.836 0.004562
## diag3_mod585                                                   4.517 6.26e-06
## diag3_mod599                                                   0.821 0.411724
## diag3_mod707                                                   2.299 0.021529
## diag3_mod780                                                   1.032 0.301879
## diag3_modOther                                                 3.607 0.000310
## diag3_modV45                                                  -0.755 0.450014
##
## (Intercept)                                               ***
## encounter_id                                              ***
## num_medications                                           **
## number_emergency                                          ***
## number_inpatient                                          ***
## number_diagnoses                                          ***
## A1Cresult>8
## A1CresultNone
## A1CresultNorm
## metforminNo
## metforminSteady                                           .
## metforminUp                                               *
## insulinNo                                                 **
## insulinSteady                                             ***
## insulinUp                                                 .
## diabetesMedYes                                            ***
## disch_disp_modifiedDischarged to home with Home Health Service ***
## disch_disp_modifiedDischarged/Transferred to SNF         ***
## disch_disp_modifiedOther                                  ***
## age_mod20-59                                              **
## age_mod60-79                                              **
## age_mod80+                                                **
## diag1_mod250.8                                            ***
## diag1_mod276                                              *
## diag1_mod38                                               ***
## diag1_mod410                                              ***
## diag1_mod414                                              ***
## diag1_mod427                                              ***
## diag1_mod428                                              *
## diag1_mod434
```

```
## diag1_mod435                                          ***
## diag1_mod486                                          ***
## diag1_mod491                                          **
## diag1_mod493                                          ***
## diag1_mod518                                          ***
## diag1_mod577
## diag1_mod584                                          **
## diag1_mod599                                          ***
## diag1_mod682                                          ***
## diag1_mod715                                          **
## diag1_mod780                                          ***
## diag1_mod786                                          ***
## diag1_mod820
## diag1_mod996                                          ***
## diag1_modOther                                        ***
## diag2_mod250.01                                       **
## diag2_mod250.02
## diag2_mod276                                          *
## diag2_mod285
## diag2_mod401
## diag2_mod403                                          *
## diag2_mod411
## diag2_mod413
## diag2_mod414
## diag2_mod424
## diag2_mod425
## diag2_mod427
## diag2_mod428                                          *
## diag2_mod486
## diag2_mod491                                          *
## diag2_mod496
## diag2_mod518
## diag2_mod584
## diag2_mod585                                          *
## diag2_mod599
## diag2_mod682                                          *
## diag2_mod707                                          *
## diag2_mod780
## diag2_modOther                                        *
## diag3_mod250.02                                       **
## diag3_mod250.6                                        ***
## diag3_mod272
## diag3_mod276
## diag3_mod285
## diag3_mod401
## diag3_mod403                                          ***
## diag3_mod414
## diag3_mod424
## diag3_mod425
## diag3_mod427
## diag3_mod428
## diag3_mod496                                          **
## diag3_mod585                                          ***
## diag3_mod599
```

```
## diag3_mod707                                                            *
## diag3_mod780
## diag3_modOther                                                          ***
## diag3_modV45
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 69205  on 98143  degrees of freedom
## Residual deviance: 66158  on 98056  degrees of freedom
## AIC: 66334
##
## Number of Fisher Scoring iterations: 5


##
## Call:
## glm(formula = '<30' ~ encounter_id + num_medications + number_emergency +
##     number_inpatient + number_diagnoses + metformin + insulin +
##     diabetesMed + disch_disp_modified + age_mod + diag1_mod +
##     diag2_mod + diag3_mod, family = binomial(logit), data = encoded_data)
##
## Deviance Residuals:
##     Min       1Q   Median       3Q      Max
## -2.4731  -0.5089  -0.4339  -0.3708   2.5962
##
## Coefficients:
##                                                              Estimate
## (Intercept)                                                  -2.916e+00
## encounter_id                                                 -6.552e-10
## num_medications                                               4.203e-03
## number_emergency                                              4.064e-02
## number_inpatient                                              2.517e-01
## number_diagnoses                                              2.716e-02
## metforminNo                                                  -1.508e-01
## metforminSteady                                              -2.363e-01
## metforminUp                                                  -4.038e-01
## insulinNo                                                    -1.148e-01
## insulinSteady                                                -1.357e-01
## insulinUp                                                    -7.022e-02
## diabetesMedYes                                                1.922e-01
## disch_disp_modifiedDischarged to home with Home Health Service 1.874e-01
## disch_disp_modifiedDischarged/Transferred to SNF             3.613e-01
## disch_disp_modifiedOther                                      3.765e-01
## age_mod20-59                                                  5.097e-01
## age_mod60-79                                                  6.359e-01
## age_mod80+                                                    6.177e-01
## diag1_mod250.8                                               -5.266e-01
## diag1_mod276                                                 -2.210e-01
## diag1_mod38                                                  -5.338e-01
## diag1_mod410                                                 -3.691e-01
## diag1_mod414                                                 -4.013e-01
## diag1_mod427                                                 -4.720e-01
## diag1_mod428                                                 -2.180e-01
```

```
## diag1_mod434                                              7.627e-02
## diag1_mod435                                             -6.087e-01
## diag1_mod486                                             -6.858e-01
## diag1_mod491                                             -3.166e-01
## diag1_mod493                                             -4.642e-01
## diag1_mod518                                             -7.599e-01
## diag1_mod577                                             -1.619e-01
## diag1_mod584                                             -3.290e-01
## diag1_mod599                                             -5.413e-01
## diag1_mod682                                             -6.042e-01
## diag1_mod715                                             -2.985e-01
## diag1_mod780                                             -5.105e-01
## diag1_mod786                                             -5.988e-01
## diag1_mod820                                             -6.362e-02
## diag1_mod996                                             -3.533e-01
## diag1_modOther                                           -3.385e-01
## diag2_mod250.01                                           3.181e-01
## diag2_mod250.02                                           1.322e-01
## diag2_mod276                                              1.544e-01
## diag2_mod285                                             -1.457e-01
## diag2_mod401                                             -8.934e-02
## diag2_mod403                                              1.759e-01
## diag2_mod411                                              8.314e-02
## diag2_mod413                                             -7.198e-02
## diag2_mod414                                             -6.335e-03
## diag2_mod424                                              4.726e-02
## diag2_mod425                                              1.313e-01
## diag2_mod427                                              6.386e-02
## diag2_mod428                                              1.507e-01
## diag2_mod486                                             -7.589e-02
## diag2_mod491                                              2.484e-01
## diag2_mod496                                              3.743e-02
## diag2_mod518                                             -1.463e-01
## diag2_mod584                                              2.713e-02
## diag2_mod585                                              2.007e-01
## diag2_mod599                                              1.678e-03
## diag2_mod682                                              1.912e-01
## diag2_mod707                                              1.764e-01
## diag2_mod780                                             -3.532e-02
## diag2_modOther                                            1.291e-01
## diag3_mod250.02                                           2.466e-01
## diag3_mod250.6                                            5.386e-01
## diag3_mod272                                             -9.077e-02
## diag3_mod276                                              6.964e-02
## diag3_mod285                                             -3.880e-02
## diag3_mod401                                             -1.976e-02
## diag3_mod403                                              3.211e-01
## diag3_mod414                                             -2.586e-02
## diag3_mod424                                             -5.086e-03
## diag3_mod425                                              6.891e-02
## diag3_mod427                                              7.438e-02
## diag3_mod428                                              9.274e-02
## diag3_mod496                                              2.003e-01
## diag3_mod585                                              3.416e-01
```

```
## diag3_mod599                                                   6.377e-02
## diag3_mod707                                                   2.007e-01
## diag3_mod780                                                   9.672e-02
## diag3_modOther                                                 1.452e-01
## diag3_modV45                                                  -7.581e-02
##                                                               Std. Error
## (Intercept)                                                    2.563e-01
## encounter_id                                                   1.117e-10
## num_medications                                                1.427e-03
## number_emergency                                               8.668e-03
## number_inpatient                                               6.659e-03
## number_diagnoses                                               7.195e-03
## metforminNo                                                    1.326e-01
## metforminSteady                                                1.341e-01
## metforminUp                                                    1.742e-01
## insulinNo                                                      3.678e-02
## insulinSteady                                                  3.348e-02
## insulinUp                                                      3.989e-02
## diabetesMedYes                                                 3.351e-02
## disch_disp_modifiedDischarged to home with Home Health Service 3.204e-02
## disch_disp_modifiedDischarged/Transferred to SNF               3.176e-02
## disch_disp_modifiedOther                                       2.979e-02
## age_mod20-59                                                   1.863e-01
## age_mod60-79                                                   1.865e-01
## age_mod80+                                                     1.876e-01
## diag1_mod250.8                                                 1.143e-01
## diag1_mod276                                                   1.064e-01
## diag1_mod38                                                    1.137e-01
## diag1_mod410                                                   1.003e-01
## diag1_mod414                                                   9.880e-02
## diag1_mod427                                                   1.058e-01
## diag1_mod428                                                   8.917e-02
## diag1_mod434                                                   1.025e-01
## diag1_mod435                                                   1.456e-01
## diag1_mod486                                                   1.018e-01
## diag1_mod491                                                   1.049e-01
## diag1_mod493                                                   1.361e-01
## diag1_mod518                                                   1.340e-01
## diag1_mod577                                                   1.243e-01
## diag1_mod584                                                   1.126e-01
## diag1_mod599                                                   1.155e-01
## diag1_mod682                                                   1.129e-01
## diag1_mod715                                                   1.127e-01
## diag1_mod780                                                   1.121e-01
## diag1_mod786                                                   1.024e-01
## diag1_mod820                                                   1.196e-01
## diag1_mod996                                                   1.057e-01
## diag1_modOther                                                 8.142e-02
## diag2_mod250.01                                                9.694e-02
## diag2_mod250.02                                                9.154e-02
## diag2_mod276                                                   6.947e-02
## diag2_mod285                                                   1.076e-01
## diag2_mod401                                                   8.729e-02
## diag2_mod403                                                   8.162e-02
```

```
## diag2_mod411                                                          9.946e-02
## diag2_mod413                                                          1.323e-01
## diag2_mod414                                                          9.295e-02
## diag2_mod424                                                          1.182e-01
## diag2_mod425                                                          1.016e-01
## diag2_mod427                                                          7.361e-02
## diag2_mod428                                                          6.958e-02
## diag2_mod486                                                          1.084e-01
## diag2_mod491                                                          9.996e-02
## diag2_mod496                                                          8.058e-02
## diag2_mod518                                                          1.093e-01
## diag2_mod584                                                          9.839e-02
## diag2_mod585                                                          9.053e-02
## diag2_mod599                                                          8.138e-02
## diag2_mod682                                                          1.005e-01
## diag2_mod707                                                          8.955e-02
## diag2_mod780                                                          1.058e-01
## diag2_modOther                                                        5.872e-02
## diag3_mod250.02                                                       9.111e-02
## diag3_mod250.6                                                        9.102e-02
## diag3_mod272                                                          9.905e-02
## diag3_mod276                                                          5.978e-02
## diag3_mod285                                                          1.044e-01
## diag3_mod401                                                          5.613e-02
## diag3_mod403                                                          7.113e-02
## diag3_mod414                                                          6.978e-02
## diag3_mod424                                                          1.102e-01
## diag3_mod425                                                          1.028e-01
## diag3_mod427                                                          6.419e-02
## diag3_mod428                                                          6.107e-02
## diag3_mod496                                                          7.090e-02
## diag3_mod585                                                          7.598e-02
## diag3_mod599                                                          8.158e-02
## diag3_mod707                                                          8.916e-02
## diag3_mod780                                                          9.636e-02
## diag3_modOther                                                        4.082e-02
## diag3_modV45                                                          1.033e-01
##                                                                       z value Pr(>|z|)
## (Intercept)                                                           -11.376  < 2e-16
## encounter_id                                                           -5.864 4.52e-09
## num_medications                                                         2.945 0.003232
## number_emergency                                                        4.689 2.74e-06
## number_inpatient                                                       37.794  < 2e-16
## number_diagnoses                                                        3.774 0.000161
## metforminNo                                                            -1.137 0.255339
## metforminSteady                                                        -1.762 0.078047
## metforminUp                                                            -2.318 0.020440
## insulinNo                                                              -3.121 0.001802
## insulinSteady                                                          -4.055 5.02e-05
## insulinUp                                                              -1.760 0.078362
## diabetesMedYes                                                          5.736 9.72e-09
## disch_disp_modifiedDischarged to home with Home Health Service         5.848 4.96e-09
## disch_disp_modifiedDischarged/Transferred to SNF                      11.374  < 2e-16
## disch_disp_modifiedOther                                              12.640  < 2e-16
```

```
## age_mod20-59                                                       2.736 0.006226
## age_mod60-79                                                       3.410 0.000649
## age_mod80+                                                         3.292 0.000995
## diag1_mod250.8                                                    -4.608 4.08e-06
## diag1_mod276                                                      -2.077 0.037821
## diag1_mod38                                                       -4.694 2.68e-06
## diag1_mod410                                                      -3.679 0.000234
## diag1_mod414                                                      -4.061 4.88e-05
## diag1_mod427                                                      -4.460 8.21e-06
## diag1_mod428                                                      -2.445 0.014486
## diag1_mod434                                                       0.744 0.456939
## diag1_mod435                                                      -4.181 2.90e-05
## diag1_mod486                                                      -6.740 1.59e-11
## diag1_mod491                                                      -3.019 0.002540
## diag1_mod493                                                      -3.410 0.000650
## diag1_mod518                                                      -5.670 1.43e-08
## diag1_mod577                                                      -1.302 0.192755
## diag1_mod584                                                      -2.921 0.003487
## diag1_mod599                                                      -4.688 2.76e-06
## diag1_mod682                                                      -5.351 8.75e-08
## diag1_mod715                                                      -2.650 0.008052
## diag1_mod780                                                      -4.552 5.31e-06
## diag1_mod786                                                      -5.849 4.95e-09
## diag1_mod820                                                      -0.532 0.594865
## diag1_mod996                                                      -3.344 0.000827
## diag1_modOther                                                    -4.157 3.22e-05
## diag2_mod250.01                                                    3.282 0.001032
## diag2_mod250.02                                                    1.445 0.148585
## diag2_mod276                                                       2.223 0.026231
## diag2_mod285                                                      -1.355 0.175519
## diag2_mod401                                                      -1.023 0.306080
## diag2_mod403                                                       2.155 0.031183
## diag2_mod411                                                       0.836 0.403214
## diag2_mod413                                                      -0.544 0.586365
## diag2_mod414                                                      -0.068 0.945661
## diag2_mod424                                                       0.400 0.689149
## diag2_mod425                                                       1.293 0.196005
## diag2_mod427                                                       0.867 0.385669
## diag2_mod428                                                       2.166 0.030330
## diag2_mod486                                                      -0.700 0.483991
## diag2_mod491                                                       2.485 0.012961
## diag2_mod496                                                       0.465 0.642286
## diag2_mod518                                                      -1.339 0.180694
## diag2_mod584                                                       0.276 0.782727
## diag2_mod585                                                       2.217 0.026615
## diag2_mod599                                                       0.021 0.983552
## diag2_mod682                                                       1.903 0.057094
## diag2_mod707                                                       1.970 0.048832
## diag2_mod780                                                      -0.334 0.738488
## diag2_modOther                                                     2.198 0.027943
## diag3_mod250.02                                                    2.707 0.006788
## diag3_mod250.6                                                     5.917 3.27e-09
## diag3_mod272                                                      -0.916 0.359474
## diag3_mod276                                                       1.165 0.244024
```

```
## diag3_mod285                                                   -0.372 0.710064
## diag3_mod401                                                   -0.352 0.724735
## diag3_mod403                                                    4.515 6.33e-06
## diag3_mod414                                                   -0.371 0.710953
## diag3_mod424                                                   -0.046 0.963182
## diag3_mod425                                                    0.671 0.502504
## diag3_mod427                                                    1.159 0.246544
## diag3_mod428                                                    1.519 0.128868
## diag3_mod496                                                    2.825 0.004724
## diag3_mod585                                                    4.496 6.92e-06
## diag3_mod599                                                    0.782 0.434396
## diag3_mod707                                                    2.251 0.024363
## diag3_mod780                                                    1.004 0.315513
## diag3_modOther                                                  3.558 0.000374
## diag3_modV45                                                   -0.733 0.463260
##
## (Intercept)                                                  ***
## encounter_id                                                 ***
## num_medications                                              **
## number_emergency                                             ***
## number_inpatient                                             ***
## number_diagnoses                                             ***
## metforminNo
## metforminSteady                                              .
## metforminUp                                                  *
## insulinNo                                                    **
## insulinSteady                                                ***
## insulinUp                                                    .
## diabetesMedYes                                               ***
## disch_disp_modifiedDischarged to home with Home Health Service ***
## disch_disp_modifiedDischarged/Transferred to SNF            ***
## disch_disp_modifiedOther                                     ***
## age_mod20-59                                                 **
## age_mod60-79                                                 ***
## age_mod80+                                                   ***
## diag1_mod250.8                                               ***
## diag1_mod276                                                 *
## diag1_mod38                                                  ***
## diag1_mod410                                                 ***
## diag1_mod414                                                 ***
## diag1_mod427                                                 ***
## diag1_mod428                                                 *
## diag1_mod434
## diag1_mod435                                                 ***
## diag1_mod486                                                 ***
## diag1_mod491                                                 **
## diag1_mod493                                                 ***
## diag1_mod518                                                 ***
## diag1_mod577
## diag1_mod584                                                 **
## diag1_mod599                                                 ***
## diag1_mod682                                                 ***
## diag1_mod715                                                 **
## diag1_mod780                                                 ***
```

```
## diag1_mod786                                              ***
## diag1_mod820
## diag1_mod996                                              ***
## diag1_modOther                                            ***
## diag2_mod250.01                                           **
## diag2_mod250.02
## diag2_mod276                                              *
## diag2_mod285
## diag2_mod401
## diag2_mod403                                              *
## diag2_mod411
## diag2_mod413
## diag2_mod414
## diag2_mod424
## diag2_mod425
## diag2_mod427
## diag2_mod428                                              *
## diag2_mod486
## diag2_mod491                                              *
## diag2_mod496
## diag2_mod518
## diag2_mod584
## diag2_mod585                                              *
## diag2_mod599
## diag2_mod682                                              .
## diag2_mod707                                              *
## diag2_mod780
## diag2_modOther                                            *
## diag3_mod250.02                                           **
## diag3_mod250.6                                            ***
## diag3_mod272
## diag3_mod276
## diag3_mod285
## diag3_mod401
## diag3_mod403                                              ***
## diag3_mod414
## diag3_mod424
## diag3_mod425
## diag3_mod427
## diag3_mod428
## diag3_mod496                                              **
## diag3_mod585                                              ***
## diag3_mod599
## diag3_mod707                                              *
## diag3_mod780
## diag3_modOther                                            ***
## diag3_modV45
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 69205  on 98143  degrees of freedom
## Residual deviance: 66166  on 98059  degrees of freedom
```

```
## AIC: 66336
##
## Number of Fisher Scoring iterations: 5


##
## Call:
## glm(formula = '<30' ~ encounter_id + number_emergency + number_inpatient +
##     number_diagnoses + metformin + insulin + diabetesMed + disch_disp_modified +
##     age_mod + diag1_mod + diag2_mod + diag3_mod, family = binomial(logit),
##     data = encoded_data)
##
## Deviance Residuals:
##     Min       1Q   Median       3Q      Max
## -2.4809  -0.5089  -0.4341  -0.3711   2.5910
##
## Coefficients:
##                                                               Estimate
## (Intercept)                                                   -2.886e+00
## encounter_id                                                  -6.564e-10
## number_emergency                                              4.027e-02
## number_inpatient                                              2.523e-01
## number_diagnoses                                              3.067e-02
## metforminNo                                                   -1.640e-01
## metforminSteady                                               -2.431e-01
## metforminUp                                                   -4.079e-01
## insulinNo                                                     -1.299e-01
## insulinSteady                                                 -1.453e-01
## insulinUp                                                     -6.808e-02
## diabetesMedYes                                                1.975e-01
## disch_disp_modifiedDischarged to home with Home Health Service 1.992e-01
## disch_disp_modifiedDischarged/Transferred to SNF             3.716e-01
## disch_disp_modifiedOther                                      3.840e-01
## age_mod20-59                                                  5.262e-01
## age_mod60-79                                                  6.514e-01
## age_mod80+                                                    6.253e-01
## diag1_mod250.8                                                -5.300e-01
## diag1_mod276                                                  -2.312e-01
## diag1_mod38                                                   -5.267e-01
## diag1_mod410                                                  -3.457e-01
## diag1_mod414                                                  -3.720e-01
## diag1_mod427                                                  -4.709e-01
## diag1_mod428                                                  -2.144e-01
## diag1_mod434                                                  6.659e-02
## diag1_mod435                                                  -6.182e-01
## diag1_mod486                                                  -6.787e-01
## diag1_mod491                                                  -3.024e-01
## diag1_mod493                                                  -4.486e-01
## diag1_mod518                                                  -7.477e-01
## diag1_mod577                                                  -1.606e-01
## diag1_mod584                                                  -3.264e-01
## diag1_mod599                                                  -5.453e-01
## diag1_mod682                                                  -6.031e-01
## diag1_mod715                                                  -2.691e-01
## diag1_mod780                                                  -5.208e-01
```

```
## diag1_mod786                                            -6.027e-01
## diag1_mod820                                            -4.536e-02
## diag1_mod996                                            -3.390e-01
## diag1_modOther                                          -3.342e-01
## diag2_mod250.01                                          3.176e-01
## diag2_mod250.02                                          1.307e-01
## diag2_mod276                                             1.499e-01
## diag2_mod285                                            -1.409e-01
## diag2_mod401                                            -8.705e-02
## diag2_mod403                                             1.834e-01
## diag2_mod411                                             8.162e-02
## diag2_mod413                                            -7.707e-02
## diag2_mod414                                            -2.356e-03
## diag2_mod424                                             4.831e-02
## diag2_mod425                                             1.349e-01
## diag2_mod427                                             6.823e-02
## diag2_mod428                                             1.563e-01
## diag2_mod486                                            -6.640e-02
## diag2_mod491                                             2.600e-01
## diag2_mod496                                             4.367e-02
## diag2_mod518                                            -1.306e-01
## diag2_mod584                                             3.428e-02
## diag2_mod585                                             2.059e-01
## diag2_mod599                                             1.493e-03
## diag2_mod682                                             1.952e-01
## diag2_mod707                                             1.808e-01
## diag2_mod780                                            -3.770e-02
## diag2_modOther                                           1.318e-01
## diag3_mod250.02                                          2.505e-01
## diag3_mod250.6                                           5.395e-01
## diag3_mod272                                            -9.463e-02
## diag3_mod276                                             6.899e-02
## diag3_mod285                                            -2.953e-02
## diag3_mod401                                            -1.889e-02
## diag3_mod403                                             3.278e-01
## diag3_mod414                                            -2.372e-02
## diag3_mod424                                            -4.777e-03
## diag3_mod425                                             7.351e-02
## diag3_mod427                                             7.974e-02
## diag3_mod428                                             9.802e-02
## diag3_mod496                                             2.072e-01
## diag3_mod585                                             3.456e-01
## diag3_mod599                                             6.608e-02
## diag3_mod707                                             2.070e-01
## diag3_mod780                                             9.454e-02
## diag3_modOther                                           1.479e-01
## diag3_modV45                                            -7.906e-02
##                                                         Std. Error
## (Intercept)                                              2.561e-01
## encounter_id                                             1.117e-10
## number_emergency                                         8.661e-03
## number_inpatient                                         6.658e-03
## number_diagnoses                                         7.094e-03
## metforminNo                                              1.325e-01
```

```
## metforminSteady                                                   1.340e-01
## metforminUp                                                       1.742e-01
## insulinNo                                                         3.642e-02
## insulinSteady                                                     3.332e-02
## insulinUp                                                         3.989e-02
## diabetesMedYes                                                    3.347e-02
## disch_disp_modifiedDischarged to home with Home Health Service    3.180e-02
## disch_disp_modifiedDischarged/Transferred to SNF                  3.157e-02
## disch_disp_modifiedOther                                          2.967e-02
## age_mod20-59                                                      1.862e-01
## age_mod60-79                                                      1.864e-01
## age_mod80+                                                        1.876e-01
## diag1_mod250.8                                                    1.143e-01
## diag1_mod276                                                      1.063e-01
## diag1_mod38                                                       1.137e-01
## diag1_mod410                                                      1.000e-01
## diag1_mod414                                                      9.829e-02
## diag1_mod427                                                      1.058e-01
## diag1_mod428                                                      8.914e-02
## diag1_mod434                                                      1.025e-01
## diag1_mod435                                                      1.455e-01
## diag1_mod486                                                      1.017e-01
## diag1_mod491                                                      1.047e-01
## diag1_mod493                                                      1.360e-01
## diag1_mod518                                                      1.339e-01
## diag1_mod577                                                      1.243e-01
## diag1_mod584                                                      1.126e-01
## diag1_mod599                                                      1.155e-01
## diag1_mod682                                                      1.129e-01
## diag1_mod715                                                      1.122e-01
## diag1_mod780                                                      1.121e-01
## diag1_mod786                                                      1.024e-01
## diag1_mod820                                                      1.195e-01
## diag1_mod996                                                      1.055e-01
## diag1_modOther                                                    8.138e-02
## diag2_mod250.01                                                   9.695e-02
## diag2_mod250.02                                                   9.153e-02
## diag2_mod276                                                      6.944e-02
## diag2_mod285                                                      1.076e-01
## diag2_mod401                                                      8.728e-02
## diag2_mod403                                                      8.158e-02
## diag2_mod411                                                      9.948e-02
## diag2_mod413                                                      1.323e-01
## diag2_mod414                                                      9.293e-02
## diag2_mod424                                                      1.181e-01
## diag2_mod425                                                      1.015e-01
## diag2_mod427                                                      7.359e-02
## diag2_mod428                                                      6.954e-02
## diag2_mod486                                                      1.084e-01
## diag2_mod491                                                      9.988e-02
## diag2_mod496                                                      8.053e-02
## diag2_mod518                                                      1.092e-01
## diag2_mod584                                                      9.835e-02
## diag2_mod585                                                      9.051e-02
```

```
## diag2_mod599                                                  8.137e-02
## diag2_mod682                                                  1.004e-01
## diag2_mod707                                                  8.952e-02
## diag2_mod780                                                  1.058e-01
## diag2_modOther                                                5.870e-02
## diag3_mod250.02                                               9.108e-02
## diag3_mod250.6                                                9.102e-02
## diag3_mod272                                                  9.903e-02
## diag3_mod276                                                  5.977e-02
## diag3_mod285                                                  1.043e-01
## diag3_mod401                                                  5.612e-02
## diag3_mod403                                                  7.109e-02
## diag3_mod414                                                  6.977e-02
## diag3_mod424                                                  1.102e-01
## diag3_mod425                                                  1.027e-01
## diag3_mod427                                                  6.416e-02
## diag3_mod428                                                  6.103e-02
## diag3_mod496                                                  7.086e-02
## diag3_mod585                                                  7.596e-02
## diag3_mod599                                                  8.157e-02
## diag3_mod707                                                  8.912e-02
## diag3_mod780                                                  9.634e-02
## diag3_modOther                                                4.079e-02
## diag3_modV45                                                  1.033e-01
##                                                             z value Pr(>|z|)
## (Intercept)                                                 -11.270  < 2e-16
## encounter_id                                                 -5.877 4.18e-09
## number_emergency                                              4.649 3.34e-06
## number_inpatient                                             37.888  < 2e-16
## number_diagnoses                                              4.324 1.53e-05
## metforminNo                                                  -1.238 0.215825
## metforminSteady                                              -1.813 0.069803
## metforminUp                                                  -2.342 0.019205
## insulinNo                                                    -3.567 0.000362
## insulinSteady                                                -4.360 1.30e-05
## insulinUp                                                    -1.707 0.087841
## diabetesMedYes                                                5.901 3.61e-09
## disch_disp_modifiedDischarged to home with Home Health Service  6.263 3.77e-10
## disch_disp_modifiedDischarged/Transferred to SNF            11.771  < 2e-16
## disch_disp_modifiedOther                                     12.943  < 2e-16
## age_mod20-59                                                  2.825 0.004721
## age_mod60-79                                                  3.495 0.000475
## age_mod80+                                                    3.333 0.000859
## diag1_mod250.8                                               -4.639 3.51e-06
## diag1_mod276                                                 -2.175 0.029644
## diag1_mod38                                                  -4.633 3.60e-06
## diag1_mod410                                                 -3.458 0.000545
## diag1_mod414                                                 -3.785 0.000154
## diag1_mod427                                                 -4.450 8.58e-06
## diag1_mod428                                                 -2.405 0.016166
## diag1_mod434                                                  0.650 0.515715
## diag1_mod435                                                 -4.248 2.16e-05
## diag1_mod486                                                 -6.673 2.51e-11
## diag1_mod491                                                 -2.887 0.003890
```

```
## diag1_mod493                                    -3.298 0.000972
## diag1_mod518                                    -5.582 2.38e-08
## diag1_mod577                                    -1.292 0.196323
## diag1_mod584                                    -2.899 0.003745
## diag1_mod599                                    -4.723 2.32e-06
## diag1_mod682                                    -5.342 9.17e-08
## diag1_mod715                                    -2.398 0.016474
## diag1_mod780                                    -4.647 3.36e-06
## diag1_mod786                                    -5.888 3.91e-09
## diag1_mod820                                    -0.380 0.704157
## diag1_mod996                                    -3.212 0.001317
## diag1_modOther                                  -4.106 4.02e-05
## diag2_mod250.01                                  3.276 0.001054
## diag2_mod250.02                                  1.428 0.153379
## diag2_mod276                                     2.159 0.030844
## diag2_mod285                                    -1.310 0.190266
## diag2_mod401                                    -0.997 0.318573
## diag2_mod403                                     2.249 0.024540
## diag2_mod411                                     0.820 0.411979
## diag2_mod413                                    -0.583 0.560204
## diag2_mod414                                    -0.025 0.979772
## diag2_mod424                                     0.409 0.682584
## diag2_mod425                                     1.328 0.184026
## diag2_mod427                                     0.927 0.353796
## diag2_mod428                                     2.248 0.024600
## diag2_mod486                                    -0.613 0.540038
## diag2_mod491                                     2.603 0.009246
## diag2_mod496                                     0.542 0.587632
## diag2_mod518                                    -1.196 0.231554
## diag2_mod584                                     0.349 0.727435
## diag2_mod585                                     2.275 0.022921
## diag2_mod599                                     0.018 0.985357
## diag2_mod682                                     1.943 0.052013
## diag2_mod707                                     2.019 0.043478
## diag2_mod780                                    -0.356 0.721543
## diag2_modOther                                   2.245 0.024765
## diag3_mod250.02                                  2.751 0.005947
## diag3_mod250.6                                   5.927 3.08e-09
## diag3_mod272                                    -0.956 0.339322
## diag3_mod276                                     1.154 0.248410
## diag3_mod285                                    -0.283 0.777118
## diag3_mod401                                    -0.337 0.736410
## diag3_mod403                                     4.611 4.00e-06
## diag3_mod414                                    -0.340 0.733857
## diag3_mod424                                    -0.043 0.965416
## diag3_mod425                                     0.716 0.474266
## diag3_mod427                                     1.243 0.213953
## diag3_mod428                                     1.606 0.108278
## diag3_mod496                                     2.924 0.003451
## diag3_mod585                                     4.549 5.38e-06
## diag3_mod599                                     0.810 0.417845
## diag3_mod707                                     2.323 0.020188
## diag3_mod780                                     0.981 0.326421
## diag3_modOther                                   3.625 0.000288
```

```
## diag3_modV45                                                 -0.765 0.444286
##
## (Intercept)                                                  ***
## encounter_id                                                 ***
## number_emergency                                             ***
## number_inpatient                                             ***
## number_diagnoses                                             ***
## metforminNo
## metforminSteady                                              .
## metforminUp                                                  *
## insulinNo                                                    ***
## insulinSteady                                                ***
## insulinUp                                                    .
## diabetesMedYes                                               ***
## disch_disp_modifiedDischarged to home with Home Health Service ***
## disch_disp_modifiedDischarged/Transferred to SNF            ***
## disch_disp_modifiedOther                                     ***
## age_mod20-59                                                 **
## age_mod60-79                                                 ***
## age_mod80+                                                   ***
## diag1_mod250.8                                               ***
## diag1_mod276                                                 *
## diag1_mod38                                                  ***
## diag1_mod410                                                 ***
## diag1_mod414                                                 ***
## diag1_mod427                                                 ***
## diag1_mod428                                                 *
## diag1_mod434
## diag1_mod435                                                 ***
## diag1_mod486                                                 ***
## diag1_mod491                                                 **
## diag1_mod493                                                 ***
## diag1_mod518                                                 ***
## diag1_mod577
## diag1_mod584                                                 **
## diag1_mod599                                                 ***
## diag1_mod682                                                 ***
## diag1_mod715                                                 *
## diag1_mod780                                                 ***
## diag1_mod786                                                 ***
## diag1_mod820
## diag1_mod996                                                 **
## diag1_modOther                                               ***
## diag2_mod250.01                                              **
## diag2_mod250.02
## diag2_mod276                                                 *
## diag2_mod285
## diag2_mod401
## diag2_mod403                                                 *
## diag2_mod411
## diag2_mod413
## diag2_mod414
## diag2_mod424
## diag2_mod425
```

```
## diag2_mod427
## diag2_mod428                                                    *
## diag2_mod486
## diag2_mod491                                                   **
## diag2_mod496
## diag2_mod518
## diag2_mod584
## diag2_mod585                                                    *
## diag2_mod599
## diag2_mod682                                                    .
## diag2_mod707                                                    *
## diag2_mod780
## diag2_modOther                                                  *
## diag3_mod250.02                                                **
## diag3_mod250.6                                                 ***
## diag3_mod272
## diag3_mod276
## diag3_mod285
## diag3_mod401
## diag3_mod403                                                   ***
## diag3_mod414
## diag3_mod424
## diag3_mod425
## diag3_mod427
## diag3_mod428
## diag3_mod496                                                   **
## diag3_mod585                                                  ***
## diag3_mod599
## diag3_mod707                                                    *
## diag3_mod780
## diag3_modOther                                                 ***
## diag3_modV45
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 69205  on 98143  degrees of freedom
## Residual deviance: 66175  on 98060  degrees of freedom
## AIC: 66343
##
## Number of Fisher Scoring iterations: 5


##
## Call:
## glm(formula = '<30' ~ encounter_id + number_emergency + number_inpatient +
##     number_diagnoses + insulin + diabetesMed + disch_disp_modified +
##     age_mod + diag1_mod + diag2_mod + diag3_mod, family = binomial(logit),
##     data = encoded_data)
##
## Deviance Residuals:
##     Min       1Q   Median       3Q      Max
## -2.4818  -0.5086  -0.4342  -0.3718   2.5939
##
```

```
## Coefficients:
##                                                                  Estimate
## (Intercept)                                                      -3.031e+00
## encounter_id                                                     -6.729e-10
## number_emergency                                                  4.025e-02
## number_inpatient                                                  2.533e-01
## number_diagnoses                                                  3.102e-02
## insulinNo                                                        -1.484e-01
## insulinSteady                                                    -1.482e-01
## insulinUp                                                        -6.931e-02
## diabetesMedYes                                                    1.684e-01
## disch_disp_modifiedDischarged to home with Home Health Service    1.975e-01
## disch_disp_modifiedDischarged/Transferred to SNF                  3.712e-01
## disch_disp_modifiedOther                                          3.845e-01
## age_mod20-59                                                      5.162e-01
## age_mod60-79                                                      6.444e-01
## age_mod80+                                                        6.233e-01
## diag1_mod250.8                                                   -5.315e-01
## diag1_mod276                                                     -2.301e-01
## diag1_mod38                                                      -5.267e-01
## diag1_mod410                                                     -3.434e-01
## diag1_mod414                                                     -3.686e-01
## diag1_mod427                                                     -4.730e-01
## diag1_mod428                                                     -2.114e-01
## diag1_mod434                                                      6.207e-02
## diag1_mod435                                                     -6.260e-01
## diag1_mod486                                                     -6.803e-01
## diag1_mod491                                                     -3.074e-01
## diag1_mod493                                                     -4.584e-01
## diag1_mod518                                                     -7.474e-01
## diag1_mod577                                                     -1.576e-01
## diag1_mod584                                                     -3.203e-01
## diag1_mod599                                                     -5.449e-01
## diag1_mod682                                                     -6.087e-01
## diag1_mod715                                                     -2.783e-01
## diag1_mod780                                                     -5.241e-01
## diag1_mod786                                                     -6.026e-01
## diag1_mod820                                                     -4.668e-02
## diag1_mod996                                                     -3.387e-01
## diag1_modOther                                                   -3.351e-01
## diag2_mod250.01                                                   3.249e-01
## diag2_mod250.02                                                   1.244e-01
## diag2_mod276                                                      1.534e-01
## diag2_mod285                                                     -1.384e-01
## diag2_mod401                                                     -8.762e-02
## diag2_mod403                                                      1.940e-01
## diag2_mod411                                                      8.358e-02
## diag2_mod413                                                     -7.549e-02
## diag2_mod414                                                      1.634e-03
## diag2_mod424                                                      4.973e-02
## diag2_mod425                                                      1.394e-01
## diag2_mod427                                                      7.003e-02
## diag2_mod428                                                      1.620e-01
## diag2_mod486                                                     -6.370e-02
```

```
## diag2_mod491                                                  2.577e-01
## diag2_mod496                                                  4.566e-02
## diag2_mod518                                                 -1.274e-01
## diag2_mod584                                                  4.256e-02
## diag2_mod585                                                  2.180e-01
## diag2_mod599                                                  4.118e-03
## diag2_mod682                                                  1.940e-01
## diag2_mod707                                                  1.819e-01
## diag2_mod780                                                 -3.723e-02
## diag2_modOther                                                1.339e-01
## diag3_mod250.02                                               2.502e-01
## diag3_mod250.6                                                5.428e-01
## diag3_mod272                                                 -9.357e-02
## diag3_mod276                                                  7.239e-02
## diag3_mod285                                                 -2.696e-02
## diag3_mod401                                                 -1.938e-02
## diag3_mod403                                                  3.386e-01
## diag3_mod414                                                 -2.065e-02
## diag3_mod424                                                 -1.272e-03
## diag3_mod425                                                  7.857e-02
## diag3_mod427                                                  8.287e-02
## diag3_mod428                                                  1.033e-01
## diag3_mod496                                                  2.104e-01
## diag3_mod585                                                  3.548e-01
## diag3_mod599                                                  6.872e-02
## diag3_mod707                                                  2.099e-01
## diag3_mod780                                                  9.603e-02
## diag3_modOther                                                1.504e-01
## diag3_modV45                                                 -7.651e-02
##                                                               Std. Error
## (Intercept)                                                   2.185e-01
## encounter_id                                                  1.115e-10
## number_emergency                                              8.651e-03
## number_inpatient                                              6.648e-03
## number_diagnoses                                              7.093e-03
## insulinNo                                                     3.576e-02
## insulinSteady                                                 3.330e-02
## insulinUp                                                     3.988e-02
## diabetesMedYes                                                3.173e-02
## disch_disp_modifiedDischarged to home with Home Health Service  3.178e-02
## disch_disp_modifiedDischarged/Transferred to SNF             3.157e-02
## disch_disp_modifiedOther                                      2.967e-02
## age_mod20-59                                                  1.862e-01
## age_mod60-79                                                  1.864e-01
## age_mod80+                                                    1.876e-01
## diag1_mod250.8                                                1.142e-01
## diag1_mod276                                                  1.063e-01
## diag1_mod38                                                   1.137e-01
## diag1_mod410                                                  9.998e-02
## diag1_mod414                                                  9.827e-02
## diag1_mod427                                                  1.058e-01
## diag1_mod428                                                  8.912e-02
## diag1_mod434                                                  1.024e-01
## diag1_mod435                                                  1.455e-01
```

```
## diag1_mod486                                              1.017e-01
## diag1_mod491                                              1.047e-01
## diag1_mod493                                              1.359e-01
## diag1_mod518                                              1.339e-01
## diag1_mod577                                              1.243e-01
## diag1_mod584                                              1.126e-01
## diag1_mod599                                              1.154e-01
## diag1_mod682                                              1.128e-01
## diag1_mod715                                              1.121e-01
## diag1_mod780                                              1.120e-01
## diag1_mod786                                              1.023e-01
## diag1_mod820                                              1.194e-01
## diag1_mod996                                              1.055e-01
## diag1_modOther                                            8.136e-02
## diag2_mod250.01                                           9.691e-02
## diag2_mod250.02                                           9.150e-02
## diag2_mod276                                              6.941e-02
## diag2_mod285                                              1.075e-01
## diag2_mod401                                              8.727e-02
## diag2_mod403                                              8.149e-02
## diag2_mod411                                              9.949e-02
## diag2_mod413                                              1.323e-01
## diag2_mod414                                              9.291e-02
## diag2_mod424                                              1.181e-01
## diag2_mod425                                              1.015e-01
## diag2_mod427                                              7.357e-02
## diag2_mod428                                              6.949e-02
## diag2_mod486                                              1.083e-01
## diag2_mod491                                              9.987e-02
## diag2_mod496                                              8.052e-02
## diag2_mod518                                              1.092e-01
## diag2_mod584                                              9.829e-02
## diag2_mod585                                              9.040e-02
## diag2_mod599                                              8.135e-02
## diag2_mod682                                              1.004e-01
## diag2_mod707                                              8.950e-02
## diag2_mod780                                              1.058e-01
## diag2_modOther                                            5.868e-02
## diag3_mod250.02                                           9.107e-02
## diag3_mod250.6                                            9.099e-02
## diag3_mod272                                              9.902e-02
## diag3_mod276                                              5.975e-02
## diag3_mod285                                              1.043e-01
## diag3_mod401                                              5.611e-02
## diag3_mod403                                              7.098e-02
## diag3_mod414                                              6.975e-02
## diag3_mod424                                              1.102e-01
## diag3_mod425                                              1.027e-01
## diag3_mod427                                              6.415e-02
## diag3_mod428                                              6.099e-02
## diag3_mod496                                              7.084e-02
## diag3_mod585                                              7.590e-02
## diag3_mod599                                              8.154e-02
## diag3_mod707                                              8.909e-02
```

```
## diag3_mod780                                                     9.634e-02
## diag3_modOther                                                   4.078e-02
## diag3_modV45                                                     1.034e-01
##                                                        z value Pr(>|z|)
## (Intercept)                                            -13.868  < 2e-16
## encounter_id                                            -6.036 1.58e-09
## number_emergency                                         4.652 3.29e-06
## number_inpatient                                        38.102  < 2e-16
## number_diagnoses                                         4.373 1.22e-05
## insulinNo                                               -4.151 3.30e-05
## insulinSteady                                           -4.452 8.51e-06
## insulinUp                                               -1.738 0.082239
## diabetesMedYes                                           5.307 1.11e-07
## disch_disp_modifiedDischarged to home with Home Health Service   6.215 5.14e-10
## disch_disp_modifiedDischarged/Transferred to SNF        11.758  < 2e-16
## disch_disp_modifiedOther                                12.960  < 2e-16
## age_mod20-59                                             2.773 0.005562
## age_mod60-79                                             3.458 0.000545
## age_mod80+                                               3.322 0.000893
## diag1_mod250.8                                          -4.653 3.27e-06
## diag1_mod276                                            -2.164 0.030427
## diag1_mod38                                             -4.634 3.59e-06
## diag1_mod410                                            -3.434 0.000594
## diag1_mod414                                            -3.751 0.000176
## diag1_mod427                                            -4.471 7.78e-06
## diag1_mod428                                            -2.372 0.017671
## diag1_mod434                                             0.606 0.544483
## diag1_mod435                                            -4.303 1.69e-05
## diag1_mod486                                            -6.690 2.23e-11
## diag1_mod491                                            -2.936 0.003330
## diag1_mod493                                            -3.372 0.000745
## diag1_mod518                                            -5.581 2.40e-08
## diag1_mod577                                            -1.268 0.204875
## diag1_mod584                                            -2.846 0.004432
## diag1_mod599                                            -4.720 2.36e-06
## diag1_mod682                                            -5.394 6.89e-08
## diag1_mod715                                            -2.482 0.013061
## diag1_mod780                                            -4.678 2.90e-06
## diag1_mod786                                            -5.888 3.91e-09
## diag1_mod820                                            -0.391 0.695953
## diag1_mod996                                            -3.210 0.001328
## diag1_modOther                                          -4.119 3.81e-05
## diag2_mod250.01                                          3.352 0.000801
## diag2_mod250.02                                          1.360 0.173873
## diag2_mod276                                             2.210 0.027106
## diag2_mod285                                            -1.287 0.198235
## diag2_mod401                                            -1.004 0.315361
## diag2_mod403                                             2.381 0.017287
## diag2_mod411                                             0.840 0.400864
## diag2_mod413                                            -0.571 0.568251
## diag2_mod414                                             0.018 0.985965
## diag2_mod424                                             0.421 0.673752
## diag2_mod425                                             1.374 0.169546
## diag2_mod427                                             0.952 0.341151
```

```
## diag2_mod428                                                  2.332 0.019726
## diag2_mod486                                                 -0.588 0.556602
## diag2_mod491                                                  2.580 0.009885
## diag2_mod496                                                  0.567 0.570702
## diag2_mod518                                                 -1.167 0.243289
## diag2_mod584                                                  0.433 0.664987
## diag2_mod585                                                  2.411 0.015892
## diag2_mod599                                                  0.051 0.959627
## diag2_mod682                                                  1.931 0.053426
## diag2_mod707                                                  2.033 0.042077
## diag2_mod780                                                 -0.352 0.724803
## diag2_modOther                                                2.281 0.022534
## diag3_mod250.02                                               2.747 0.006007
## diag3_mod250.6                                                5.966 2.43e-09
## diag3_mod272                                                 -0.945 0.344710
## diag3_mod276                                                  1.211 0.225712
## diag3_mod285                                                 -0.258 0.796047
## diag3_mod401                                                 -0.345 0.729751
## diag3_mod403                                                  4.770 1.84e-06
## diag3_mod414                                                 -0.296 0.767161
## diag3_mod424                                                 -0.012 0.990784
## diag3_mod425                                                  0.765 0.444281
## diag3_mod427                                                  1.292 0.196404
## diag3_mod428                                                  1.694 0.090246
## diag3_mod496                                                  2.970 0.002979
## diag3_mod585                                                  4.674 2.95e-06
## diag3_mod599                                                  0.843 0.399327
## diag3_mod707                                                  2.356 0.018474
## diag3_mod780                                                  0.997 0.318880
## diag3_modOther                                                3.687 0.000227
## diag3_modV45                                                 -0.740 0.459131
##
## (Intercept)                                                  ***
## encounter_id                                                 ***
## number_emergency                                             ***
## number_inpatient                                             ***
## number_diagnoses                                             ***
## insulinNo                                                    ***
## insulinSteady                                                ***
## insulinUp                                                    .
## diabetesMedYes                                               ***
## disch_disp_modifiedDischarged to home with Home Health Service ***
## disch_disp_modifiedDischarged/Transferred to SNF            ***
## disch_disp_modifiedOther                                     ***
## age_mod20-59                                                 **
## age_mod60-79                                                 ***
## age_mod80+                                                   ***
## diag1_mod250.8                                               ***
## diag1_mod276                                                 *
## diag1_mod38                                                  ***
## diag1_mod410                                                 ***
## diag1_mod414                                                 ***
## diag1_mod427                                                 ***
## diag1_mod428                                                 *
```

```
## diag1_mod434
## diag1_mod435                                           ***
## diag1_mod486                                           ***
## diag1_mod491                                           **
## diag1_mod493                                           ***
## diag1_mod518                                           ***
## diag1_mod577
## diag1_mod584                                           **
## diag1_mod599                                           ***
## diag1_mod682                                           ***
## diag1_mod715                                           *
## diag1_mod780                                           ***
## diag1_mod786                                           ***
## diag1_mod820
## diag1_mod996                                           **
## diag1_modOther                                         ***
## diag2_mod250.01                                        ***
## diag2_mod250.02
## diag2_mod276                                           *
## diag2_mod285
## diag2_mod401
## diag2_mod403                                           *
## diag2_mod411
## diag2_mod413
## diag2_mod414
## diag2_mod424
## diag2_mod425
## diag2_mod427
## diag2_mod428                                           *
## diag2_mod486
## diag2_mod491                                           **
## diag2_mod496
## diag2_mod518
## diag2_mod584
## diag2_mod585                                           *
## diag2_mod599
## diag2_mod682                                           .
## diag2_mod707                                           *
## diag2_mod780
## diag2_modOther                                         *
## diag3_mod250.02                                        **
## diag3_mod250.6                                         ***
## diag3_mod272
## diag3_mod276
## diag3_mod285
## diag3_mod401
## diag3_mod403                                           ***
## diag3_mod414
## diag3_mod424
## diag3_mod425
## diag3_mod427
## diag3_mod428                                           .
## diag3_mod496                                           **
## diag3_mod585                                           ***
```

```
## diag3_mod599
## diag3_mod707                                                        *
## diag3_mod780
## diag3_modOther                                                      ***
## diag3_modV45
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 69205  on 98143  degrees of freedom
## Residual deviance: 66187  on 98063  degrees of freedom
## AIC: 66349
##
## Number of Fisher Scoring iterations: 5


##
## Call:
## glm(formula = '<30' ~ encounter_id + number_emergency + number_inpatient +
##     number_diagnoses, family = binomial, data = data.train)
##
## Deviance Residuals:
##     Min       1Q   Median       3Q      Max
## -2.6499  -0.4853  -0.4477  -0.4124   2.4087
##
## Coefficients:
##                    Estimate Std. Error z value Pr(>|z|)
## (Intercept)      -2.662e+00  6.036e-02 -44.111  < 2e-16 ***
## encounter_id     -9.582e-10  1.369e-10  -7.000 2.56e-12 ***
## number_emergency  3.607e-02  1.132e-02   3.185  0.00145 **
## number_inpatient  2.748e-01  8.217e-03  33.446  < 2e-16 ***
## number_diagnoses  6.867e-02  7.853e-03   8.745  < 2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 41666  on 58885  degrees of freedom
## Residual deviance: 40294  on 58881  degrees of freedom
## AIC: 40304
##
## Number of Fisher Scoring iterations: 5


##
## Call:
## glm(formula = '<30' ~ encounter_id + number_emergency + number_inpatient +
##     number_diagnoses + insulin + diabetesMed + disch_disp_modified +
##     age_mod + diag1_mod + diag2_mod + diag3_mod, family = binomial,
##     data = data.train)
##
## Deviance Residuals:
##     Min       1Q   Median       3Q      Max
## -2.5098  -0.5091  -0.4334  -0.3687   2.6287
##
```

```
## Coefficients:
##                                                              Estimate
## (Intercept)                                                 -2.960e+00
## encounter_id                                                -8.547e-10
## number_emergency                                             4.212e-02
## number_inpatient                                             2.575e-01
## number_diagnoses                                             2.899e-02
## insulinNo                                                   -1.732e-01
## insulinSteady                                               -1.762e-01
## insulinUp                                                   -1.009e-01
## diabetesMedYes                                               1.372e-01
## disch_disp_modifiedDischarged to home with Home Health Service  2.146e-01
## disch_disp_modifiedDischarged/Transferred to SNF             3.640e-01
## disch_disp_modifiedOther                                     3.728e-01
## age_mod20-59                                                 5.420e-01
## age_mod60-79                                                 6.757e-01
## age_mod80+                                                   6.704e-01
## diag1_mod250.8                                              -4.919e-01
## diag1_mod276                                                -2.781e-01
## diag1_mod38                                                 -4.418e-01
## diag1_mod410                                                -4.271e-01
## diag1_mod414                                                -3.470e-01
## diag1_mod427                                                -5.931e-01
## diag1_mod428                                                -2.020e-01
## diag1_mod434                                                 6.170e-02
## diag1_mod435                                                -6.843e-01
## diag1_mod486                                                -7.608e-01
## diag1_mod491                                                -1.764e-01
## diag1_mod493                                                -4.543e-01
## diag1_mod518                                                -7.160e-01
## diag1_mod577                                                -1.448e-01
## diag1_mod584                                                -2.491e-01
## diag1_mod599                                                -6.220e-01
## diag1_mod682                                                -6.802e-01
## diag1_mod715                                                -1.309e-01
## diag1_mod780                                                -4.716e-01
## diag1_mod786                                                -5.540e-01
## diag1_mod820                                                 3.747e-02
## diag1_mod996                                                -3.773e-01
## diag1_modOther                                              -3.147e-01
## diag2_mod250.01                                             3.160e-01
## diag2_mod250.02                                             2.259e-01
## diag2_mod276                                                 1.928e-01
## diag2_mod285                                                -1.402e-01
## diag2_mod401                                                -6.084e-02
## diag2_mod403                                                 2.250e-01
## diag2_mod411                                                 2.609e-02
## diag2_mod413                                                 1.869e-02
## diag2_mod414                                                 1.198e-02
## diag2_mod424                                                -6.837e-02
## diag2_mod425                                                 1.419e-01
## diag2_mod427                                                 7.846e-02
## diag2_mod428                                                 1.446e-01
## diag2_mod486                                                -1.367e-01
```

```
## diag2_mod491                                                    3.429e-01
## diag2_mod496                                                    5.089e-02
## diag2_mod518                                                   -1.428e-01
## diag2_mod584                                                    1.338e-02
## diag2_mod585                                                    2.765e-01
## diag2_mod599                                                   -4.982e-02
## diag2_mod682                                                    1.551e-01
## diag2_mod707                                                    2.858e-01
## diag2_mod780                                                   -2.562e-02
## diag2_modOther                                                  1.522e-01
## diag3_mod250.02                                                 1.736e-01
## diag3_mod250.6                                                  5.852e-01
## diag3_mod272                                                   -5.759e-02
## diag3_mod276                                                    8.379e-02
## diag3_mod285                                                   -1.008e-01
## diag3_mod401                                                   -6.540e-02
## diag3_mod403                                                    3.149e-01
## diag3_mod414                                                   -1.012e-01
## diag3_mod424                                                   -3.261e-04
## diag3_mod425                                                    8.761e-02
## diag3_mod427                                                    1.380e-02
## diag3_mod428                                                    3.199e-02
## diag3_mod496                                                    2.095e-01
## diag3_mod585                                                    3.272e-01
## diag3_mod599                                                    1.691e-02
## diag3_mod707                                                    1.561e-01
## diag3_mod780                                                    1.593e-01
## diag3_modOther                                                  9.573e-02
## diag3_modV45                                                   -4.963e-02
##                                                                Std. Error
## (Intercept)                                                     2.830e-01
## encounter_id                                                    1.452e-10
## number_emergency                                               1.157e-02
## number_inpatient                                               8.476e-03
## number_diagnoses                                               9.151e-03
## insulinNo                                                       4.604e-02
## insulinSteady                                                   4.286e-02
## insulinUp                                                       5.159e-02
## diabetesMedYes                                                  4.078e-02
## disch_disp_modifiedDischarged to home with Home Health Service  4.070e-02
## disch_disp_modifiedDischarged/Transferred to SNF               4.082e-02
## disch_disp_modifiedOther                                        3.833e-02
## age_mod20-59                                                    2.415e-01
## age_mod60-79                                                    2.417e-01
## age_mod80+                                                      2.433e-01
## diag1_mod250.8                                                  1.457e-01
## diag1_mod276                                                    1.390e-01
## diag1_mod38                                                     1.455e-01
## diag1_mod410                                                    1.309e-01
## diag1_mod414                                                    1.273e-01
## diag1_mod427                                                    1.402e-01
## diag1_mod428                                                    1.156e-01
## diag1_mod434                                                    1.327e-01
## diag1_mod435                                                    1.935e-01
```

```
## diag1_mod486                                       1.338e-01
## diag1_mod491                                       1.334e-01
## diag1_mod493                                       1.767e-01
## diag1_mod518                                       1.734e-01
## diag1_mod577                                       1.583e-01
## diag1_mod584                                       1.446e-01
## diag1_mod599                                       1.513e-01
## diag1_mod682                                       1.473e-01
## diag1_mod715                                       1.414e-01
## diag1_mod780                                       1.435e-01
## diag1_mod786                                       1.310e-01
## diag1_mod820                                       1.520e-01
## diag1_mod996                                       1.365e-01
## diag1_modOther                                     1.055e-01
## diag2_mod250.01                                    1.257e-01
## diag2_mod250.02                                    1.172e-01
## diag2_mod276                                       8.925e-02
## diag2_mod285                                       1.381e-01
## diag2_mod401                                       1.113e-01
## diag2_mod403                                       1.047e-01
## diag2_mod411                                       1.299e-01
## diag2_mod413                                       1.669e-01
## diag2_mod414                                       1.198e-01
## diag2_mod424                                       1.585e-01
## diag2_mod425                                       1.339e-01
## diag2_mod427                                       9.520e-02
## diag2_mod428                                       9.000e-02
## diag2_mod486                                       1.395e-01
## diag2_mod491                                       1.276e-01
## diag2_mod496                                       1.045e-01
## diag2_mod518                                       1.396e-01
## diag2_mod584                                       1.300e-01
## diag2_mod585                                       1.160e-01
## diag2_mod599                                       1.059e-01
## diag2_mod682                                       1.315e-01
## diag2_mod707                                       1.143e-01
## diag2_mod780                                       1.348e-01
## diag2_modOther                                     7.570e-02
## diag3_mod250.02                                    1.196e-01
## diag3_mod250.6                                     1.146e-01
## diag3_mod272                                       1.245e-01
## diag3_mod276                                       7.568e-02
## diag3_mod285                                       1.340e-01
## diag3_mod401                                       7.170e-02
## diag3_mod403                                       9.007e-02
## diag3_mod414                                       9.154e-02
## diag3_mod424                                       1.419e-01
## diag3_mod425                                       1.296e-01
## diag3_mod427                                       8.333e-02
## diag3_mod428                                       7.907e-02
## diag3_mod496                                       9.044e-02
## diag3_mod585                                       9.662e-02
## diag3_mod599                                       1.051e-01
## diag3_mod707                                       1.147e-01
```

```
## diag3_mod780                                                     1.191e-01
## diag3_modOther                                                   5.196e-02
## diag3_modV45                                                     1.302e-01
##                                                       z value Pr(>|z|)
## (Intercept)                                           -10.459  < 2e-16
## encounter_id                                           -5.888 3.92e-09
## number_emergency                                        3.640 0.000273
## number_inpatient                                       30.384  < 2e-16
## number_diagnoses                                        3.168 0.001535
## insulinNo                                              -3.762 0.000168
## insulinSteady                                          -4.112 3.93e-05
## insulinUp                                              -1.955 0.050578
## diabetesMedYes                                          3.365 0.000764
## disch_disp_modifiedDischarged to home with Home Health Service   5.274 1.34e-07
## disch_disp_modifiedDischarged/Transferred to SNF       8.917  < 2e-16
## disch_disp_modifiedOther                                9.726  < 2e-16
## age_mod20-59                                            2.244 0.024822
## age_mod60-79                                            2.795 0.005191
## age_mod80+                                              2.755 0.005869
## diag1_mod250.8                                         -3.376 0.000736
## diag1_mod276                                           -2.001 0.045446
## diag1_mod38                                            -3.037 0.002392
## diag1_mod410                                           -3.264 0.001100
## diag1_mod414                                           -2.726 0.006417
## diag1_mod427                                           -4.232 2.32e-05
## diag1_mod428                                           -1.748 0.080472
## diag1_mod434                                             0.465 0.641951
## diag1_mod435                                           -3.537 0.000404
## diag1_mod486                                           -5.686 1.30e-08
## diag1_mod491                                           -1.322 0.186040
## diag1_mod493                                           -2.572 0.010122
## diag1_mod518                                           -4.128 3.66e-05
## diag1_mod577                                           -0.914 0.360482
## diag1_mod584                                           -1.723 0.084932
## diag1_mod599                                           -4.110 3.96e-05
## diag1_mod682                                           -4.618 3.88e-06
## diag1_mod715                                           -0.926 0.354694
## diag1_mod780                                           -3.286 0.001017
## diag1_mod786                                           -4.227 2.37e-05
## diag1_mod820                                            0.247 0.805291
## diag1_mod996                                           -2.765 0.005692
## diag1_modOther                                         -2.984 0.002840
## diag2_mod250.01                                         2.513 0.011977
## diag2_mod250.02                                         1.927 0.054028
## diag2_mod276                                            2.161 0.030703
## diag2_mod285                                           -1.015 0.310030
## diag2_mod401                                           -0.547 0.584562
## diag2_mod403                                            2.149 0.031654
## diag2_mod411                                            0.201 0.840876
## diag2_mod413                                            0.112 0.910798
## diag2_mod414                                            0.100 0.920362
## diag2_mod424                                           -0.431 0.666295
## diag2_mod425                                            1.060 0.289241
## diag2_mod427                                            0.824 0.409848
```

```
## diag2_mod428                                                1.607 0.108076
## diag2_mod486                                               -0.980 0.327306
## diag2_mod491                                                2.688 0.007191
## diag2_mod496                                                0.487 0.626321
## diag2_mod518                                               -1.023 0.306268
## diag2_mod584                                                0.103 0.917992
## diag2_mod585                                                2.384 0.017108
## diag2_mod599                                               -0.471 0.637933
## diag2_mod682                                                1.180 0.238130
## diag2_mod707                                                2.500 0.012407
## diag2_mod780                                               -0.190 0.849208
## diag2_modOther                                              2.010 0.044400
## diag3_mod250.02                                             1.452 0.146576
## diag3_mod250.6                                              5.107 3.27e-07
## diag3_mod272                                               -0.463 0.643718
## diag3_mod276                                                1.107 0.268226
## diag3_mod285                                               -0.752 0.452031
## diag3_mod401                                               -0.912 0.361763
## diag3_mod403                                                3.497 0.000471
## diag3_mod414                                               -1.106 0.268903
## diag3_mod424                                               -0.002 0.998167
## diag3_mod425                                                0.676 0.499026
## diag3_mod427                                                0.166 0.868465
## diag3_mod428                                                0.405 0.685743
## diag3_mod496                                                2.317 0.020519
## diag3_mod585                                                3.387 0.000707
## diag3_mod599                                                0.161 0.872149
## diag3_mod707                                                1.360 0.173767
## diag3_mod780                                                1.337 0.181086
## diag3_modOther                                              1.842 0.065449
## diag3_modV45                                               -0.381 0.703116
## 
## (Intercept)                                                ***
## encounter_id                                               ***
## number_emergency                                           ***
## number_inpatient                                           ***
## number_diagnoses                                           **
## insulinNo                                                  ***
## insulinSteady                                              ***
## insulinUp                                                  .
## diabetesMedYes                                             ***
## disch_disp_modifiedDischarged to home with Home Health Service ***
## disch_disp_modifiedDischarged/Transferred to SNF           ***
## disch_disp_modifiedOther                                   ***
## age_mod20-59                                               *
## age_mod60-79                                               **
## age_mod80+                                                 **
## diag1_mod250.8                                             ***
## diag1_mod276                                               *
## diag1_mod38                                                **
## diag1_mod410                                               **
## diag1_mod414                                               **
## diag1_mod427                                               ***
## diag1_mod428                                               .
```

```
## diag1_mod434
## diag1_mod435                                            ***
## diag1_mod486                                            ***
## diag1_mod491
## diag1_mod493                                            *
## diag1_mod518                                            ***
## diag1_mod577
## diag1_mod584                                            .
## diag1_mod599                                            ***
## diag1_mod682                                            ***
## diag1_mod715
## diag1_mod780                                            **
## diag1_mod786                                            ***
## diag1_mod820
## diag1_mod996                                            **
## diag1_modOther                                          **
## diag2_mod250.01                                         *
## diag2_mod250.02                                         .
## diag2_mod276                                            *
## diag2_mod285
## diag2_mod401
## diag2_mod403                                            *
## diag2_mod411
## diag2_mod413
## diag2_mod414
## diag2_mod424
## diag2_mod425
## diag2_mod427
## diag2_mod428
## diag2_mod486
## diag2_mod491                                            **
## diag2_mod496
## diag2_mod518
## diag2_mod584
## diag2_mod585                                            *
## diag2_mod599
## diag2_mod682
## diag2_mod707                                            *
## diag2_mod780
## diag2_modOther                                          *
## diag3_mod250.02
## diag3_mod250.6                                          ***
## diag3_mod272
## diag3_mod276
## diag3_mod285
## diag3_mod401
## diag3_mod403                                            ***
## diag3_mod414
## diag3_mod424
## diag3_mod425
## diag3_mod427
## diag3_mod428
## diag3_mod496                                            *
## diag3_mod585                                            ***
```

```
## diag3_mod599
## diag3_mod707
## diag3_mod780
## diag3_modOther                                                          .
## diag3_modV45
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 41666  on 58885  degrees of freedom
## Residual deviance: 39736  on 58805  degrees of freedom
## AIC: 39898
##
## Number of Fisher Scoring iterations: 5


##
## Call:
## glm(formula = '<30' ~ encounter_id + number_emergency + number_inpatient +
##     number_diagnoses + insulin + diabetesMed + disch_disp_modified +
##     age_mod + diag1_mod + diag2_mod + diag3_mod, family = binomial,
##     data = encoded_data)
##
## Deviance Residuals:
##     Min       1Q   Median       3Q      Max
## -2.4818  -0.5086  -0.4342  -0.3718   2.5939
##
## Coefficients:
##                                                             Estimate
## (Intercept)                                                -3.031e+00
## encounter_id                                               -6.729e-10
## number_emergency                                            4.025e-02
## number_inpatient                                            2.533e-01
## number_diagnoses                                            3.102e-02
## insulinNo                                                  -1.484e-01
## insulinSteady                                              -1.482e-01
## insulinUp                                                  -6.931e-02
## diabetesMedYes                                              1.684e-01
## disch_disp_modifiedDischarged to home with Home Health Service  1.975e-01
## disch_disp_modifiedDischarged/Transferred to SNF            3.712e-01
## disch_disp_modifiedOther                                    3.845e-01
## age_mod20-59                                                5.162e-01
## age_mod60-79                                                6.444e-01
## age_mod80+                                                  6.233e-01
## diag1_mod250.8                                             -5.315e-01
## diag1_mod276                                               -2.301e-01
## diag1_mod38                                                -5.267e-01
## diag1_mod410                                               -3.434e-01
## diag1_mod414                                               -3.686e-01
## diag1_mod427                                               -4.730e-01
## diag1_mod428                                               -2.114e-01
## diag1_mod434                                                6.207e-02
## diag1_mod435                                               -6.260e-01
## diag1_mod486                                               -6.803e-01
```

```
## diag1_mod491                                            -3.074e-01
## diag1_mod493                                            -4.584e-01
## diag1_mod518                                            -7.474e-01
## diag1_mod577                                            -1.576e-01
## diag1_mod584                                            -3.203e-01
## diag1_mod599                                            -5.449e-01
## diag1_mod682                                            -6.087e-01
## diag1_mod715                                            -2.783e-01
## diag1_mod780                                            -5.241e-01
## diag1_mod786                                            -6.026e-01
## diag1_mod820                                            -4.668e-02
## diag1_mod996                                            -3.387e-01
## diag1_modOther                                          -3.351e-01
## diag2_mod250.01                                          3.249e-01
## diag2_mod250.02                                          1.244e-01
## diag2_mod276                                             1.534e-01
## diag2_mod285                                            -1.384e-01
## diag2_mod401                                            -8.762e-02
## diag2_mod403                                             1.940e-01
## diag2_mod411                                             8.358e-02
## diag2_mod413                                            -7.549e-02
## diag2_mod414                                             1.634e-03
## diag2_mod424                                             4.973e-02
## diag2_mod425                                             1.394e-01
## diag2_mod427                                             7.003e-02
## diag2_mod428                                             1.620e-01
## diag2_mod486                                            -6.370e-02
## diag2_mod491                                             2.577e-01
## diag2_mod496                                             4.566e-02
## diag2_mod518                                            -1.274e-01
## diag2_mod584                                             4.256e-02
## diag2_mod585                                             2.180e-01
## diag2_mod599                                             4.118e-03
## diag2_mod682                                             1.940e-01
## diag2_mod707                                             1.819e-01
## diag2_mod780                                            -3.723e-02
## diag2_modOther                                           1.339e-01
## diag3_mod250.02                                          2.502e-01
## diag3_mod250.6                                           5.428e-01
## diag3_mod272                                            -9.357e-02
## diag3_mod276                                             7.239e-02
## diag3_mod285                                            -2.696e-02
## diag3_mod401                                            -1.938e-02
## diag3_mod403                                             3.386e-01
## diag3_mod414                                            -2.065e-02
## diag3_mod424                                            -1.272e-03
## diag3_mod425                                             7.857e-02
## diag3_mod427                                             8.287e-02
## diag3_mod428                                             1.033e-01
## diag3_mod496                                             2.104e-01
## diag3_mod585                                             3.548e-01
## diag3_mod599                                             6.872e-02
## diag3_mod707                                             2.099e-01
## diag3_mod780                                             9.603e-02
```

```
## diag3_modOther                                                1.504e-01
## diag3_modV45                                                 -7.651e-02
##                                                               Std. Error
## (Intercept)                                                   2.185e-01
## encounter_id                                                  1.115e-10
## number_emergency                                              8.651e-03
## number_inpatient                                              6.648e-03
## number_diagnoses                                              7.093e-03
## insulinNo                                                     3.576e-02
## insulinSteady                                                 3.330e-02
## insulinUp                                                     3.988e-02
## diabetesMedYes                                                3.173e-02
## disch_disp_modifiedDischarged to home with Home Health Service  3.178e-02
## disch_disp_modifiedDischarged/Transferred to SNF              3.157e-02
## disch_disp_modifiedOther                                      2.967e-02
## age_mod20-59                                                  1.862e-01
## age_mod60-79                                                  1.864e-01
## age_mod80+                                                    1.876e-01
## diag1_mod250.8                                                1.142e-01
## diag1_mod276                                                  1.063e-01
## diag1_mod38                                                   1.137e-01
## diag1_mod410                                                  9.998e-02
## diag1_mod414                                                  9.827e-02
## diag1_mod427                                                  1.058e-01
## diag1_mod428                                                  8.912e-02
## diag1_mod434                                                  1.024e-01
## diag1_mod435                                                  1.455e-01
## diag1_mod486                                                  1.017e-01
## diag1_mod491                                                  1.047e-01
## diag1_mod493                                                  1.359e-01
## diag1_mod518                                                  1.339e-01
## diag1_mod577                                                  1.243e-01
## diag1_mod584                                                  1.126e-01
## diag1_mod599                                                  1.154e-01
## diag1_mod682                                                  1.128e-01
## diag1_mod715                                                  1.121e-01
## diag1_mod780                                                  1.120e-01
## diag1_mod786                                                  1.023e-01
## diag1_mod820                                                  1.194e-01
## diag1_mod996                                                  1.055e-01
## diag1_modOther                                                8.136e-02
## diag2_mod250.01                                               9.691e-02
## diag2_mod250.02                                               9.150e-02
## diag2_mod276                                                  6.941e-02
## diag2_mod285                                                  1.075e-01
## diag2_mod401                                                  8.727e-02
## diag2_mod403                                                  8.149e-02
## diag2_mod411                                                  9.949e-02
## diag2_mod413                                                  1.323e-01
## diag2_mod414                                                  9.291e-02
## diag2_mod424                                                  1.181e-01
## diag2_mod425                                                  1.015e-01
## diag2_mod427                                                  7.357e-02
## diag2_mod428                                                  6.949e-02
```

```
## diag2_mod486                                                 1.083e-01
## diag2_mod491                                                 9.987e-02
## diag2_mod496                                                 8.052e-02
## diag2_mod518                                                 1.092e-01
## diag2_mod584                                                 9.829e-02
## diag2_mod585                                                 9.040e-02
## diag2_mod599                                                 8.135e-02
## diag2_mod682                                                 1.004e-01
## diag2_mod707                                                 8.950e-02
## diag2_mod780                                                 1.058e-01
## diag2_modOther                                               5.868e-02
## diag3_mod250.02                                              9.107e-02
## diag3_mod250.6                                               9.099e-02
## diag3_mod272                                                 9.902e-02
## diag3_mod276                                                 5.975e-02
## diag3_mod285                                                 1.043e-01
## diag3_mod401                                                 5.611e-02
## diag3_mod403                                                 7.098e-02
## diag3_mod414                                                 6.975e-02
## diag3_mod424                                                 1.102e-01
## diag3_mod425                                                 1.027e-01
## diag3_mod427                                                 6.415e-02
## diag3_mod428                                                 6.099e-02
## diag3_mod496                                                 7.084e-02
## diag3_mod585                                                 7.590e-02
## diag3_mod599                                                 8.154e-02
## diag3_mod707                                                 8.909e-02
## diag3_mod780                                                 9.634e-02
## diag3_modOther                                               4.078e-02
## diag3_modV45                                                 1.034e-01
##                                                        z value Pr(>|z|)
## (Intercept)                                            -13.868  < 2e-16
## encounter_id                                            -6.036 1.58e-09
## number_emergency                                         4.652 3.29e-06
## number_inpatient                                        38.102  < 2e-16
## number_diagnoses                                         4.373 1.22e-05
## insulinNo                                               -4.151 3.30e-05
## insulinSteady                                           -4.452 8.51e-06
## insulinUp                                               -1.738 0.082239
## diabetesMedYes                                           5.307 1.11e-07
## disch_disp_modifiedDischarged to home with Home Health Service  6.215 5.14e-10
## disch_disp_modifiedDischarged/Transferred to SNF       11.758  < 2e-16
## disch_disp_modifiedOther                               12.960  < 2e-16
## age_mod20-59                                             2.773 0.005562
## age_mod60-79                                             3.458 0.000545
## age_mod80+                                               3.322 0.000893
## diag1_mod250.8                                          -4.653 3.27e-06
## diag1_mod276                                            -2.164 0.030427
## diag1_mod38                                             -4.634 3.59e-06
## diag1_mod410                                            -3.434 0.000594
## diag1_mod414                                            -3.751 0.000176
## diag1_mod427                                            -4.471 7.78e-06
## diag1_mod428                                            -2.372 0.017671
## diag1_mod434                                             0.606 0.544483
```

```
## diag1_mod435                                    -4.303 1.69e-05
## diag1_mod486                                    -6.690 2.23e-11
## diag1_mod491                                    -2.936 0.003330
## diag1_mod493                                    -3.372 0.000745
## diag1_mod518                                    -5.581 2.40e-08
## diag1_mod577                                    -1.268 0.204875
## diag1_mod584                                    -2.846 0.004432
## diag1_mod599                                    -4.720 2.36e-06
## diag1_mod682                                    -5.394 6.89e-08
## diag1_mod715                                    -2.482 0.013061
## diag1_mod780                                    -4.678 2.90e-06
## diag1_mod786                                    -5.888 3.91e-09
## diag1_mod820                                    -0.391 0.695953
## diag1_mod996                                    -3.210 0.001328
## diag1_modOther                                  -4.119 3.81e-05
## diag2_mod250.01                                  3.352 0.000801
## diag2_mod250.02                                  1.360 0.173873
## diag2_mod276                                     2.210 0.027106
## diag2_mod285                                    -1.287 0.198235
## diag2_mod401                                    -1.004 0.315361
## diag2_mod403                                     2.381 0.017287
## diag2_mod411                                     0.840 0.400864
## diag2_mod413                                    -0.571 0.568251
## diag2_mod414                                     0.018 0.985965
## diag2_mod424                                     0.421 0.673752
## diag2_mod425                                     1.374 0.169546
## diag2_mod427                                     0.952 0.341151
## diag2_mod428                                     2.332 0.019726
## diag2_mod486                                    -0.588 0.556602
## diag2_mod491                                     2.580 0.009885
## diag2_mod496                                     0.567 0.570702
## diag2_mod518                                    -1.167 0.243289
## diag2_mod584                                     0.433 0.664987
## diag2_mod585                                     2.411 0.015892
## diag2_mod599                                     0.051 0.959627
## diag2_mod682                                     1.931 0.053426
## diag2_mod707                                     2.033 0.042077
## diag2_mod780                                    -0.352 0.724803
## diag2_modOther                                   2.281 0.022534
## diag3_mod250.02                                  2.747 0.006007
## diag3_mod250.6                                   5.966 2.43e-09
## diag3_mod272                                    -0.945 0.344710
## diag3_mod276                                     1.211 0.225712
## diag3_mod285                                    -0.258 0.796047
## diag3_mod401                                    -0.345 0.729751
## diag3_mod403                                     4.770 1.84e-06
## diag3_mod414                                    -0.296 0.767161
## diag3_mod424                                    -0.012 0.990784
## diag3_mod425                                     0.765 0.444281
## diag3_mod427                                     1.292 0.196404
## diag3_mod428                                     1.694 0.090246
## diag3_mod496                                     2.970 0.002979
## diag3_mod585                                     4.674 2.95e-06
## diag3_mod599                                     0.843 0.399327
```

```
## diag3_mod707                                                      2.356 0.018474
## diag3_mod780                                                      0.997 0.318880
## diag3_modOther                                                    3.687 0.000227
## diag3_modV45                                                     -0.740 0.459131
##
## (Intercept)                                                *** 
## encounter_id                                               *** 
## number_emergency                                           *** 
## number_inpatient                                           *** 
## number_diagnoses                                           *** 
## insulinNo                                                  *** 
## insulinSteady                                              *** 
## insulinUp                                                  .   
## diabetesMedYes                                             *** 
## disch_disp_modifiedDischarged to home with Home Health Service *** 
## disch_disp_modifiedDischarged/Transferred to SNF           *** 
## disch_disp_modifiedOther                                   *** 
## age_mod20-59                                               **  
## age_mod60-79                                               *** 
## age_mod80+                                                 *** 
## diag1_mod250.8                                             *** 
## diag1_mod276                                               *   
## diag1_mod38                                                *** 
## diag1_mod410                                               *** 
## diag1_mod414                                               *** 
## diag1_mod427                                               *** 
## diag1_mod428                                               *   
## diag1_mod434                                                   
## diag1_mod435                                               *** 
## diag1_mod486                                               *** 
## diag1_mod491                                               **  
## diag1_mod493                                               *** 
## diag1_mod518                                               *** 
## diag1_mod577                                                   
## diag1_mod584                                               **  
## diag1_mod599                                               *** 
## diag1_mod682                                               *** 
## diag1_mod715                                               *   
## diag1_mod780                                               *** 
## diag1_mod786                                               *** 
## diag1_mod820                                                   
## diag1_mod996                                               **  
## diag1_modOther                                             *** 
## diag2_mod250.01                                            *** 
## diag2_mod250.02                                                
## diag2_mod276                                               *   
## diag2_mod285                                                   
## diag2_mod401                                                   
## diag2_mod403                                               *   
## diag2_mod411                                                   
## diag2_mod413                                                   
## diag2_mod414                                                   
## diag2_mod424                                                   
## diag2_mod425                                                   
```

```
## diag2_mod427
## diag2_mod428                                                        *
## diag2_mod486
## diag2_mod491                                                        **
## diag2_mod496
## diag2_mod518
## diag2_mod584
## diag2_mod585                                                        *
## diag2_mod599
## diag2_mod682                                                        .
## diag2_mod707                                                        *
## diag2_mod780
## diag2_modOther                                                      *
## diag3_mod250.02                                                     **
## diag3_mod250.6                                                      ***
## diag3_mod272
## diag3_mod276
## diag3_mod285
## diag3_mod401
## diag3_mod403                                                        ***
## diag3_mod414
## diag3_mod424
## diag3_mod425
## diag3_mod427
## diag3_mod428                                                        .
## diag3_mod496                                                        **
## diag3_mod585                                                        ***
## diag3_mod599
## diag3_mod707                                                        *
## diag3_mod780
## diag3_modOther                                                      ***
## diag3_modV45
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 69205  on 98143  degrees of freedom
## Residual deviance: 66187  on 98063  degrees of freedom
## AIC: 66349
##
## Number of Fisher Scoring iterations: 5
```

Anovas (in order: fitall, fit1, fit2, fit3, fit4, fit5)

```
## Analysis of Deviance Table (Type II tests)
##
## Response: <30
##                 LR Chisq Df Pr(>Chisq)
## encounter_id       65.50  1  5.803e-16 ***
## patient_nbr        21.99  1  2.742e-06 ***
## race                1.88  4  0.7578345
## gender              1.41  2  0.4944045
## time_in_hospital    0.05  1  0.8166475
```

```
## num_lab_procedures       0.00  1  0.9603628
## num_procedures           7.50  1  0.0061677 **
## num_medications         14.38  1  0.0001496 ***
## number_outpatient        0.26  1  0.6121234
## number_emergency        23.22  1  1.446e-06 ***
## number_inpatient      1279.11  1  < 2.2e-16 ***
## number_diagnoses        11.15  1  0.0008423 ***
## max_glu_serum            6.77  3  0.0795340 .
## A1Cresult                9.58  3  0.0224517 *
## metformin               10.69  3  0.0135055 *
## glimepiride              4.90  3  0.1794496
## glipizide                8.21  3  0.0417732 *
## glyburide                2.21  3  0.5290008
## pioglitazone             1.80  3  0.6140396
## rosiglitazone            5.11  3  0.1639378
## insulin                 13.01  3  0.0046152 **
## change                   0.42  1  0.5147496
## diabetesMed             30.71  1  2.990e-08 ***
## disch_disp_modified    212.69  3  < 2.2e-16 ***
## adm_src_mod             21.04  3  0.0001034 ***
## adm_typ_mod              4.41  3  0.2200965
## age_mod                 32.58  3  3.946e-07 ***
## diag1_mod              196.40 23  < 2.2e-16 ***
## diag2_mod               63.28 24  2.168e-05 ***
## diag3_mod               91.08 19  2.135e-11 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1


## Analysis of Deviance Table (Type II tests)
##
## Response: <30
##                    LR Chisq Df Pr(>Chisq)
## encounter_id          33.20  1  8.324e-09 ***
## time_in_hospital       0.05  1  0.8252345
## num_medications        6.72  1  0.0095453 **
## number_emergency      22.03  1  2.685e-06 ***
## number_inpatient    1327.22  1  < 2.2e-16 ***
## number_diagnoses      14.26  1  0.0001594 ***
## A1Cresult              8.35  3  0.0392206 *
## metformin             13.20  3  0.0042258 **
## insulin               18.12  3  0.0004162 ***
## diabetesMed           33.33  1  7.794e-09 ***
## disch_disp_modified  210.74  3  < 2.2e-16 ***
## age_mod               32.32  3  4.485e-07 ***
## diag1_mod            196.84 23  < 2.2e-16 ***
## diag2_mod             64.01 24  1.696e-05 ***
## diag3_mod             92.45 19  1.217e-11 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1


## Analysis of Deviance Table (Type II tests)
##
## Response: <30
##                    LR Chisq Df Pr(>Chisq)
```

```
## encounter_id              34.36  1  4.588e-09 ***
## num_medications            8.85  1  0.0029373 **
## number_emergency          21.99  1  2.738e-06 ***
## number_inpatient        1328.21  1  < 2.2e-16 ***
## number_diagnoses          14.41  1  0.0001474 ***
## A1Cresult                  8.31  3  0.0400853 *
## metformin                 13.21  3  0.0042078 **
## insulin                   18.12  3  0.0004162 ***
## diabetesMed               33.30  1  7.908e-09 ***
## disch_disp_modified      216.55  3  < 2.2e-16 ***
## age_mod                   32.43  3  4.253e-07 ***
## diag1_mod                197.49 23  < 2.2e-16 ***
## diag2_mod                 64.08 24  1.661e-05 ***
## diag3_mod                 92.72 19  1.091e-11 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1


## Analysis of Deviance Table (Type II tests)
##
## Response: <30
##                      LR Chisq Df Pr(>Chisq)
## encounter_id             34.75  1  3.741e-09 ***
## num_medications           8.60  1  0.0033621 **
## number_emergency         22.20  1  2.461e-06 ***
## number_inpatient       1349.11  1  < 2.2e-16 ***
## number_diagnoses         14.33  1  0.0001538 ***
## metformin                13.93  3  0.0030002 **
## insulin                  17.21  3  0.0006413 ***
## diabetesMed              32.89  1  9.747e-09 ***
## disch_disp_modified     218.01  3  < 2.2e-16 ***
## age_mod                  35.73  3  8.526e-08 ***
## diag1_mod               196.73 23  < 2.2e-16 ***
## diag2_mod                63.69 24  1.893e-05 ***
## diag3_mod                91.48 19  1.813e-11 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1


## Analysis of Deviance Table (Type II tests)
##
## Response: <30
##                      LR Chisq Df Pr(>Chisq)
## encounter_id             34.91  1  3.455e-09 ***
## number_emergency         21.80  1  3.019e-06 ***
## number_inpatient       1355.89  1  < 2.2e-16 ***
## number_diagnoses         18.82  1  1.434e-05 ***
## metformin                12.76  3  0.0051768 **
## insulin                  21.00  3  0.0001051 ***
## diabetesMed              34.82  1  3.622e-09 ***
## disch_disp_modified     232.61  3  < 2.2e-16 ***
## age_mod                  35.72  3  8.564e-08 ***
## diag1_mod               196.30 23  < 2.2e-16 ***
## diag2_mod                63.23 24  2.205e-05 ***
## diag3_mod                93.32 19  8.522e-12 ***
## ---
```

```
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1


## Analysis of Deviance Table (Type II tests)
##
## Response: <30
##                     LR Chisq Df Pr(>Chisq)
## encounter_id           36.83  1  1.291e-09 ***
## number_emergency       21.80  1  3.019e-06 ***
## number_inpatient     1370.18  1  < 2.2e-16 ***
## number_diagnoses       19.26  1  1.140e-05 ***
## insulin                24.02  3  2.479e-05 ***
## diabetesMed            28.22  1  1.082e-07 ***
## disch_disp_modified   232.58  3  < 2.2e-16 ***
## age_mod                36.73  3  5.236e-08 ***
## diag1_mod             197.40 23  < 2.2e-16 ***
## diag2_mod              64.47 24  1.457e-05 ***
## diag3_mod              95.65 19  3.256e-12 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```