EDA

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```
## Rows: 800
## Columns: 25
## $ Q1       <int> 4, 4, 4, 5, 5, 5, 4, 4, 3, 5, 5, 4, NA, NA, 4, 4, 4, 5, 5, 5,~
## $ Q2       <int> 5, 5, 4, 5, 5, 4, 5, 5, 4, 4, 5, 5, 3, 4, 5, 5, 5, 4, 5, 5, 3~
## $ Q3       <int> 5, 5, 5, 5, 5, 4, 3, 5, 5, 5, 5, 5, 5, 4, 5, 4, 5, 5, NA, 3, ~
## $ Q4       <int> 5, 5, 3, 5, 4, 5, 2, 5, 4, 5, 5, 3, 5, 4, 5, 4, 5, 5, 5, 5, 5~
## $ Q5       <int> 4, 5, 5, 4, 5, 3, 5, 5, NA, 4, 5, 2, 3, 5, 4, 4, 5, 5, 5, 5, ~
## $ Q6       <int> 5, 4, 4, 4, 3, 5, 5, 5, 5, 5, 4, 5, 3, 5, 4, 4, 4, 4, 4, 3, 2~
## $ Q7       <int> 2, 4, 3, 3, 4, 4, 4, 4, 4, 4, 1, 4, 2, 3, 4, 4, 2, 4, 4, 4, 2~
## $ Q8       <int> 5, 3, 4, 4, 5, 5, 4, 2, 5, 5, 4, 5, 1, 5, 5, 3, 4, 3, 4, 2, 4~
## $ Q9       <int> 4, 5, 5, 5, 5, 5, 4, 5, 5, 5, 4, 5, 5, 5, 5, 4, 4, NA, 5, 4, ~
## $ Q10      <int> 3, 5, 5, 5, 3, 4, 5, 5, 5, 5, 2, 3, 4, 5, 5, 5, 5, 3, 4, 3, 5~
## $ Q11      <int> 5, 5, 5, 5, 5, 4, 3, 5, 4, 5, 5, 4, 5, 3, 4, 3, 4, 5, 4, 4, 5~
## $ Q12      <int> 4, 5, 4, 5, 4, 5, 3, NA, 3, 3, 5, 3, NA, 4, 2, 4, 5, 5, 5, 5,~
## $ Q13      <int> NA, NA, 1, 2, 5, 5, 4, 3, 1, 3, NA, 5, 5, 3, NA, 5, 3, 5, 3, ~
## $ Q14      <int> 5, 4, 4, 4, 5, 3, 5, 5, 4, 5, 5, 5, 5, 5, 5, 5, 4, 5, 3, 5, 5~
## $ Q15      <int> 4, 5, 4, 4, 4, 5, 5, NA, 5, 5, 4, 4, 3, 5, 5, 5, 4, 5, 3, 5, ~
## $ Q16      <int> 5, 5, 5, 5, 4, 5, 5, 5, 5, 4, 4, 4, 5, 5, 5, 5, 4, 5, 5, 4, 4~
## $ Q17      <int> 5, 3, 5, 5, 4, 5, 5, 4, 4, 5, 3, NA, 2, 3, 4, 4, 5, 5, 5, 5, ~
## $ Q18      <int> 4, 3, 2, 5, 5, 5, 4, 5, 5, 4, 4, NA, 3, 4, 5, 4, 5, 3, 5, 3, ~
## $ Q19      <int> 5, 3, 4, 4, 5, 5, 5, 5, 5, 5, NA, NA, 3, 2, 4, 4, 4, 4, 5, 5,~
## $ Q20      <int> 5, NA, NA, 5, 5, NA, 4, NA, 5, NA, NA, NA, 5, NA, NA, NA, NA,~
## $ Q21      <int> NA, 3, 4, 4, 4, 5, NA, 4, 5, 5, 5, 5, 5, 4, 4, 5, 5, NA, 5, 5~
## $ Q22      <int> 4, 4, 3, 5, 5, 5, 5, 3, 5, 5, 3, 3, 5, 5, 4, 5, 4, 3, 4, NA, ~
## $ Q23      <int> 3, 5, 5, 5, 4, 5, 4, 3, 4, 5, 2, 4, 5, 4, 5, 5, 4, 3, NA, 5, ~
## $ DocID    <chr> "doc-09", "doc-17", "doc-15", "doc-01", "doc-05", "doc-14", "~
## $ position <chr> "bedside", "bedside", "bedside", "bedside", "non-bedside", "n~
```

```
## Rows: 2,113
## Columns: 32
## $ DocID              <chr> "doc-01", "doc-01", "doc-01", "doc-01", "doc-01", "~
## $ PtID               <int> 101103, 101108, 101151, 101551, 102061, 102327, 101~
## $ pt_age             <chr> "lt60", "lt60", "ge60", "lt60", "ge60", "lt60", "ge~
## $ emergency          <chr> "no_op", "no_op", "no_op", "no_op", "no_op", "no_op~
## $ ICU_type           <chr> "medical", "medical", "medical", "medical", "medica~
## $ Charlson           <int> 1, 3, 3, 3, 2, 1, 1, 2, 1, 1, 2, 1, 1, 3, 1, 1, 3, ~
## $ APACHEII_adm       <int> 27, 22, 22, 21, 24, 19, 25, 20, 22, 24, 24, 22, 25,~
## $ SOFA_adm           <int> 11, 5, 5, 6, 6, 6, 6, 6, 6, 7, 7, 7, 7, 8, 9, 10, 1~
## $ pt_sex             <chr> "M", "M", "F", "M", "F", "M", "M", "F", "F", "M", "~
## $ status_discharge   <chr> "A", "A", "A", "A", "A", "A", "A", "A", "A", "A", "~
## $ ICU_length_of_stay <int> 10, 6, 10, 8, 6, 4, 10, 0, 0, 36, 24, 24, 4, 3, 3, ~
## $ primary_diag       <chr> "cardiovascular", "cardiovascular", "cardiovascular~
```

```
## $ end_sofa           <int> 5, 0, 5, 2, 10, 5, 6, 6, 6, 7, 4, 2, 5, 6, 6, 9, 4,~
## $ change_in_sofa     <int> -6, -5, 0, -4, 4, -1, 0, 0, 0, 0, -3, -5, -2, -2, -~
## $ num_sites          <chr> "2+", "2+", "2+", "2+", "2+", "2+", "2+", "2+", "2+~
## $ leadership         <chr> "leader_x", "leader_x", "leader_x", "leader_x", "le~
## $ rank               <chr> "senior", "senior", "senior", "senior", "senior", "~
## $ avg_overall2016    <dbl> 4.033301, 4.033301, 4.033301, 4.033301, 4.033301, 4~
## $ resident_eval      <int> 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, ~
## $ doc_sex            <chr> "F", "F", "F", "F", "F", "F", "F", "F", "F", "F", "~
## $ domain             <chr> "anesthesia", "anesthesia", "anesthesia", "anesthes~
## $ doc_age            <chr> "50+", "50+", "50+", "50+", "50+", "50+", "50+", "5~
## $ education          <chr> "", "", "", "", "", "", "", "", "", "", "", "", "",~
## $ avg_med            <dbl> 4.338889, 4.338889, 4.338889, 4.338889, 4.338889, 4~
## $ avg_adv            <dbl> 4.241379, 4.241379, 4.241379, 4.241379, 4.241379, 4~
## $ avg_sci            <dbl> 4.08, 4.08, 4.08, 4.08, 4.08, 4.08, 4.08, 4.08, 4.0~
## $ avg_prof           <dbl> 3.986111, 3.986111, 3.986111, 3.986111, 3.986111, 3~
## $ avg_comm           <dbl> 4.208333, 4.208333, 4.208333, 4.208333, 4.208333, 4~
## $ avg_collab         <dbl> 4.246667, 4.246667, 4.246667, 4.246667, 4.246667, 4~
## $ avg_manage         <dbl> 4.287356, 4.287356, 4.287356, 4.287356, 4.287356, 4~
## $ avg_overall        <dbl> 4.392857, 4.392857, 4.392857, 4.392857, 4.392857, 4~
## $ avg_eval360        <dbl> 4.222699, 4.222699, 4.222699, 4.222699, 4.222699, 4~
```

Table 1: Patient demographic and status, and physician demographics and evaluation scores.

Characteristic	**N = 2,113**
Patient Age	
60 or older	924 (44%)
Less than 60	1,189 (56%)
Patient Sex	
Female	851 (40%)
Male	1,262 (60%)
Patient Primary Diagnosis	
Cardiovascular	568 (27%)
Gastrointestinal	308 (15%)
Neurological	515 (24%)
Respiratory	569 (27%)
Trauma	153 (7.2%)
Type of ICU Admitted	
Medical	1,350 (64%)
Neurological	263 (12%)
Surgical	258 (12%)
Trauma	242 (11%)
Length of Stay in ICU (Days)	6.700 (6.034)
Need for Emergent Response at Admission	
Emergent Response Needed	350 (17%)
No Emergent Response Needed	1,763 (83%)
APACHEII at Admission	23.171 (4.082)
SOFA at Admission	7.568 (2.697)
SOFA at the End	6.561 (3.405)
Change in SOFA	-1.008 (3.459)
Patient Status at Discharge	
Alive	1,125 (53%)
Dead	988 (47%)
Physician Age	
50 or older	1,531 (72%)
Less than 50	582 (28%)
Physician Sex	
Female	918 (43%)
Male	1,195 (57%)
Physician Domain	
Anesthesia	134 (6.3%)
Emergency	321 (15%)
Internal medicine	1,078 (51%)
Medicine	252 (12%)
Neurology	92 (4.4%)
Pulmonary medicine	236 (11%)
Physician Leadership Role	
Leader	1,037 (49%)
Non-leader	1,076 (51%)
Physician Rank	
Junior	1,077 (51%)
Senior	1,036 (49%)
Number of ICU Sites the Physician is Working at	
1	1,313 (62%)
2+	800 (38%)
Average Evaluation 360 Score	4.253 (0.056)
Average Medical Expert Score	4.348 (0.099)

Method

Level 1 Model (Patient-Level)

For patient i treated by doctor j, the model is:

$$\log\left(\frac{p_{ij}}{1-p_{ij}}\right) = \beta_{0j} + \beta_{1j}X_{1ij} + \beta_2 X_{2ij} + \cdots + \beta_k X_{kij}$$

Where: - p_{ij} is the probability of the outcome (patient status) being 1. - X_{1ij} is a patient-level explanatory variable for which the slope may vary across doctors. - $X_{2ij}, \ldots, X_{kij}$ are other patient-level explanatory variables with fixed slopes. - β_{0j} and β_{1j} are the intercept and slope for X_{1ij} for doctor j.

Level 2 Model (Doctor-Level)

The Level 2 model explains the variation in intercepts and slopes across doctors:

$$\beta_{0j} = \gamma_{00} + u_{0j}$$
$$\beta_{1j} = \gamma_{10} + u_{1j}$$

Where: - γ_{00} and γ_{10} are the average intercept and slope across all doctors. - u_{0j} and u_{1j} are the random effects for doctor j, representing the deviation of doctor j's intercept and slope from the average.

In this model, u_{0j} and u_{1j} are assumed to follow a multivariate normal distribution with mean vector 0 and a covariance matrix to be estimated.

The complete hierarchical model combines these two levels, allowing for the examination of patient outcomes while accounting for variability in intercepts and slopes across different doctors.

examine the data sets provided below to determine if the physician 360 evaluations explain any observed differences in patient outcomes (status discharge = A or D)

```
## Loading required package: Matrix

##
## Attaching package: 'Matrix'

## The following objects are masked from 'package:tidyr':
##
##     expand, pack, unpack

## Loading required package: zoo

##
## Attaching package: 'zoo'

## The following objects are masked from 'package:base':
##
##     as.Date, as.Date.numeric
```

```
## Warning in checkConv(attr(opt, "derivs"), opt$par, ctrl = control$checkConv, :
## Model failed to converge with max|grad| = 0.0678801 (tol = 0.002, component 1)

## Warning in checkConv(attr(opt, "derivs"), opt$par, ctrl = control$checkConv, : Model is nearly unide
##  - Rescale variables?

## Generalized linear mixed model fit by maximum likelihood (Laplace
##   Approximation) [glmerMod]
##  Family: binomial  ( logit )
## Formula:
## status_discharge ~ pt_age + emergency + pt_sex + ICU_type + SOFA_adm +
##     APACHEII_adm + change_in_sofa + ICU_length_of_stay + avg_overall2016 +
##     resident_eval + avg_eval360 + leadership + rank + num_sites +
##     doc_age + (1 | DocID)
##    Data: ptdoc
##
##      AIC      BIC   logLik deviance df.resid
##   2374.4   2481.9  -1168.2   2336.4     2094
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -4.7142 -0.6701 -0.2722  0.7277  5.1869
##
## Random effects:
##  Groups Name        Variance Std.Dev.
##  DocID  (Intercept) 0.4981   0.7057
## Number of obs: 2113, groups:  DocID, 25
##
## Fixed effects:
##                       Estimate Std. Error z value Pr(>|z|)
## (Intercept)        -11.334649  13.416158  -0.845  0.39819
## pt_age1              0.358712   0.132249   2.712  0.00668 **
## emergency1           0.052679   0.145598   0.362  0.71749
## pt_sex1              0.067991   0.104658   0.650  0.51591
## ICU_typeneuro        0.160391   0.160890   0.997  0.31882
## ICU_typesurgical     0.281256   0.171924   1.636  0.10185
## ICU_typetrauma      -0.126639   0.181806  -0.697  0.48608
## SOFA_adm             0.283794   0.046320   6.127 8.97e-10 ***
## APACHEII_adm         0.087800   0.032338   2.715  0.00663 **
## change_in_sofa       0.092038   0.016616   5.539 3.04e-08 ***
## ICU_length_of_stay  -0.023418   0.008639  -2.711  0.00671 **
## avg_overall2016     -0.336475   0.151153  -2.226  0.02601 *
## resident_eval       -0.636887   0.255432  -2.493  0.01265 *
## avg_eval360          2.557724   3.161189   0.809  0.41846
## leadership1         -0.734437   0.313982  -2.339  0.01933 *
## rank1               -0.099695   0.326609  -0.305  0.76018
## num_sites1           0.320647   0.367118   0.873  0.38244
## doc_age1            -1.029157   0.359923  -2.859  0.00424 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

##
## Correlation matrix not shown by default, as p = 18 > 12.
```

```
## Use print(x, correlation=TRUE)  or
##     vcov(x)        if you need it

## optimizer (Nelder_Mead) convergence code: 0 (OK)
## Model failed to converge with max|grad| = 0.0678801 (tol = 0.002, component 1)
## Model is nearly unidentifiable: large eigenvalue ratio
##  - Rescale variables?

## Warning in checkConv(attr(opt, "derivs"), opt$par, ctrl = control$checkConv, : Model failed to conve

## Warning in checkConv(attr(opt, "derivs"), opt$par, ctrl = control$checkConv, : Model is nearly unide
##  - Rescale variables?

## Generalized linear mixed model fit by maximum likelihood (Laplace
##   Approximation) [glmerMod]
##  Family: binomial  ( logit )
## Formula:
## status_discharge ~ pt_age + emergency + pt_sex + ICU_type + SOFA_adm +
##     APACHEII_adm + change_in_sofa + ICU_length_of_stay + avg_overall2016 +
##     resident_eval + avg_eval360 + leadership + rank + num_sites +
##     doc_age + (1 + change_in_sofa | DocID)
##    Data: ptdoc
##
##      AIC      BIC   logLik deviance df.resid
##   2368.4   2487.2  -1163.2   2326.4     2092
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -4.7012 -0.6686 -0.2672  0.7252  5.3862
##
## Random effects:
##  Groups Name           Variance Std.Dev. Corr
##  DocID  (Intercept)    0.658138 0.81126
##         change_in_sofa 0.003279 0.05726  1.00
## Number of obs: 2113, groups:  DocID, 25
##
## Fixed effects:
##                       Estimate Std. Error z value Pr(>|z|)
## (Intercept)        -13.275267  11.103501  -1.196  0.23186
## pt_age1              0.355577   0.132908   2.675  0.00746 **
## emergency1           0.035433   0.146482   0.242  0.80886
## pt_sex1              0.081993   0.105217   0.779  0.43582
## ICU_typeneuro        0.172555   0.161594   1.068  0.28560
## ICU_typesurgical     0.285689   0.172604   1.655  0.09789 .
## ICU_typetrauma      -0.139955   0.182791  -0.766  0.44388
## SOFA_adm             0.279009   0.046392   6.014 1.81e-09 ***
## APACHEII_adm         0.087348   0.032424   2.694  0.00706 **
## change_in_sofa       0.068933   0.021895   3.148  0.00164 **
## ICU_length_of_stay  -0.026217   0.008762  -2.992  0.00277 **
## avg_overall2016     -0.310009   0.131388  -2.359  0.01830 *
## resident_eval       -0.556801   0.221189  -2.517  0.01183 *
## avg_eval360          2.927935   2.623438   1.116  0.26439
## leadership1         -0.834070   0.269792  -3.092  0.00199 **
```

```
## rank1                0.092066   0.293034   0.314  0.75338
## num_sites1           0.066399   0.328636   0.202  0.83988
## doc_age1            -0.862380   0.317631  -2.715  0.00663 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

##
## Correlation matrix not shown by default, as p = 18 > 12.
## Use print(x, correlation=TRUE)  or
##     vcov(x)        if you need it

## optimizer (Nelder_Mead) convergence code: 0 (OK)
## Model failed to converge with max|grad| = 0.0925883 (tol = 0.002, component 1)
## Model is nearly unidentifiable: large eigenvalue ratio
##  - Rescale variables?

## Likelihood ratio test
##
## Model 1: status_discharge ~ pt_age + emergency + pt_sex + ICU_type + SOFA_adm +
##     APACHEII_adm + change_in_sofa + ICU_length_of_stay + avg_overall2016 +
##     resident_eval + avg_eval360 + leadership + rank + num_sites +
##     doc_age + (1 | DocID)
## Model 2: status_discharge ~ pt_age + emergency + pt_sex + ICU_type + SOFA_adm +
##     APACHEII_adm + change_in_sofa + ICU_length_of_stay + avg_overall2016 +
##     resident_eval + avg_eval360 + leadership + rank + num_sites +
##     doc_age + (1 + change_in_sofa | DocID)
##   #Df  LogLik Df  Chisq Pr(>Chisq)
## 1  19 -1168.2
## 2  21 -1163.2  2 10.006   0.006716 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

## Warning in checkConv(attr(opt, "derivs"), opt$par, ctrl = control$checkConv, :
## Model failed to converge with max|grad| = 0.0238917 (tol = 0.002, component 1)

## Generalized linear mixed model fit by maximum likelihood (Laplace
##   Approximation) [glmerMod]
##  Family: binomial  ( logit )
## Formula:
## status_discharge ~ pt_age + SOFA_adm + APACHEII_adm + change_in_sofa +
##     ICU_length_of_stay + avg_overall2016 + resident_eval + leadership +
##     doc_age + (1 + change_in_sofa | DocID)
##    Data: ptdoc
##
##      AIC      BIC   logLik deviance df.resid
##   2360.2   2433.8  -1167.1   2334.2     2100
##
## Scaled residuals:
##     Min      1Q  Median      3Q     Max
## -5.1550 -0.6591 -0.2700  0.7343  5.4298
##
## Random effects:
##  Groups Name           Variance Std.Dev. Corr
```

```
##  DocID  (Intercept)    0.690587 0.83102
##         change_in_sofa 0.003031 0.05506  1.00
## Number of obs: 2113, groups:  DocID, 25
##
## Fixed effects:
##                      Estimate Std. Error z value Pr(>|z|)
## (Intercept)        -0.811933   1.021525  -0.795 0.426716
## pt_age1             0.353871   0.125877   2.811 0.004935 **
## SOFA_adm            0.283410   0.041666   6.802 1.03e-11 ***
## APACHEII_adm        0.083360   0.027766   3.002 0.002681 **
## change_in_sofa      0.070569   0.021399   3.298 0.000974 ***
## ICU_length_of_stay -0.025682   0.008655  -2.967 0.003003 **
## avg_overall2016    -0.276121   0.128650  -2.146 0.031849 *
## resident_eval      -0.539534   0.227200  -2.375 0.017563 *
## leadership1        -0.809918   0.273651  -2.960 0.003080 **
## doc_age1           -0.845804   0.326202  -2.593 0.009517 **
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Correlation of Fixed Effects:
##             (Intr) pt_ag1 SOFA_d APACHE chng__ ICU___ a_2016 rsdnt_ ldrsh1
## pt_age1      0.178
## SOFA_adm     0.260  0.495
## APACHEII_dm -0.402 -0.563 -0.793
## change_n_sf  0.098  0.009  0.181  0.033
## ICU_lngth__ -0.018  0.025  0.034 -0.031  0.136
## avg_vrl2016 -0.708 -0.069 -0.125  0.123 -0.012 -0.001
## resident_vl -0.550  0.004 -0.032 -0.021 -0.100 -0.030  0.074
## leadership1 -0.157  0.008  0.034 -0.087  0.001 -0.005  0.136 -0.050
## doc_age1    -0.380  0.030 -0.044 -0.015 -0.080 -0.040  0.148  0.122  0.075
## optimizer (Nelder_Mead) convergence code: 0 (OK)
## Model failed to converge with max|grad| = 0.0238917 (tol = 0.002, component 1)

## This is DHARMa 0.4.6. For overview type '?DHARMa'. For recent changes, type news(package = 'DHARMa')

##    [1] 0.2574311379 0.5818098624 0.5191717985 0.3205872660 0.0270877029
##    [6] 0.6017782198 0.4611868109 0.0576964834 0.1987062684 0.3148293063
##   [11] 0.1178477020 0.0504135824 0.2975045380 0.1947916797 0.0200627318
##   [16] 0.8610894794 0.3087670426 0.5703174821 0.4879690801 0.1815980968
##   [21] 0.5772885016 0.8215537545 0.0967160538 0.5294556827 0.4698887964
##   [26] 0.8720756296 0.9105980463 0.7356216067 0.6882968487 0.9107250712
##   [31] 0.9678098762 0.6290774412 0.8536461946 0.5449218423 0.9549294959
##   [36] 0.9549074925 0.9891721647 0.8738653484 0.9627167789 0.8824913648
##   [41] 0.6286408310 0.7167912100 0.7536981182 0.8444761053 0.3819872201
##   [46] 0.5014977845 0.6666616058 0.6357346656 0.8799331976 0.9919054609
##   [51] 0.8305598499 0.9213684498 0.8488052799 0.7002291690 0.6366270120
##   [56] 0.5954417970 0.6946548713 0.5214388118 0.7970368315 0.4671716276
##   [61] 0.6212998343 0.4258708314 0.0707655612 0.1178218343 0.1829034693
##   [66] 0.2036265131 0.8966908748 0.9913743842 0.9364433621 0.7710899392
##   [71] 0.9793839408 0.6404065088 0.6466506456 0.5562398268 0.6915590832
##   [76] 0.8082986686 0.7979345297 0.8668704016 0.7303273272 0.3418320802
##   [81] 0.1186219229 0.1065826510 0.4124045297 0.3833398560 0.2909444122
##   [86] 0.0478271609 0.3265379397 0.2459249283 0.2389185352 0.0482659280
##   [91] 0.0067215320 0.1802660029 0.2655649166 0.0222217656 0.1610989022
```

```
##   [96] 0.1066075967 0.2158627530 0.2213620283 0.0599323042 0.0244331736
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## [1911]  0.014801116 -1.122499361  0.179679724 -0.260090528 -1.547069668
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## [1936]  0.074975966  0.353565678 -0.066775048  1.022779043  0.757195856
## [1941]  0.395362148  1.605839871  1.821643814  0.663982162  0.797329446
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## [1966]  0.570362237  0.224136290 -1.008879924 -0.826102088 -0.840690590
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## [2016]  0.504656275  0.784169709 -1.360106745 -0.113338799 -1.442143025
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## [2026]  0.019991069 -0.383437678 -1.513237911 -0.063396916 -1.402754011
## [2031] -0.381669788  0.372601366 -1.047517256  0.131495961 -1.421247314
## [2036] -0.719229965 -0.137603223 -0.266005861 -0.074142272 -1.142075308
## [2041] -0.611076146 -1.731204158 -0.277909293 -0.119539169 -1.652498424
## [2046] -0.335737897 -0.760100298  0.469324158  1.260215923  0.186835890
## [2051]  1.361848107  0.877560288 -0.913889355 -0.360867852 -0.296559218
## [2056] -0.949114764 -0.851614503  0.341894394 -2.325813192 -0.180980335
## [2061]  0.553573315 -1.286550518 -0.914275994 -0.569030462 -0.375416750
## [2066] -0.263494265 -0.330955196 -0.484928669 -0.501159000 -0.545213624
## [2071] -0.597708783 -0.509448498 -1.055474229 -0.032882430  0.230145916
## [2076]  0.119354468 -0.019913887 -1.606991445 -1.792184655 -0.414829140
## [2081] -1.072724578 -0.928434604 -0.423265934 -1.824987107 -1.137912329
## [2086] -1.926191088 -0.347942164 -0.197847602  1.299703123  0.033956161
## [2091]  1.018299424  0.121132808  2.587765393  1.573178297  1.870144852
## [2096]  0.368258159 -0.290517411 -0.076170618  0.300356916 -0.140286354
## [2101] -1.826880465 -2.286169593  0.252845549 -2.886531175  0.059832396
## [2106]  0.376885274  0.416540824 -0.006074054 -0.188199635 -1.627816443
## [2111] -0.118867167  1.634392388  0.122676471
```
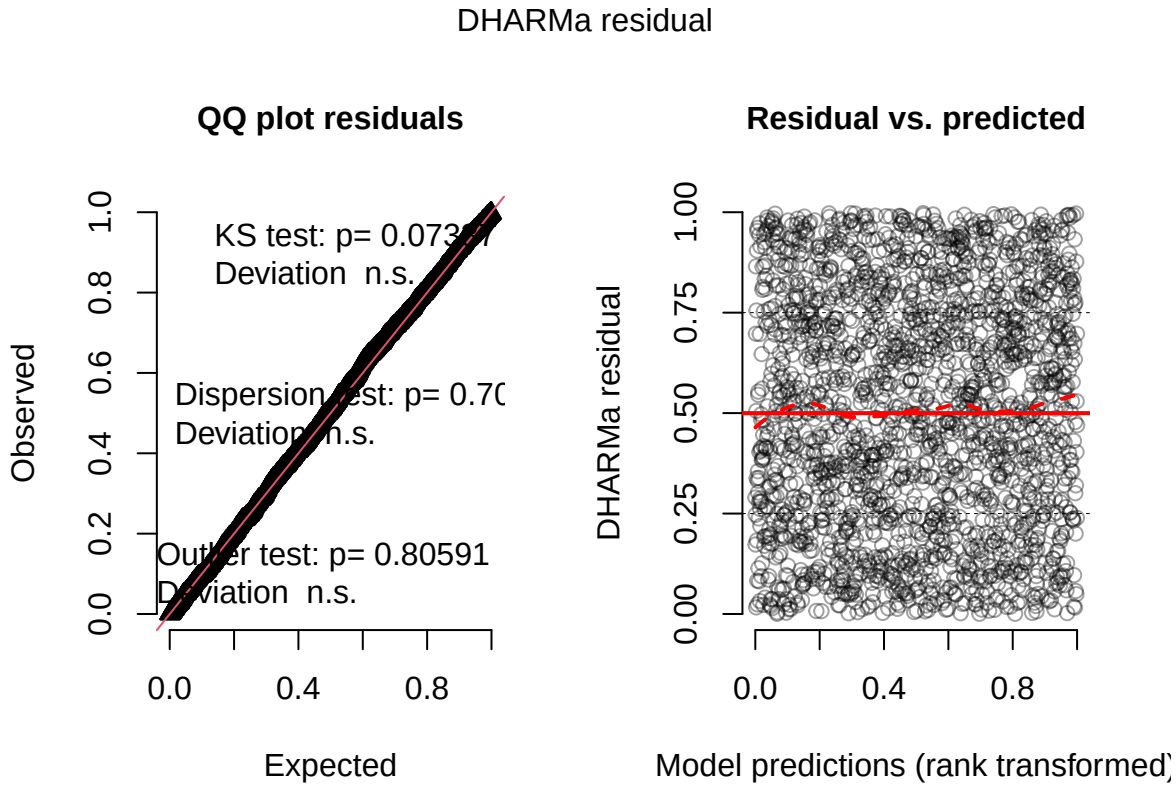
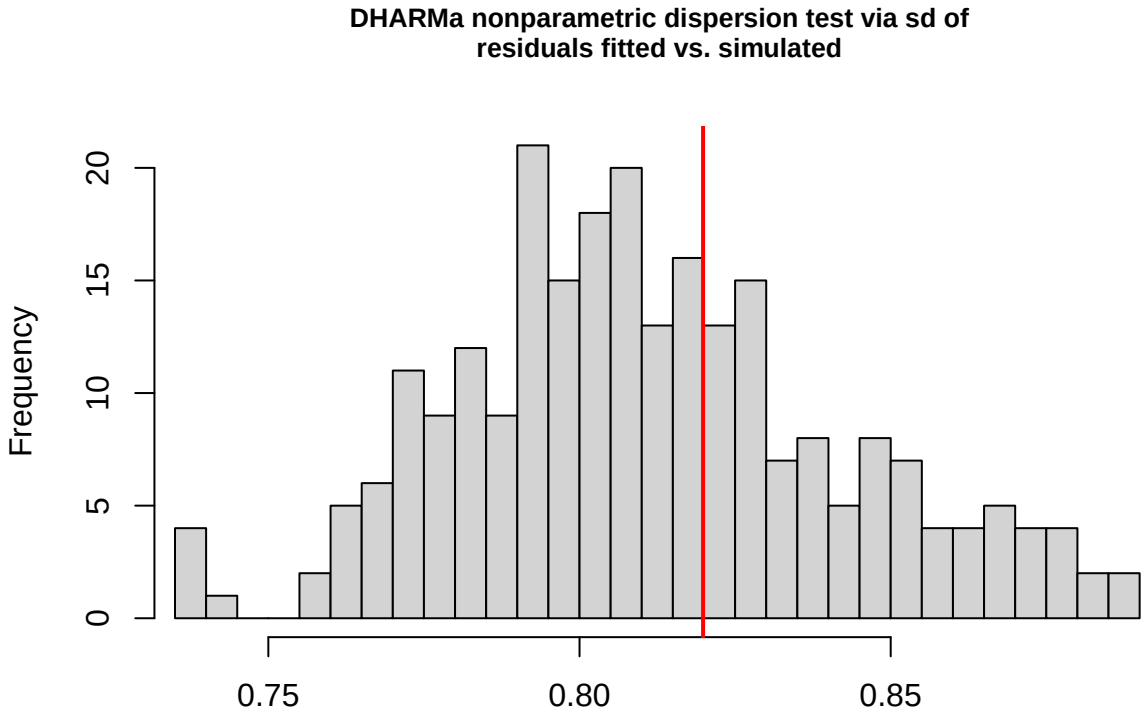
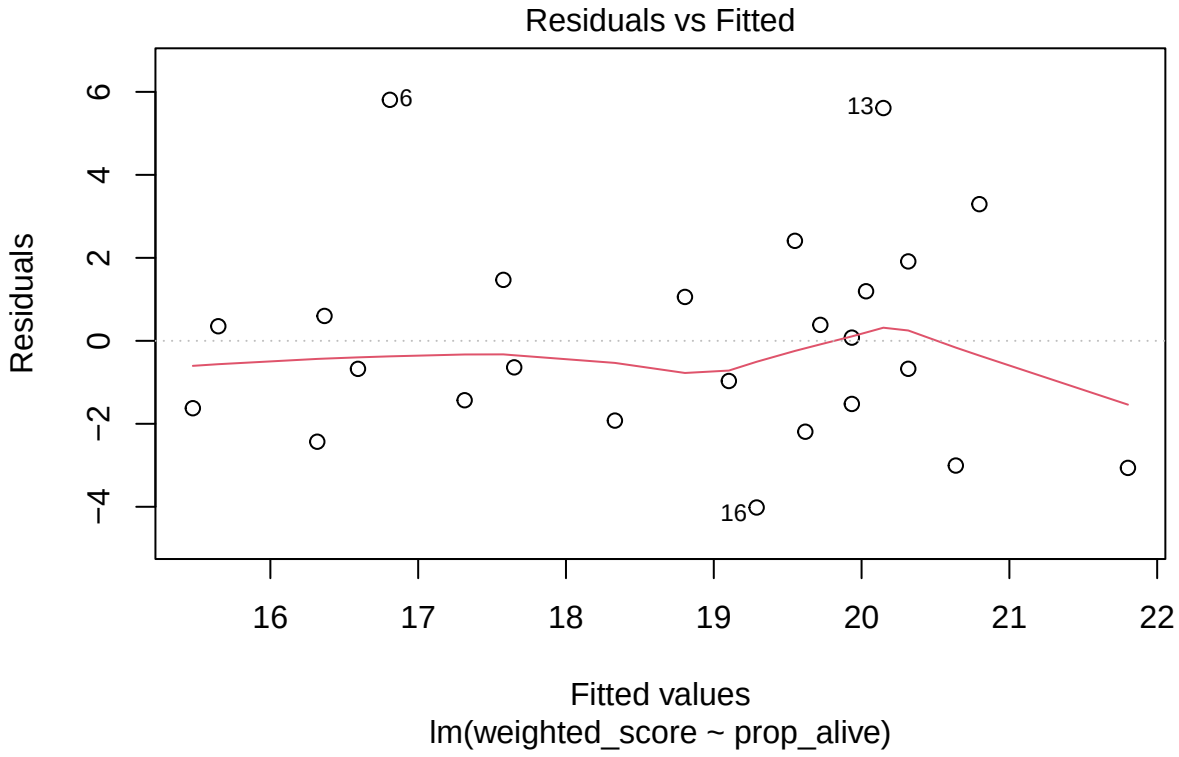
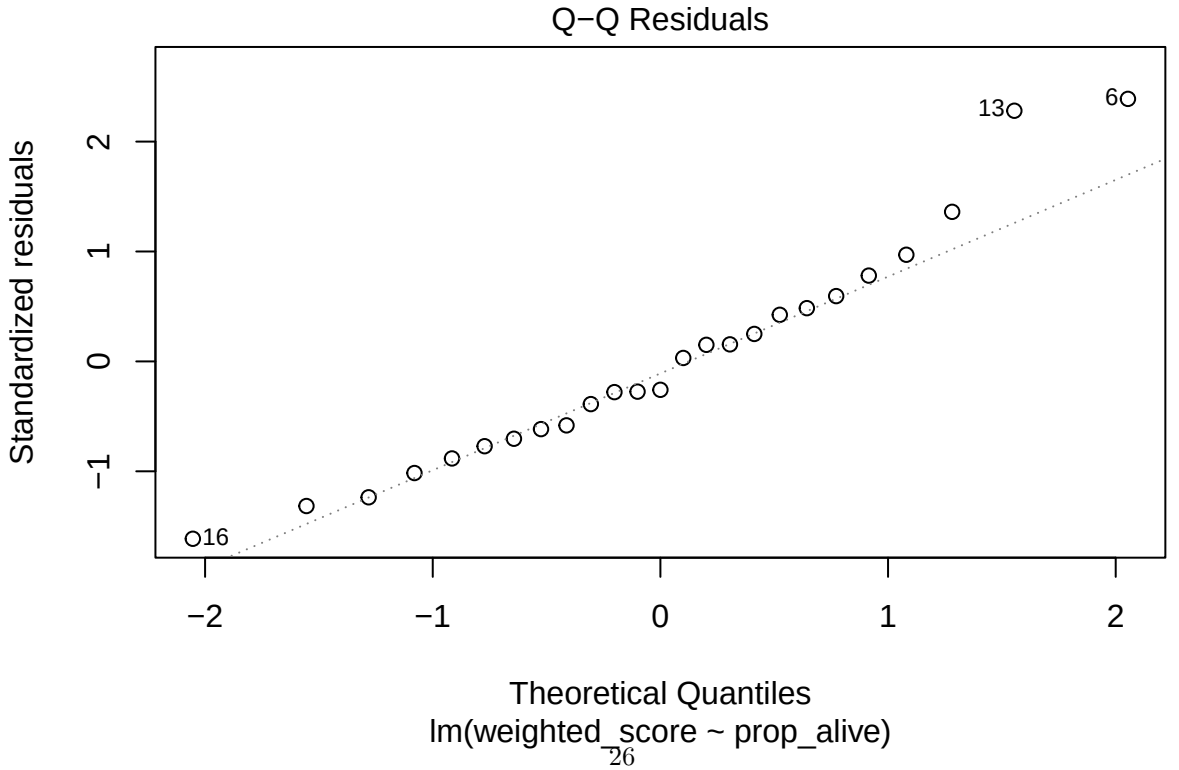



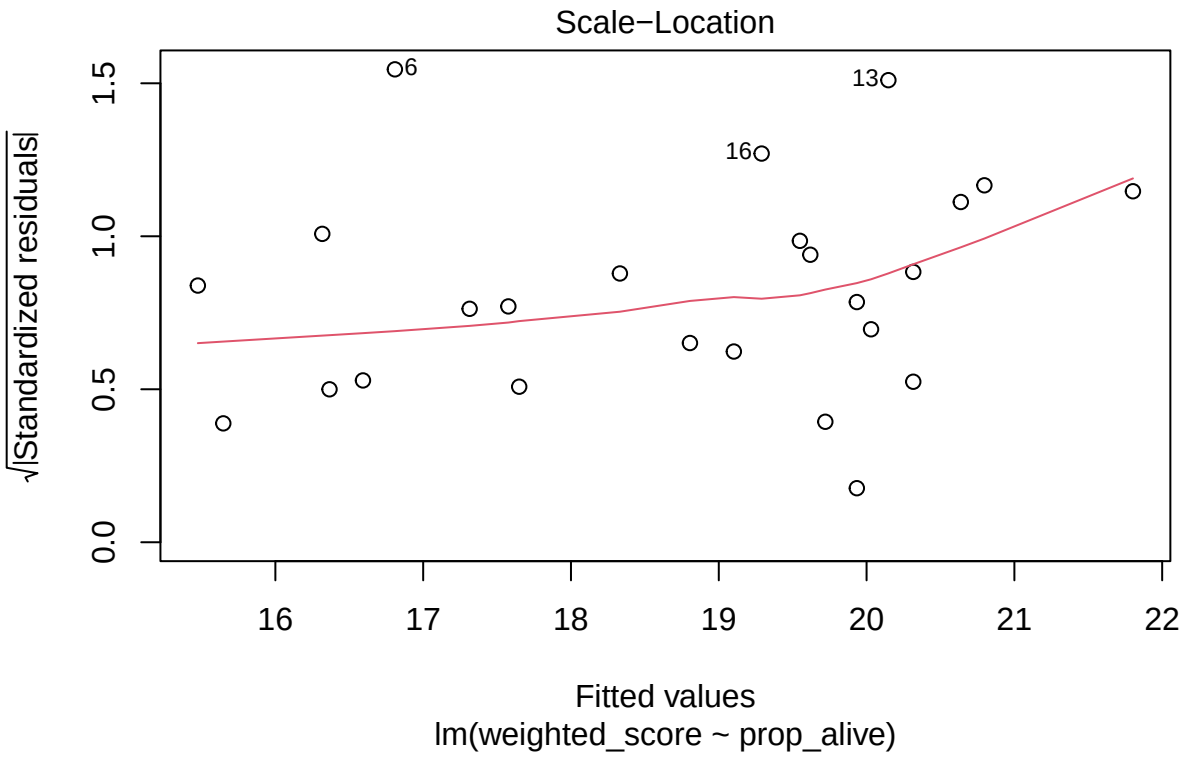


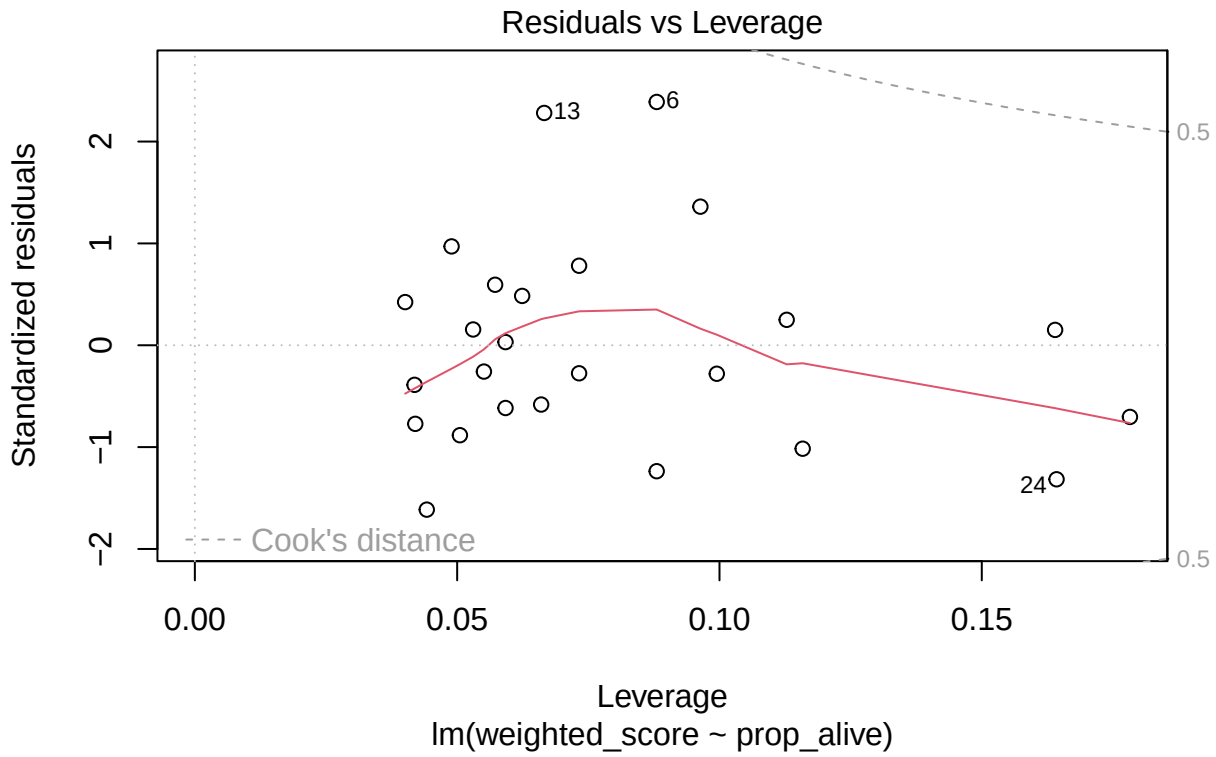

```
##
##  DHARMa nonparametric dispersion test via sd of residuals fitted vs.
##  simulated
##
## data:  simulationOutput
## dispersion = 1.0107, p-value = 0.704
## alternative hypothesis: two.sided
```

develop a weighted score for doctor evaluation

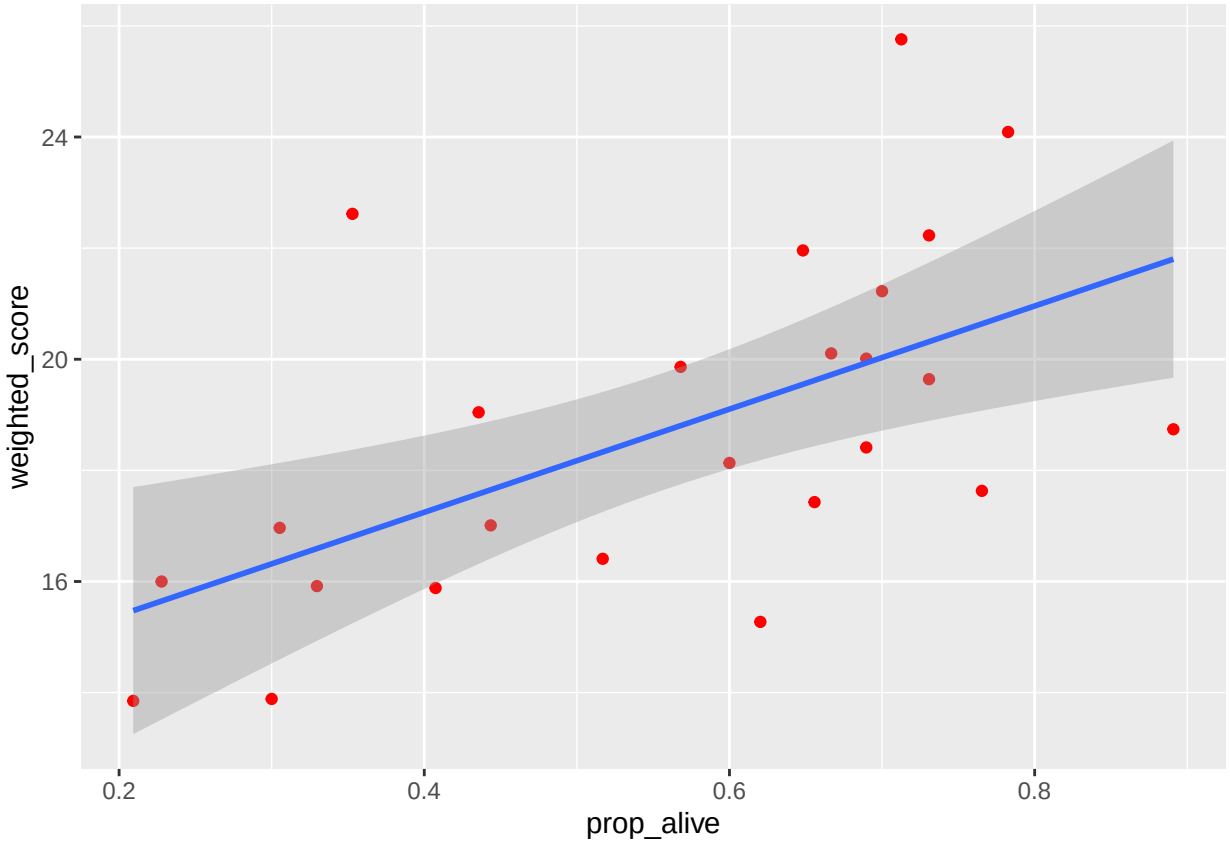





Scale−Location
√|Standardized residuals|
0.0
0.5
1.0
1.5
6
13
16
16
17
18
19
20
21
22
Fitted values
lm(weighted_score ~ prop_alive)




```
## `geom_smooth()` using formula = 'y ~ x'
```



Results

Discussion

- future step: use ICU length of stay as the time-to-event outcome and use status discharge as status for survival analysis