

# Model Selection Results

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```
library(tidyverse)
library(kableExtra)

source("aux_functions.R")
```

## Model Selection

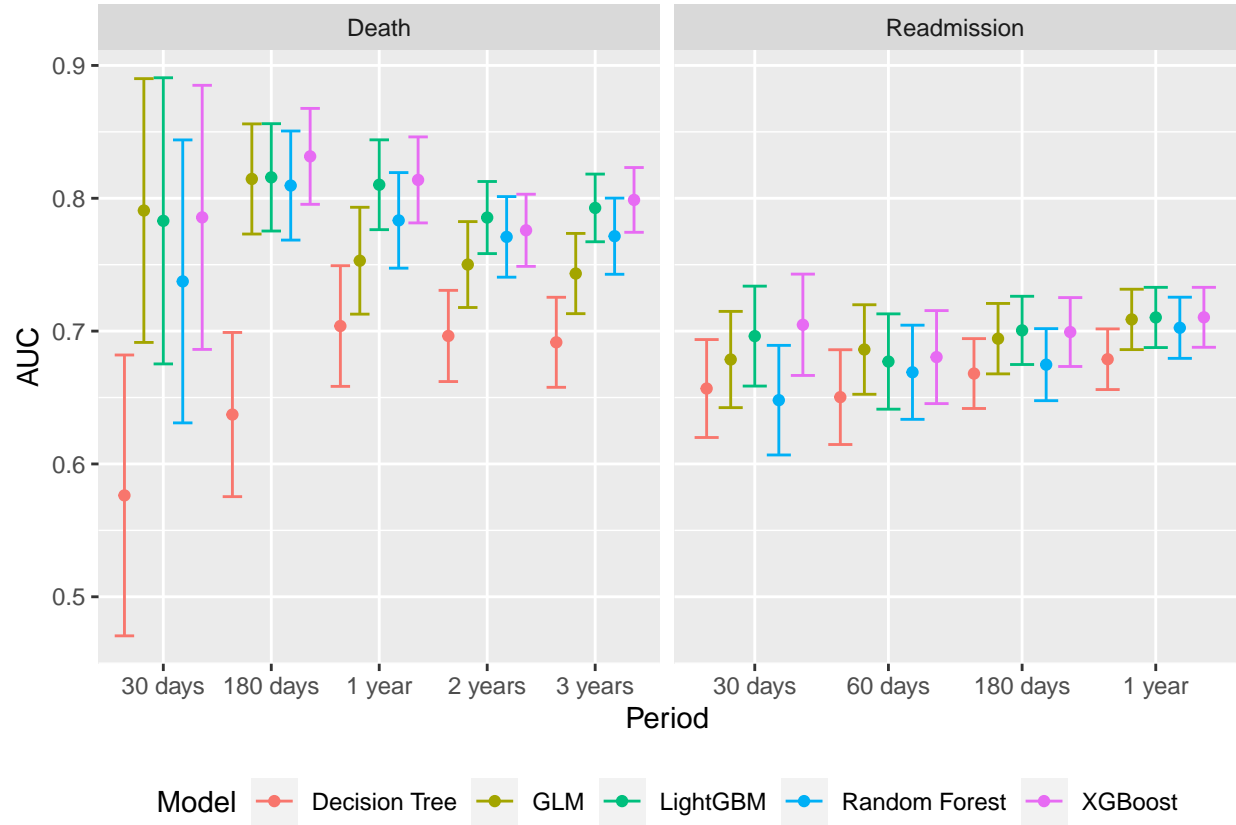


Table 1: Readmission models comparison

Period	Model	AUC	Lower Limit	Upper Limit
30 days	XGBoost	0.70	0.67	0.74
30 days	LightGBM	0.70	0.66	0.73
30 days	GLM	0.68	0.64	0.71
30 days	Decision Tree	0.66	0.62	0.69
30 days	Random Forest	0.65	0.61	0.69
60 days	GLM	0.69	0.65	0.72
60 days	XGBoost	0.68	0.65	0.72
60 days	LightGBM	0.68	0.64	0.71
60 days	Random Forest	0.67	0.63	0.70
60 days	Decision Tree	0.65	0.61	0.69
180 days	LightGBM	0.70	0.67	0.73

Table 1: Readmission models comparison (*continued*)

Period	Model	AUC	Lower Limit	Upper Limit
180 days	XGBoost	0.70	0.67	0.73
180 days	GLM	0.69	0.67	0.72
180 days	Random Forest	0.67	0.65	0.70
180 days	Decision Tree	0.67	0.64	0.69
1 year	XGBoost	0.71	0.69	0.73
1 year	LightGBM	0.71	0.69	0.73
1 year	GLM	0.71	0.69	0.73
1 year	Random Forest	0.70	0.68	0.73
1 year	Decision Tree	0.68	0.66	0.70

Table 2: Death models comparison

Period	Model	AUC	Lower Limit	Upper Limit
30 days	GLM	0.79	0.69	0.89
30 days	XGBoost	0.79	0.69	0.89
30 days	LightGBM	0.78	0.68	0.89
30 days	Random Forest	0.74	0.63	0.84
30 days	Decision Tree	0.58	0.47	0.68
180 days	XGBoost	0.83	0.80	0.87
180 days	LightGBM	0.82	0.78	0.86
180 days	GLM	0.81	0.77	0.86
180 days	Random Forest	0.81	0.77	0.85
180 days	Decision Tree	0.64	0.58	0.70
1 year	XGBoost	0.81	0.78	0.85
1 year	LightGBM	0.81	0.78	0.84
1 year	Random Forest	0.78	0.75	0.82
1 year	GLM	0.75	0.71	0.79
1 year	Decision Tree	0.70	0.66	0.75
2 years	LightGBM	0.79	0.76	0.81
2 years	XGBoost	0.78	0.75	0.80
2 years	Random Forest	0.77	0.74	0.80
2 years	GLM	0.75	0.72	0.78
2 years	Decision Tree	0.70	0.66	0.73
3 years	XGBoost	0.80	0.77	0.82
3 years	LightGBM	0.79	0.77	0.82
3 years	Random Forest	0.77	0.74	0.80
3 years	GLM	0.74	0.71	0.77
3 years	Decision Tree	0.69	0.66	0.73

# Final Model

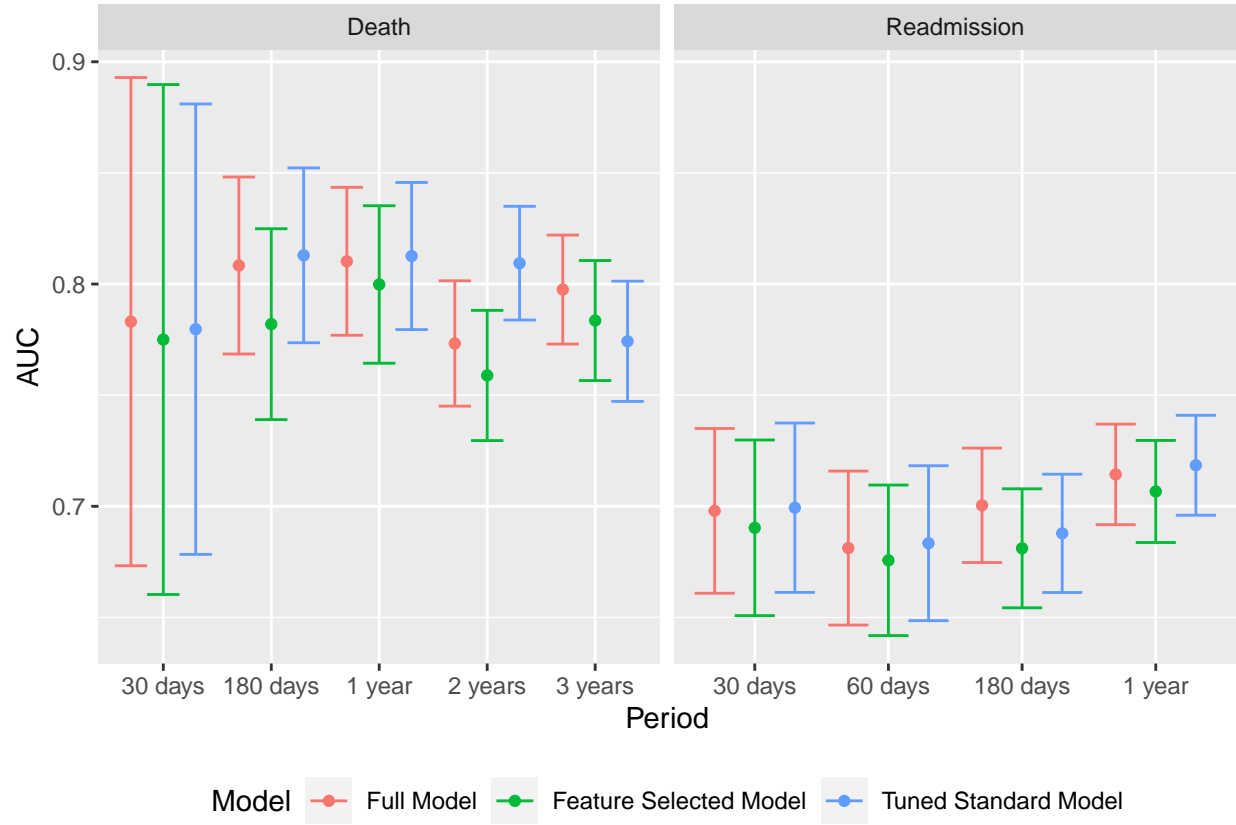


Table 3: Readmission models comparison

Period	Model	AUC	Lower Limit	Upper Limit
30 days	Tuned Standard Model	0.70	0.66	0.74
30 days	Full Model	0.70	0.66	0.73
30 days	Feature Selected Model	0.69	0.65	0.73
60 days	Tuned Standard Model	0.68	0.65	0.72
60 days	Full Model	0.68	0.65	0.72
60 days	Feature Selected Model	0.68	0.64	0.71
180 days	Full Model	0.70	0.67	0.73
180 days	Tuned Standard Model	0.69	0.66	0.71
180 days	Feature Selected Model	0.68	0.65	0.71
1 year	Tuned Standard Model	0.72	0.70	0.74
1 year	Full Model	0.71	0.69	0.74
1 year	Feature Selected Model	0.71	0.68	0.73

Table 4: Death models comparison

Period	Model	AUC	Lower Limit	Upper Limit
30 days	Full Model	0.78	0.67	0.89
30 days	Tuned Standard Model	0.78	0.68	0.88
30 days	Feature Selected Model	0.78	0.66	0.89
180 days	Tuned Standard Model	0.81	0.77	0.85
180 days	Full Model	0.81	0.77	0.85
180 days	Feature Selected Model	0.78	0.74	0.82
1 year	Tuned Standard Model	0.81	0.78	0.85
1 year	Full Model	0.81	0.78	0.84
1 year	Feature Selected Model	0.80	0.76	0.84

Table 4: Death models comparison (*continued*)

Period	Model	AUC	Lower Limit	Upper Limit
2 years	Tuned Standard Model	0.81	0.78	0.83
2 years	Full Model	0.77	0.75	0.80
2 years	Feature Selected Model	0.76	0.73	0.79
3 years	Full Model	0.80	0.77	0.82
3 years	Feature Selected Model	0.78	0.76	0.81
3 years	Tuned Standard Model	0.77	0.75	0.80

## Selected Features

### death\_180days

1. hospital\_stay
2. age
3. laboratorio
4. vasodilatador
5. espironolactona
6. year\_adm\_t0
7. ieca\_bra
8. analyses\_clinicas\_qtde
9. admission\_pre\_t0\_count
10. comorbidities\_count
11. icu\_t0
12. equipe\_multiprof
13. meds\_cardiovasc\_qtde
14. meds\_antimicrobianos
15. diuretico
16. classe\_meds\_qtde
17. antiarritmico
18. estatina
19. admission\_pre\_t0\_180d
20. dva
21. insuf\_cardiaca
22. psicofarmacos
23. exames\_imagem\_qtde
24. ecocardiograma
25. stroke
26. metodos\_graficos\_qtde
27. cied\_final\_group\_1
28. admission\_t0\_emergency
29. cateterismo
30. citologia
31. interconsulta
32. proced\_invasivos\_qtde
33. cintilografia
34. renal\_failure
35. ultrassom
36. af
37. sex
38. cancer
39. copd
40. tomografia
41. cultura
42. prior\_mi
43. ressonancia
44. insulina
45. heart\_failure
46. procedure\_type\_new

47. digoxina
48. antifungico
49. procedure\_type\_1
50. nyha\_basal
51. endoscopia

## death\_1year

1. age
2. hospital\_stay
3. year\_adm\_t0
4. comorbidities\_count
5. admission\_pre\_t0\_count
6. vasodilatador
7. laboratorio
8. analyses\_clinicas\_qtde
9. espirolactona
10. metodos\_graficos\_qtde
11. meds\_cardiovasc\_qtde
12. classe\_meds\_qtde
13. psicofarmacos
14. meds\_antimicrobianos
15. ieca\_bra
16. icu\_t0
17. diuretico
18. estatina
19. equipe\_multiprof
20. education\_level
21. cied\_final\_group\_1
22. admission\_t0\_emergency
23. citologia
24. diabetes
25. renal\_failure
26. sex
27. procedure\_type\_new
28. copd
29. bic
30. insulina
31. cateter\_venoso\_central
32. antifungico
33. flebografia

## death\_2year

1. sex
2. age
3. education\_level
4. underlying\_heart\_disease
5. heart\_disease
6. hypertension
7. prior\_mi
8. heart\_failure
9. af
10. valvopathy
11. diabetes
12. renal\_failure
13. hemodialysis
14. stroke
15. comorbidities\_count
16. procedure\_type\_1
17. reop\_type\_1
18. cied\_final\_1

19. cied\_final\_group\_1
20. admission\_pre\_t0\_count
21. admission\_pre\_t0\_180d
22. year\_adm\_t0
23. icu\_t0
24. dialysis\_t0
25. admission\_t0\_emergency
26. aco
27. antiarritmico
28. ieca\_bra
29. dva
30. digoxina
31. estatina
32. diuretico
33. vasodilatador
34. insuf\_cardiaca
35. espirolactona
36. antiplaquetario\_ev
37. psicofarmacos
38. antiviral
39. classe\_meds\_qtde
40. meds\_cardiovasc\_qtde
41. meds\_antimicrobianos
42. vni
43. ventilacao\_mecanica
44. transplante\_cardiaco
45. icp
46. angioplastia
47. cateterismo
48. proced\_invasivos\_qtde
49. transfusao
50. interconsulta
51. equipe\_multiprof
52. teste\_esforco
53. tilt\_teste
54. metodos\_graficos\_qtde
55. laboratorio
56. cultura
57. analises\_clinicas\_qtde
58. citologia
59. histopatologia\_qtde
60. cintilografia
61. ecocardiograma
62. pet\_ct
63. ultrassom
64. tomografia
65. exames\_imagem\_qtde
66. hospital\_stay

## **death\_30days**

1. sex
2. age
3. education\_level
4. underlying\_heart\_disease
5. heart\_disease
6. nyha\_basal
7. hypertension
8. prior\_mi
9. heart\_failure
10. af

11. valvopathy
12. diabetes
13. renal\_failure
14. hemodialysis
15. cancer
16. comorbidities\_count
17. procedure\_type\_1
18. reop\_type\_1
19. procedure\_type\_new
20. cied\_final\_1
21. cied\_final\_group\_1
22. admission\_pre\_t0\_count
23. admission\_pre\_t0\_180d
24. year\_adm\_t0
25. icu\_t0
26. antiarritmico
27. antihipertensivo
28. betabloqueador
29. dva
30. diuretico
31. vasodilatador
32. espirolactona
33. antiplaquetario\_ev
34. insulina
35. psicofarmacos
36. antifungico
37. classe\_meds\_qtde
38. meds\_cardiovasc\_qtde
39. meds\_antimicrobianos
40. vni
41. ventilacao\_mecanica
42. intervencao\_cv
43. cateter\_venoso\_central
44. proced\_invasivos\_qtde
45. transfusao
46. interconsulta
47. equipe\_multiprof
48. holter
49. metodos\_graficos\_qtde
50. laboratorio
51. cultura
52. analises\_clinicas\_qtde
53. citologia
54. histopatologia\_qtde
55. angio\_tc
56. angiografia
57. cintilografia
58. ecocardiograma
59. flebografia
60. ultrassom
61. tomografia
62. ressonancia
63. exames\_imagem\_qtde
64. bic
65. hospital\_stay

## **death\_3year**

1. hospital\_stay
2. year\_adm\_t0
3. admission\_pre\_t0\_count

4. age
5. espirolactona
6. education\_level
7. comorbidities\_count
8. nyha\_basal

## **readmission\_180d**

1. hospital\_stay
2. age
3. meds\_cardiovasc\_qtde
4. admission\_pre\_t0\_count
5. icu\_t0
6. laboratorio
7. ieca\_bra
8. classe\_meds\_qtde
9. meds\_antimicrobianos
10. vasodilatador
11. metodos\_graficos\_qtde
12. antiarritmico
13. exames\_imagem\_qtde
14. diuretico
15. psicofarmacos
16. equipe\_multiprof
17. estatina
18. cied\_final\_1
19. reop\_type\_1
20. espirolactona
21. patient\_state
22. aco
23. interconsulta
24. diabetes
25. copd
26. insulina
27. prior\_mi
28. icp
29. espiro\_ergoespiro
30. heart\_disease
31. teste\_esforco
32. dialysis\_t0

## **readmission\_1year**

1. hospital\_stay
2. admission\_pre\_t0\_count
3. meds\_cardiovasc\_qtde
4. vasodilatador
5. admission\_pre\_t0\_180d
6. icu\_t0
7. classe\_meds\_qtde
8. diuretico
9. year\_adm\_t0
10. antiarritmico
11. cied\_final\_1
12. equipe\_multiprof
13. age
14. metodos\_graficos\_qtde
15. reop\_type\_1
16. admission\_t0\_emergency
17. ieca\_bra
18. insuf\_cardiaca
19. espirolactona



20. laboratorio
21. bloq\_calcio
22. meds\_antimicrobianos
23. cied\_final\_group\_1
24. procedure\_type\_new
25. estatina
26. dva
27. education\_level
28. psicofarmacos
29. analyses\_clinicas\_qtde
30. procedure\_type\_1
31. exames\_imagem\_qtde
32. proced\_invasivos\_qtde
33. sex
34. patient\_state
35. aco
36. cultura
37. comorbidities\_count
38. holter
39. betabloqueador
40. ultrassom
41. nyha\_basal
42. prior\_mi
43. valvopathy
44. bic
45. histopatologia\_qtde
46. outros\_proced\_cirurgicos
47. ressonancia
48. cateter\_venoso\_central
49. ventilacao\_mecanica
50. anticonvulsivante
51. eletrofisiologia
52. heart\_disease

## **readmission\_\_30d**

1. hospital\_stay
2. analyses\_clinicas\_qtde
3. vasodilatador
4. classe\_meds\_qtde
5. metodos\_graficos\_qtde
6. exames\_imagem\_qtde
7. icu\_t0
8. meds\_cardiovasc\_qtde
9. admission\_pre\_t0\_count
10. dva
11. equipe\_multiprof
12. anticonvulsivante
13. holter
14. comorbidities\_count
15. procedure\_type\_new
16. prior\_mi
17. heart\_failure
18. eletrofisiologia
19. biopsia
20. flebografia
21. nyha\_basal

## **readmission\_\_60d**

1. age
2. underlying\_heart\_disease

3. heart\_disease
4. heart\_failure
5. transplant
6. valvopathy
7. hemodialysis
8. comorbidities\_count
9. procedure\_type\_1
10. reop\_type\_1
11. procedure\_type\_new
12. cied\_final\_group\_1
13. admission\_pre\_t0\_count
14. admission\_pre\_t0\_180d
15. icu\_t0
16. dialysis\_t0
17. admission\_t0\_emergency
18. aco
19. antiarritmico
20. ieca\_bra
21. dva
22. digoxina
23. estatina
24. diuretico
25. vasodilatador
26. insuf\_cardiaca
27. espirolactona
28. bloq\_calcio
29. antiplaquetario\_ev
30. insulina
31. anticonvulsivante
32. psicofarmacos
33. antifungico
34. antiviral
35. classe\_meds\_qtde
36. meds\_cardiovasc\_qtde
37. meds\_antimicrobianos
38. ventilacao\_mecanica
39. transplante\_cardiaco
40. cir\_toracica
41. icp
42. angioplastia
43. eletrofisiologia
44. proced\_invasivos\_qtde
45. cve\_desf
46. interconsulta
47. equipe\_multiprof
48. teste\_esforco
49. espiro\_ergoespiro
50. tilt\_teste
51. metodos\_graficos\_qtde
52. laboratorio
53. analises\_clinicas\_qtde
54. biopsia
55. histopatologia\_qtde
56. angio\_rm
57. arteriografia
58. ecocardiograma
59. endoscopia
60. pet\_ct
61. ultrassom
62. tomografia
63. ressonancia

- 64. exames\_imagem\_qtde
- 65. hospital\_stay

## Union

- 1. hospital\_stay
- 2. age
- 3. laboratorio
- 4. vasodilatador
- 5. espironolactona
- 6. year\_adm\_t0
- 7. ieca\_bra
- 8. analises\_clinicas\_qtde
- 9. admission\_pre\_t0\_count
- 10. comorbidities\_count
- 11. icu\_t0
- 12. equipe\_multiprof
- 13. meds\_cardiovasc\_qtde
- 14. meds\_antimicrobianos
- 15. diuretico
- 16. classe\_meds\_qtde
- 17. antiarritmico
- 18. estatina
- 19. admission\_pre\_t0\_180d
- 20. dva
- 21. insuf\_cardiaca
- 22. psicofarmacos
- 23. exames\_imagem\_qtde
- 24. ecocardiograma
- 25. stroke
- 26. metodos\_graficos\_qtde
- 27. cied\_final\_group\_1
- 28. admission\_t0\_emergency
- 29. cateterismo
- 30. citologia
- 31. interconsulta
- 32. proced\_invasivos\_qtde
- 33. cintilografia
- 34. renal\_failure
- 35. ultrassom
- 36. af
- 37. sex
- 38. cancer
- 39. copd
- 40. tomografia
- 41. cultura
- 42. prior\_mi
- 43. ressonancia
- 44. insulina
- 45. heart\_failure
- 46. procedure\_type\_new
- 47. digoxina
- 48. antifungico
- 49. procedure\_type\_1
- 50. nyha\_basal
- 51. endoscopia
- 52. education\_level
- 53. diabetes
- 54. bic
- 55. cateter\_venoso\_central
- 56. flebografia

57. underlying\_heart\_disease  
58. heart\_disease  
59. hypertension  
60. valvopathy  
61. hemodialysis  
62. reop\_type\_1  
63. cied\_final\_1  
64. dialysis\_t0  
65. aco  
66. antiplaquetario\_ev  
67. antiviral  
68. vni  
69. ventilacao\_mecanica  
70. transplante\_cardiaco  
71. icp  
72. angioplastia  
73. transfusao  
74. teste\_esforco  
75. tilt\_teste  
76. histopatologia\_qtde  
77. pet\_ct  
78. antihipertensivo  
79. betabloqueador  
80. intervencao\_cv  
81. holter  
82. angio\_tc  
83. angiografia  
84. patient\_state  
85. espiro\_ergoespiro  
86. bloq\_calcio  
87. outros\_proced\_cirurgicos  
88. anticonvulsivante  
89. eletrofisiologia  
90. biopsia  
91. transplant  
92. cir\_toracica  
93. cve\_desf  
94. angio\_rm  
95. arteriografia