

# Model Selection Results

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```
library(tidyverse)
library(kableExtra)

source("aux_functions.R")
```

## Model Selection

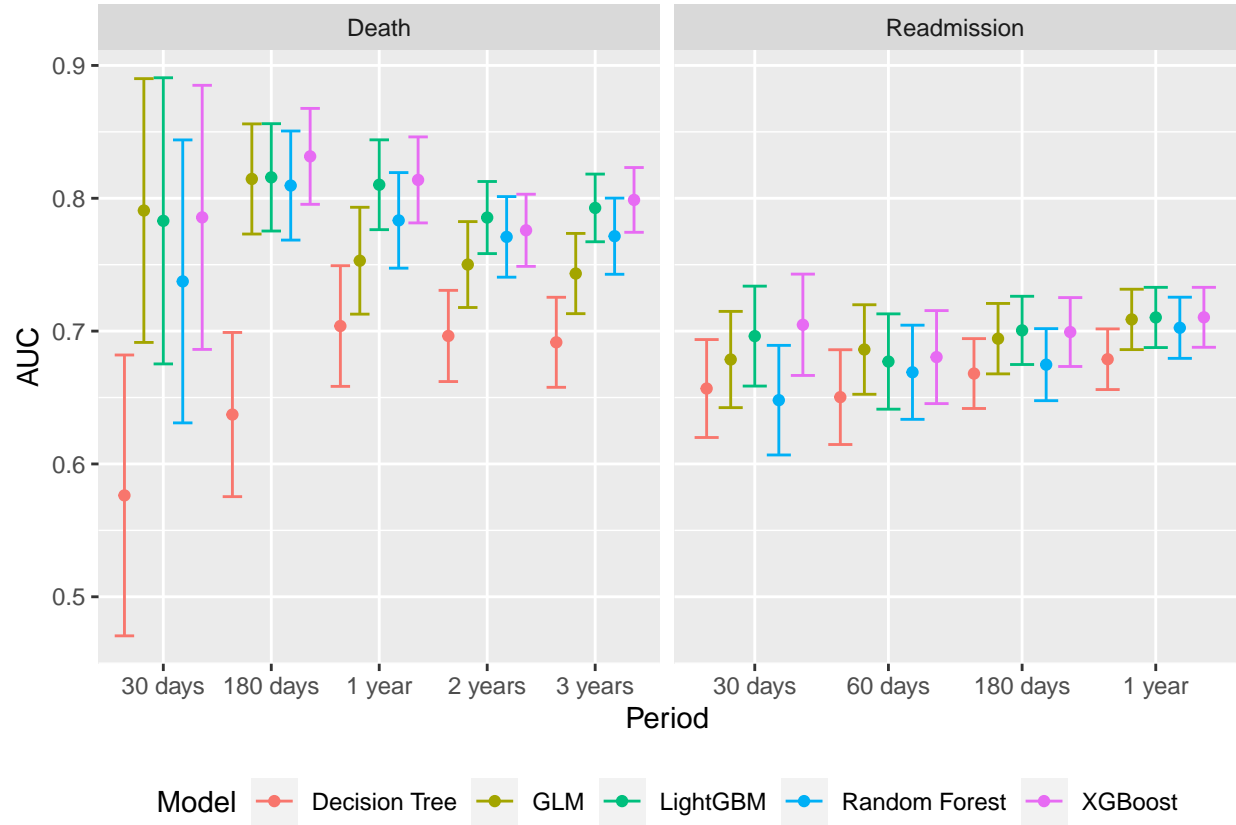


Table 1: Readmission models comparison

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

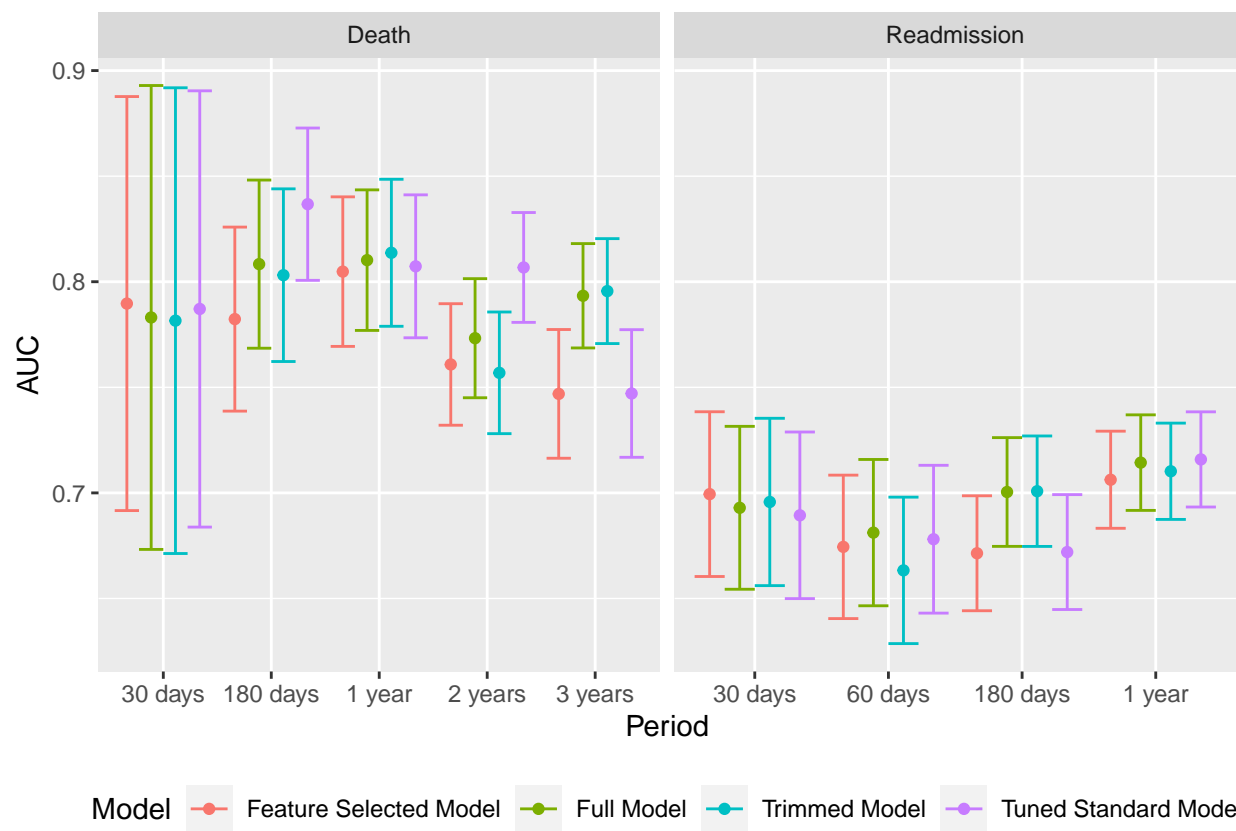


Table 3: Readmission models comparison

Period	Model	AUC	Lower Limit	Upper Limit
30 days	Feature Selected Model	0.70	0.66	0.74
30 days	Trimmed Model	0.70	0.66	0.74
30 days	Full Model	0.69	0.65	0.73
30 days	Tuned Standard Model	0.69	0.65	0.73
60 days	Full Model	0.68	0.65	0.72
60 days	Tuned Standard Model	0.68	0.64	0.71
60 days	Feature Selected Model	0.67	0.64	0.71
60 days	Trimmed Model	0.66	0.63	0.70
180 days	Trimmed Model	0.70	0.67	0.73
180 days	Full Model	0.70	0.67	0.73
180 days	Tuned Standard Model	0.67	0.64	0.70
180 days	Feature Selected Model	0.67	0.64	0.70
1 year	Tuned Standard Model	0.72	0.69	0.74
1 year	Full Model	0.71	0.69	0.74
1 year	Trimmed Model	0.71	0.69	0.73
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	Feature Selected Model	0.79	0.69	0.89
30 days	Tuned Standard Model	0.79	0.68	0.89
30 days	Full Model	0.78	0.67	0.89
30 days	Trimmed Model	0.78	0.67	0.89
180 days	Tuned Standard Model	0.84	0.80	0.87

Table 4: Death models comparison (*continued*)

Period	Model	AUC	Lower Limit	Upper Limit
180 days	Full Model	0.81	0.77	0.85
180 days	Trimmed Model	0.80	0.76	0.84
180 days	Feature Selected Model	0.78	0.74	0.83
1 year	Trimmed Model	0.81	0.78	0.85
1 year	Full Model	0.81	0.78	0.84
1 year	Tuned Standard Model	0.81	0.77	0.84
1 year	Feature Selected Model	0.80	0.77	0.84
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
2 years	Trimmed Model	0.76	0.73	0.79
3 years	Trimmed Model	0.80	0.77	0.82
3 years	Full Model	0.79	0.77	0.82
3 years	Tuned Standard Model	0.75	0.72	0.78
3 years	Feature Selected Model	0.75	0.72	0.78

## death\_180days

1. hospital\_stay
2. age
3. laboratorio
4. vasodilatador
5. espirolactona
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. diabetes
42. cultura
43. prior\_mi
44. holter
45. reop\_type\_1
46. heart\_failure
47. hypertension
48. procedure\_type\_new
49. digoxina
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. espironolactona
9. metodos\_graficos\_qtde
10. meds\_cardiovasc\_qtde
11. classe\_meds\_qtde
12. psicofarmacos
13. meds\_antimicrobianos
14. ieca\_bra
15. icu\_t0
16. diuretico
17. estatina
18. insuf\_cardiaca
19. equipe\_multiprof
20. exames\_imagem\_qtde
21. antiarritmico
22. education\_level
23. cied\_final\_group\_1
24. dva

## death\_\_2year

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

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

## death\_\_3year

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

5. espirolactona
6. comorbidities\_count
7. stroke

## **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. dva
20. histopatologia\_qtde
21. comorbidities\_count
22. espirolactona
23. proced\_invasivos\_qtde

## **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. exames\_imagem\_qtde
31. proced\_invasivos\_qtde
32. sex
33. heart\_failure
34. patient\_state
35. aco
36. digoxina
37. cultura
38. comorbidities\_count
39. holter
40. betabloqueador
41. nyha\_basal
42. prior\_mi
43. valvopathy
44. histopatologia\_qtde
45. underlying\_heart\_disease
46. outros\_proced\_cirurgicos
47. ressonancia
48. cardiac\_arrest
49. ventilacao\_mecanica
50. anticonvulsivante
51. heart\_disease

## readmission\_30d

1. hospital\_stay
2. laboratorio
3. meds\_antimicrobianos
4. analyses\_clinicas\_qtde
5. admission\_pre\_t0\_count
6. psicofarmacos
7. year\_adm\_t0
8. antiarritmico
9. vasodilatador
10. classe\_meds\_qtde
11. dva
12. meds\_cardiovasc\_qtde
13. exames\_imagem\_qtde
14. estatina
15. espirolactona
16. icu\_t0
17. metodos\_graficos\_qtde
18. bic
19. age
20. diuretico
21. equipe\_multiprof
22. comorbidities\_count
23. admission\_t0\_emergency
24. ecocardiograma
25. ultrassom
26. cied\_final\_1
27. betabloqueador
28. ventilacao\_mecanica
29. holter
30. reop\_type\_1
31. proced\_invasivos\_qtde
32. aco
33. ieca\_bra
34. admission\_pre\_t0\_180d
35. interconsulta

36. tomografia
37. insuf\_cardiaca
38. cintilografia
39. cied\_final\_group\_1
40. digoxina
41. cultura
42. diabetes
43. patient\_state
44. anticonvulsivante
45. outros\_proced\_cirurgicos
46. hypertension
47. eletrofisiologia
48. antifungico
49. hipoglicemiante
50. procedure\_type\_new
51. histopatologia\_qtde
52. heart\_failure
53. ressonancia
54. cir\_cardiovascular
55. cardiac\_arrest
56. race
57. procedure\_type\_1
58. biopsia
59. insulina
60. bloq\_calcio
61. valvopathy
62. antihipertensivo
63. mpp
64. flebografia
65. cateterismo
66. antiviral
67. stroke
68. af
69. prior\_mi
70. angio\_tc
71. underlying\_heart\_disease
72. endoscopia
73. cec
74. nyha\_basal
75. cve\_desf
76. drenagem\_torax
77. copd
78. renal\_failure
79. dieta\_enteral
80. icp
81. antiplaquetario\_ev
82. intervencao\_cv
83. cavografia
84. trombolitico
85. angio\_rm

## **readmission\_\_60d**

1. age
2. underlying\_heart\_disease
3. heart\_disease
4. prior\_mi
5. heart\_failure
6. af
7. transplant
8. hemodialysis

9. comorbidities\_count
10. procedure\_type\_1
11. reop\_type\_1
12. procedure\_type\_new
13. cied\_final\_group\_1
14. admission\_pre\_t0\_count
15. admission\_pre\_t0\_180d
16. icu\_t0
17. dialysis\_t0
18. admission\_t0\_emergency
19. aco
20. antiarritmico
21. betabloqueador
22. ieca\_bra
23. dva
24. estatina
25. diuretico
26. vasodilatador
27. insuf\_cardiaca
28. espirolactona
29. bloq\_calcio
30. antiplaquetario\_ev
31. insulina
32. anticonvulsivante
33. psicofarmacos
34. antiviral
35. classe\_meds\_qtde
36. meds\_cardiovasc\_qtde
37. meds\_antimicrobianos
38. cec
39. transplante\_cardiaco
40. cir\_toracica
41. icp
42. angioplastia
43. cateterismo
44. proced\_invasivos\_qtde
45. equipe\_multiprof
46. holter
47. teste\_esforco
48. espiro\_ergoespiro
49. tilt\_teste
50. metodos\_graficos\_qtde
51. laboratorio
52. cultura
53. analises\_clinicas\_qtde
54. biopsia
55. histopatologia\_qtde
56. angio\_rm
57. arteriografia
58. cintilografia
59. ecocardiograma
60. endoscopia
61. pet\_ct
62. ultrassom
63. exames\_imagem\_qtde
64. bic
65. hospital\_stay

## Union

1. hospital\_stay

2. age
3. laboratorio
4. vasodilatador
5. espirolactona
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. diabetes
42. cultura
43. prior\_mi
44. holter
45. reop\_type\_1
46. heart\_failure
47. hypertension
48. procedure\_type\_new
49. digoxina
50. nyha\_basal
51. endoscopia
52. education\_level
53. heart\_disease
54. valvopathy
55. hemodialysis
56. procedure\_type\_1
57. cied\_final\_1
58. dialysis\_t0
59. aco
60. antiplaquetario\_ev
61. antiviral
62. vni

63. ventilacao\_mecanica  
64. transplante\_cardiaco  
65. icp  
66. angioplastia  
67. transfusao  
68. teste\_esforco  
69. tilt\_teste  
70. histopatologia\_qtde  
71. pet\_ct  
72. underlying\_heart\_disease  
73. antihipertensivo  
74. betabloqueador  
75. insulina  
76. antifungico  
77. intervencao\_cv  
78. cateter\_venoso\_central  
79. angio\_tc  
80. angiografia  
81. flebografia  
82. ressonancia  
83. bic  
84. bloq\_calcio  
85. patient\_state  
86. outros\_proced\_cirurgicos  
87. cardiac\_arrest  
88. anticonvulsivante  
89. eletrofisiologia  
90. hipoglicemiante  
91. cir\_cardiovascular  
92. race  
93. biopsia  
94. mpp  
95. cec  
96. cve\_desf  
97. drenagem\_torax  
98. dieta\_enteral  
99. cavografia  
100. trombolitico  
101. angio\_rm  
102. transplant  
103. cir\_toracica  
104. espiro\_ergoespiro  
105. arteriografia