Statistics for NIA VRI

Using simulated data

01 maj 2021

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Table 1 - Baseline characteristics

		No VRI (n=297)	Culture-negative VRI (n=69)	Culture-positive VRI (n=43)	Total (n=409)
Age	mean (sd)	60.2 (15.2)	57 (16.9)	58.9 (13.5)	59.5 (15.3)
Gender	Male	152 (51.2)	28 (40.6)	21 (48.8)	201 (49.1)
Diagnosis	SAH, aneurysmal	101 (34.0)	47 (68.1)	21 (48.8)	169 (41.3)
	ICH	115 (38.7)	11 (15.9)	14 (32.6)	140 (34.2)
	SAH, other	18 (6.1)	4 (5.8)	3 (7.0)	25 (6.1)
	TBI	63 (21.2)	7 (10.1)	5 (11.6)	75 (18.3)
Craniotomy	1	89 (30.0)	25 (36.2)	7 (16.3)	121 (29.6)
Craniectomy	1	14 (4.7)	4 (5.8)	4 (9.3)	22 (5.4)
Endovascular	1	58 (19.5)	26 (37.7)	16 (37.2)	100 (24.4)
EVD Bilateral	1	46 (15.5)	5 (7.2)	7 (16.3)	58 (14.2)
EVD replacement	1	35 (11.8)	17 (24.6)	17 (39.5)	69 (16.9)
Reoperation	0	253 (85.2)	58 (84.1)	37 (86.0)	348 (85.1)
	1	34 (11.4)	10 (14.5)	5 (11.6)	49 (12.0)
		10 (3.4)	1 (1.4)	1 (2.3)	12 (2.9)
EVD duration	mean (sd)	12.3 (6.9)	16.7 (5.3)	19.5 (5.5)	13.8 (7)
Time to Treatment	mean (sd)		8.6 (4.4)	11.2 (4.6)	9.6 (4.6)
	missing	297	0	0	297
Treatment duration	mean (sd)		5.9 (2.8)	7.3 (3.7)	6.5 (3.2)
	missing	297	0	0	297
VRI Gentamicin	1	0 (0.0)	0 (0.0)	2 (4.7)	2 (0.5)
VRI Vancomycin	1	0 (0.0)	68 (98.6)	43 (100.0)	111 (27.1)
VRI Other	1	0 (0.0)	2 (2.9)	2 (4.7)	4 (1.0)
After EVD	Removal	243 (81.8)	45 (65.2)	30 (69.8)	318 (77.8)
	VP-shunt	51 (17.2)	23 (33.3)	13 (30.2)	87 (21.3)
	Transferred	3 (1.0)	1 (1.4)	0 (0.0)	4 (1.0)
Mortality	1	111 (37.4)	9 (13.0)	5 (11.6)	125 (30.6)

Table 2 - CSF characteristics

		Negative (n=754)	Negative, but positive later (n=71)	Positive (n=43)	Total (n=868)
Days to sample	mean (sd)	9.9 (5.5)	7.7 (3.5)	10.5 (4.6)	9.8 (5.3)
CSF WBC	mean (sd)	231.1 (417.1)	307.1 (763.9)	801 (1,306.1)	266.9 (548.1)
	missing	36	3	0	39
CSF RBC	mean (sd)	24,371.1 (34,385)	27,120 (38,571.9)	22,563.4 (25,695.4)	24,486.1 (34,299.2)
	missing	65	11	2	78
CSF Glucose	mean (sd)	4.5 (1.1)	4.3 (1.3)	3.9 (1.4)	4.4 (1.2)
	missing	5	0	0	5
Blood CRP	mean (sd)	44.7 (67.9)	44.7 (70)	21.2 (22.8)	43.4 (66.6)
	missing	77	14	3	94
CSF WBC RBC ratio	mean (sd)	0 (0.1)	0 (0.3)	0.2 (0.6)	0 (0.2)
	missing	88	12	2	102

Table 2 - CSF characteristics (old groups)

		Negative (n=685)	Negative, but let to treatment (n=69)	Negative, but positive later (n=71)	Positive (n=43)	Total (n=868)
Days to sample	mean (sd)	10.1 (5.5)	8.2 (4.3)	7.7 (3.5)	10.5 (4.6)	9.8 (5.3)
CSF WBC	mean (sd)	195.6 (390.6)	570.7 (504.7)	307.1 (763.9)	801 (1,306.1)	266.9 (548.1)
	missing	35	1	3	0	39
CSF RBC	mean (sd)	23,275.4 (33,791.5)	34,543.3 (38,269.9)	27,120 (38,571.9)	22,563.4 (25,695.4)	24,486.1 (34,299.2)
	missing	63	2	11	2	78
CSF Glucose	mean (sd)	4.5 (1.1)	4.5 (1.2)	4.3 (1.3)	3.9 (1.4)	4.4 (1.2)
	missing	5	0	0	0	5
Blood CRP	mean (sd)	45.5 (70)	36.8 (44)	44.7 (70)	21.2 (22.8)	43.4 (66.6)
	missing	75	2	14	3	94
CSF WBC RBC ratio	mean (sd)	0 (0.1)	0.1 (0.2)	0 (0.3)	0.2 (0.6)	0 (0.2)
	missing	86	2	12	2	102

Table 3 - Rule out VRI

Variables	Sensitivity	Specificity	PPV	NPV
WBC/RBC ratio (n=707)	0.41 (0.26-0.58)	0.88 (0.85-0.9)	0.17 (0.1-0.26)	0.96 (0.94-0.97)
CSF/plasma glucose ratio (n=755)	0.8 (0.64-0.91)	0.43 (0.39-0.46)	0.07 (0.05-0.1)	0.97 (0.95-0.99)
CSF protein (n=785)	0.57 (0.41-0.72)	0.55 (0.51-0.58)	0.07 (0.04-0.1)	0.96 (0.93-0.97)
High WBC/RBC ratio and high CSF protein and low glucose ratio (n=670)	0.29 (0.15-0.46)	0.95 (0.93-0.97)	0.26 (0.14-0.42)	0.96 (0.94-0.97)
Low WBC/RBC ratio and low CSF protein and high glucose ratio (n=670)	0.13 (0.04-0.28)	0.77 (0.74-0.8)	0.03 (0.01-0.08)	0.94 (0.91-0.96)

Figure 2 - Timeline

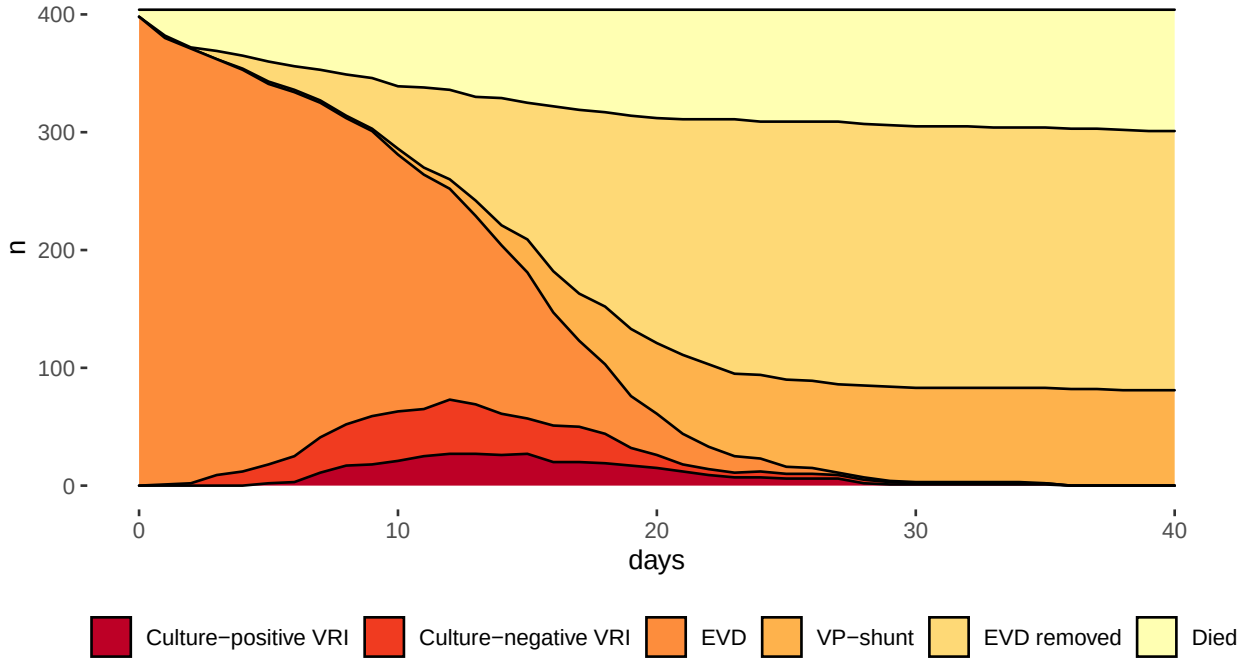
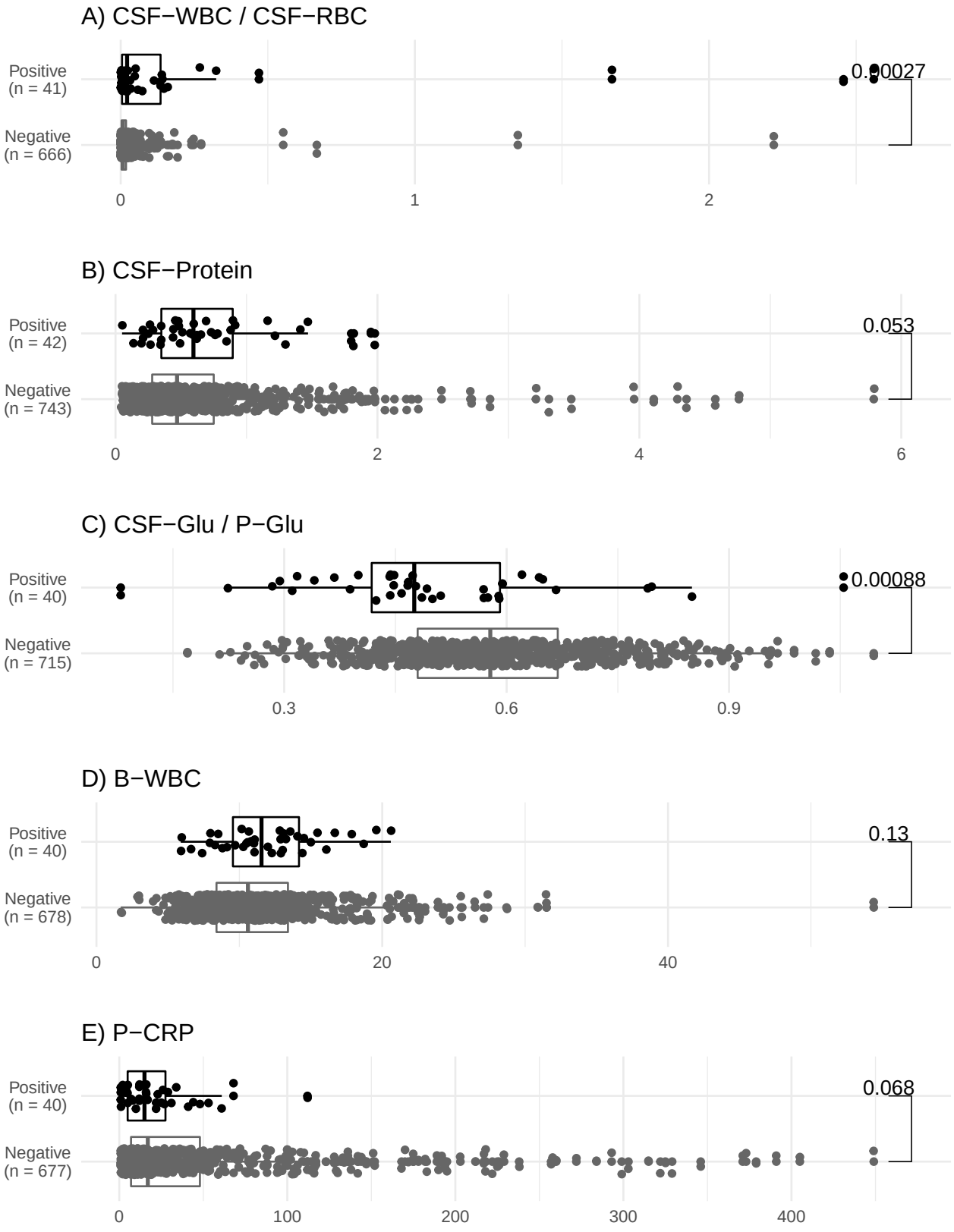
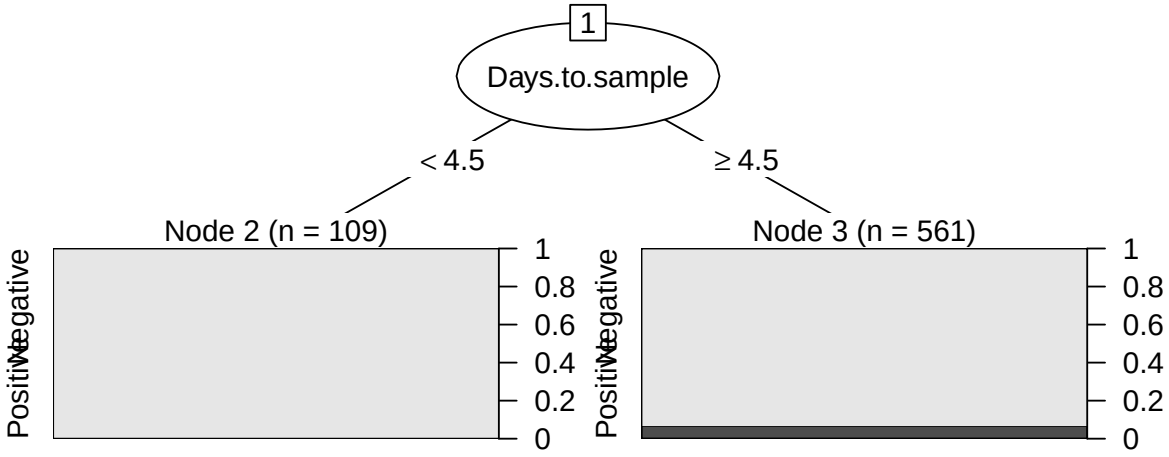


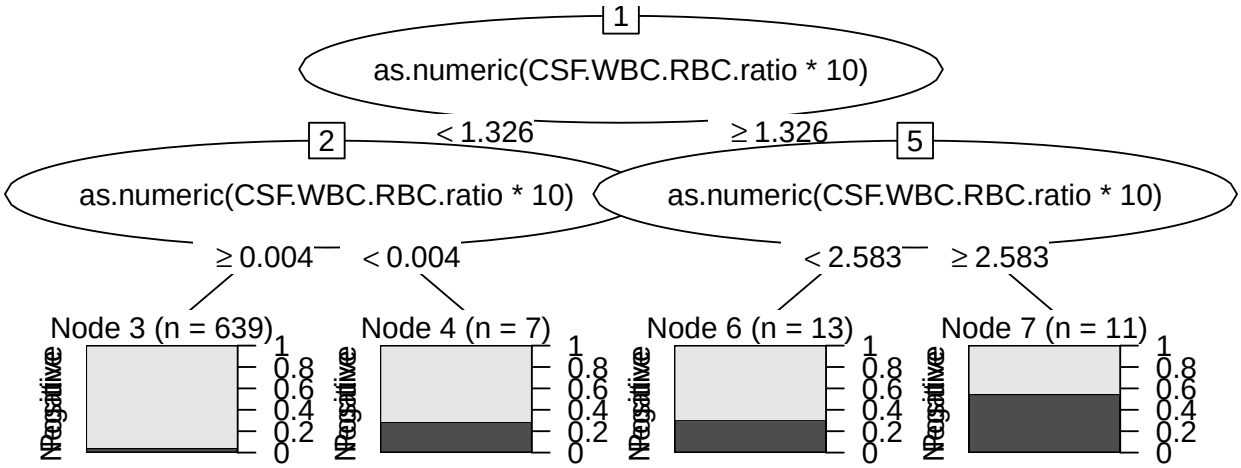
Figure 3 - Biomarkers

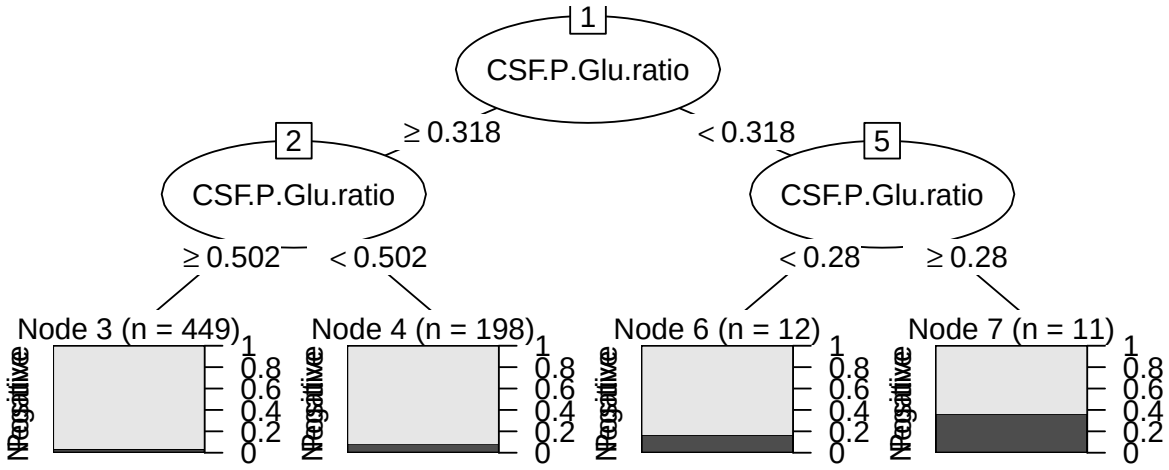


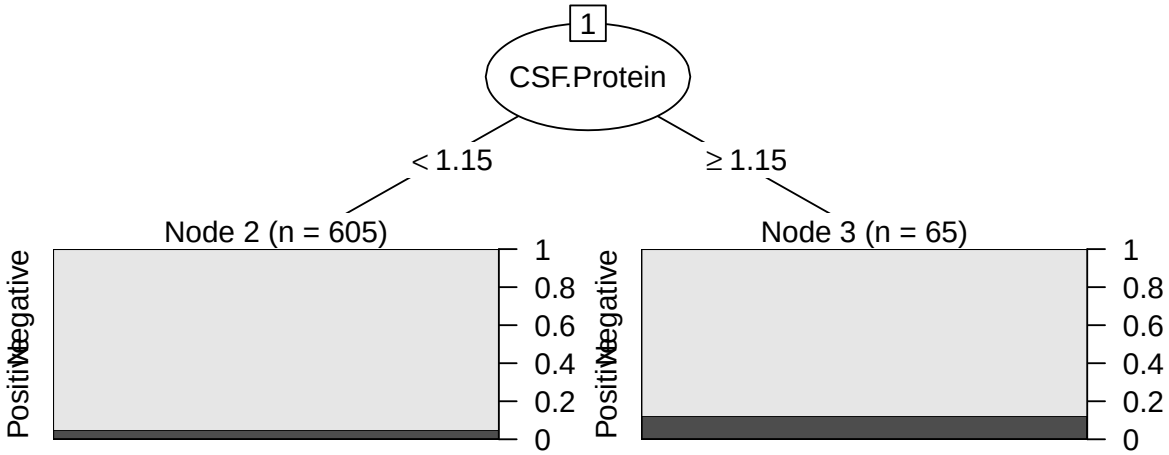
Appendix 1 - VERDICT - VEntriculitis RelateD InfeCTion risk stratification

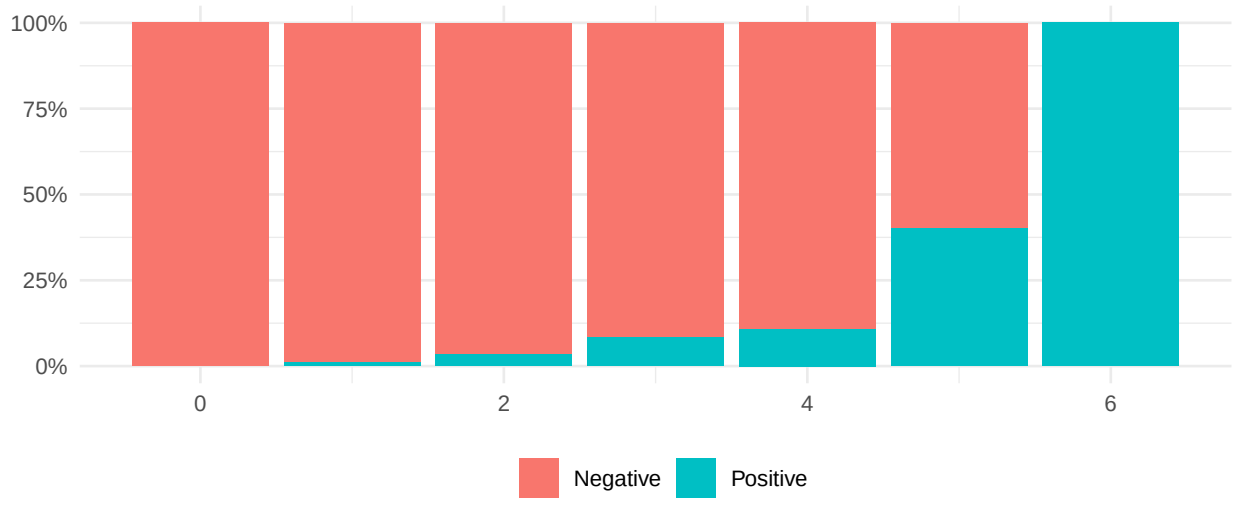
```
##                       Estimate Std. Error    z value   Pr(>|z|)
## (Intercept)       -1.436462919 0.95367290 -1.5062428 0.13200486
## Days.to.sample     0.006588428 0.03293522  0.2000420 0.84144771
## CSF.WBC.RBC.ratio  1.801563327 0.59827419  3.0112670 0.00260160
## CSF.P.Glu.ratio   -2.835990792 1.37268244 -2.0660210 0.03882649
## CSF.Protein       -0.044562434 0.31892470 -0.1397271 0.88887559
```



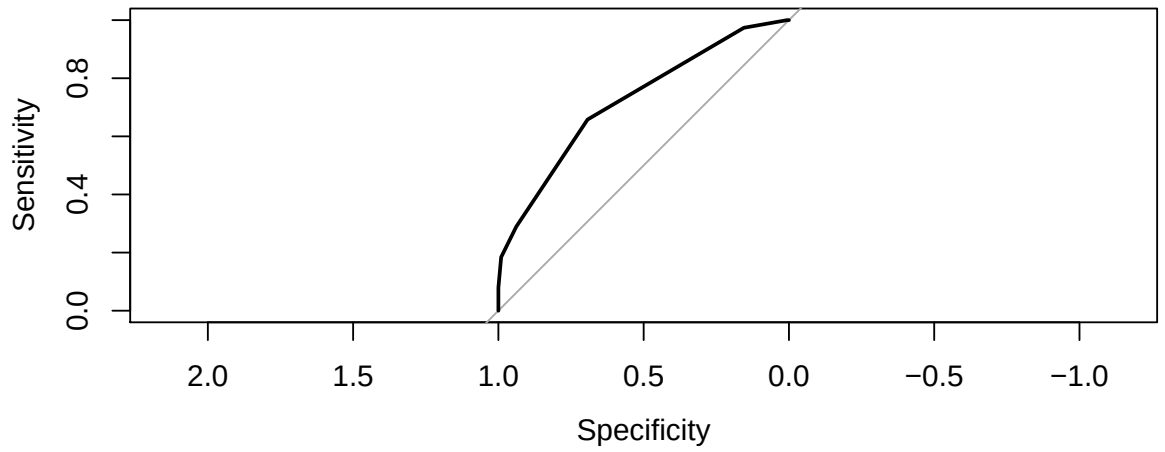



1
CSF.P.Glu.ratio
≥ 0.318
< 0.318
2
CSF.P.Glu.ratio
5
CSF.P.Glu.ratio
≥ 0.502
< 0.502
< 0.28
≥ 0.28
Node 3 (n = 449)
Node 4 (n = 198)
Node 6 (n = 12)
Node 7 (n = 11)
Negative
Positive
1
0.8
0.6
0.4
0.2
0


1
CSF.Protein
< 1.15
≥ 1.15
Node 2 (n = 605)
Node 3 (n = 65)
Negative
Positive
1
0.8
0.6
0.4
0.2
0


100%
75%
50%
25%
0%
0
2
4
6
Negative
Positive

X0	X1	X2	X3	X4	X5	X6
4	94	340	155	33	6	0
0	1	12	14	4	4	3
4	95	352	169	37	10	3




```
## Area under the curve: 0.7218
```

```
## 95% CI: 0.6396-0.8039 (DeLong)
```