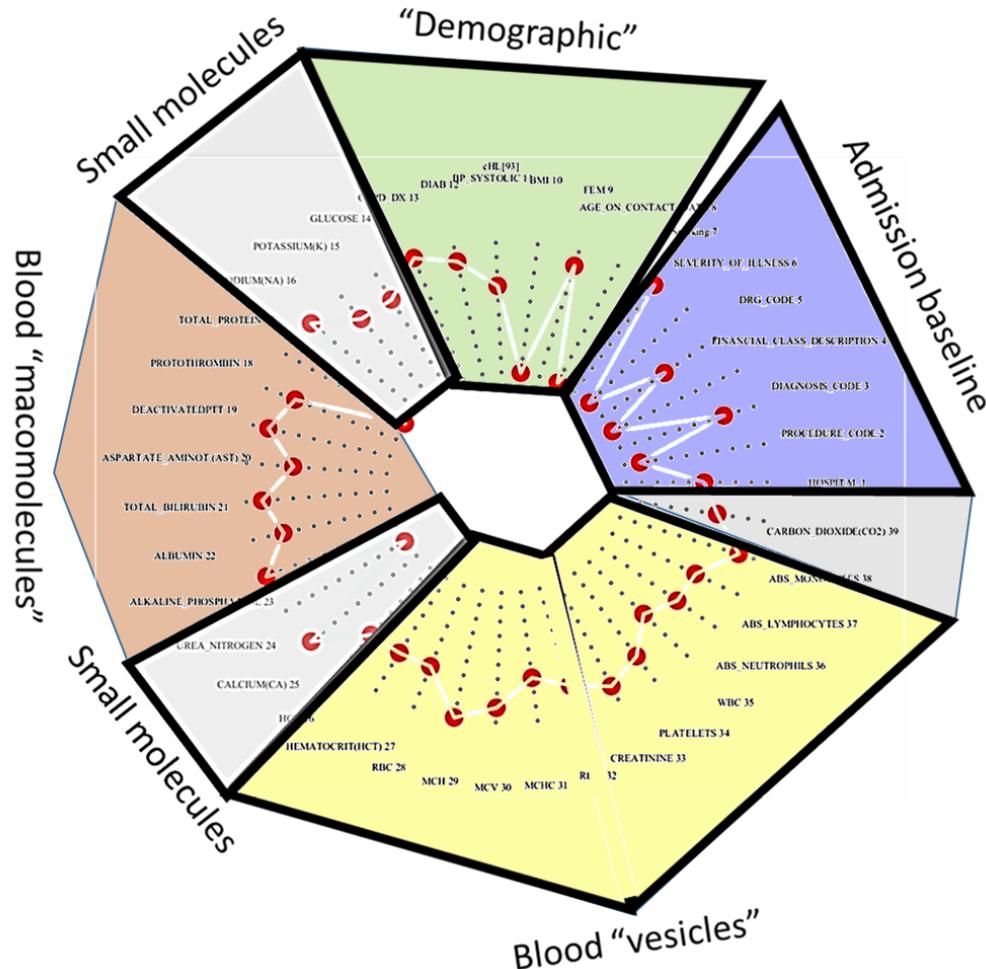
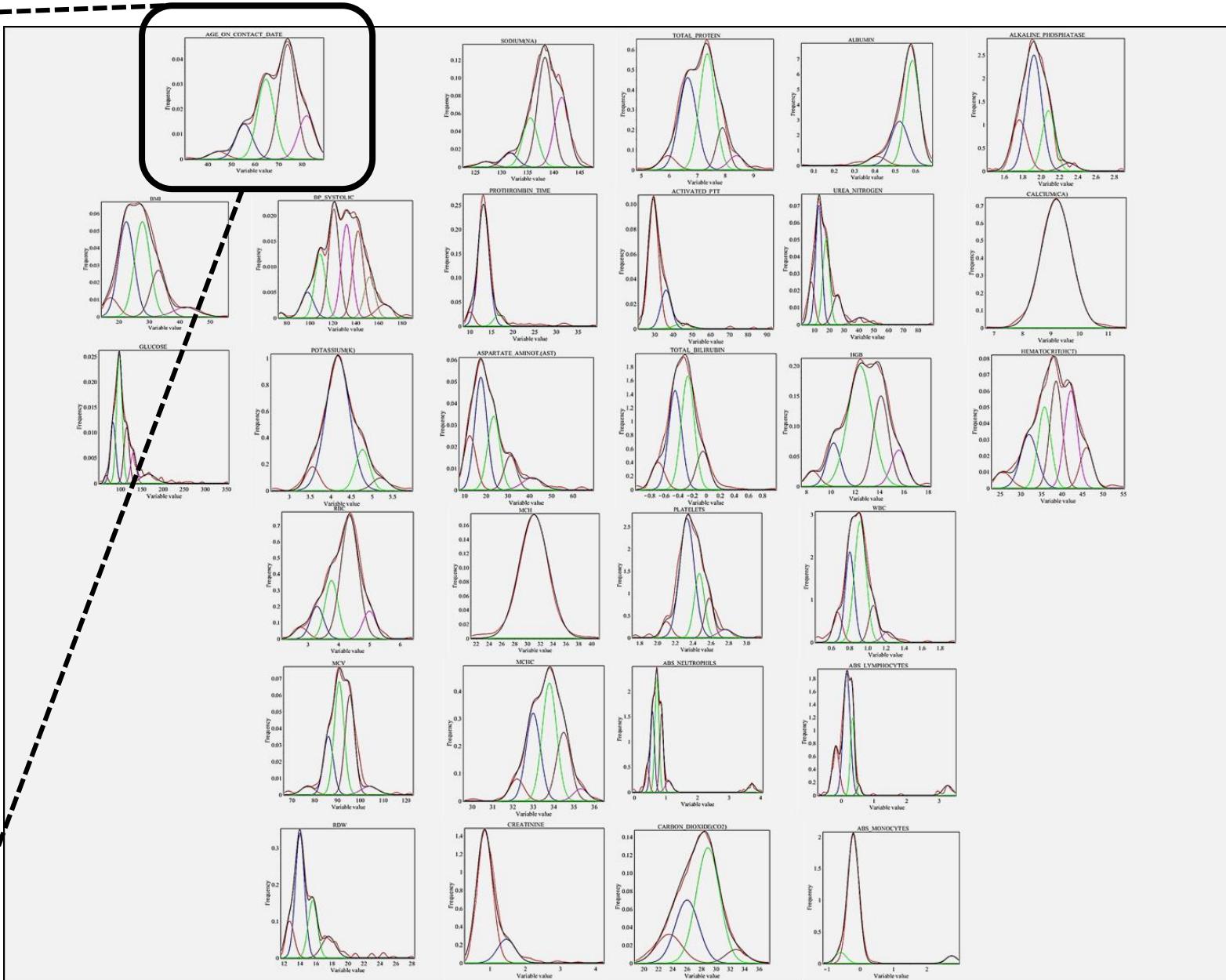
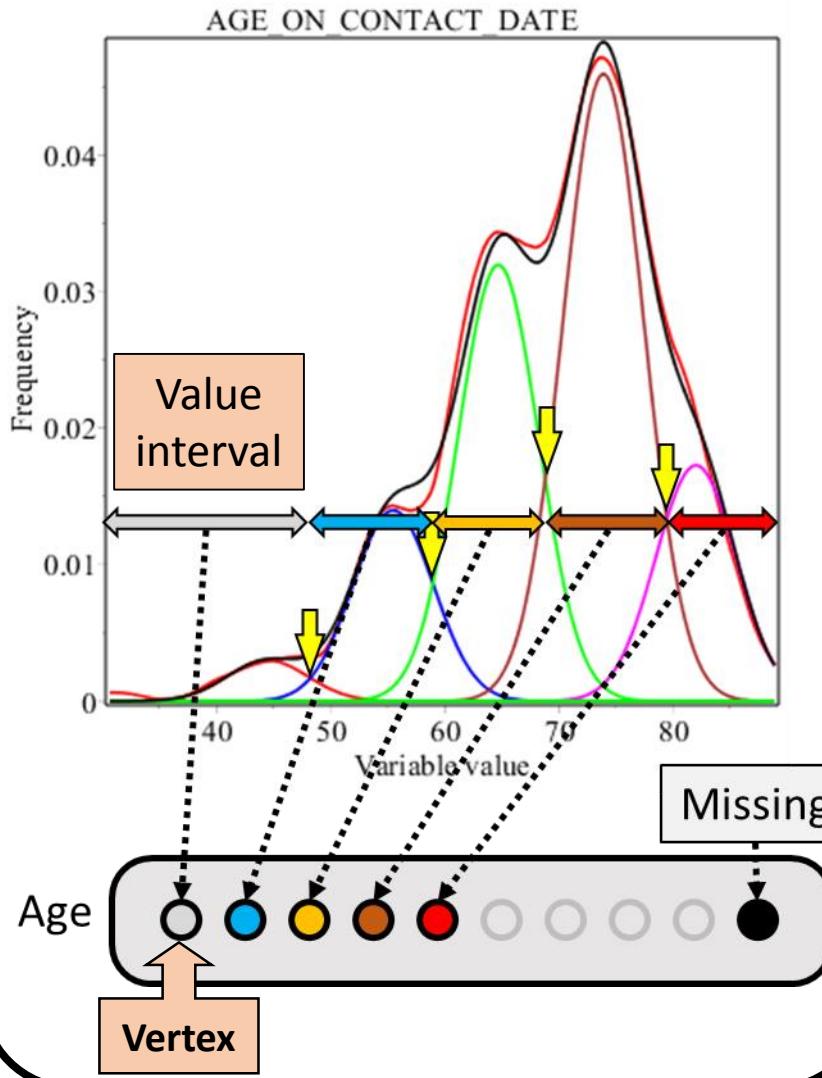


## Categories of information for lung cancer surgery project

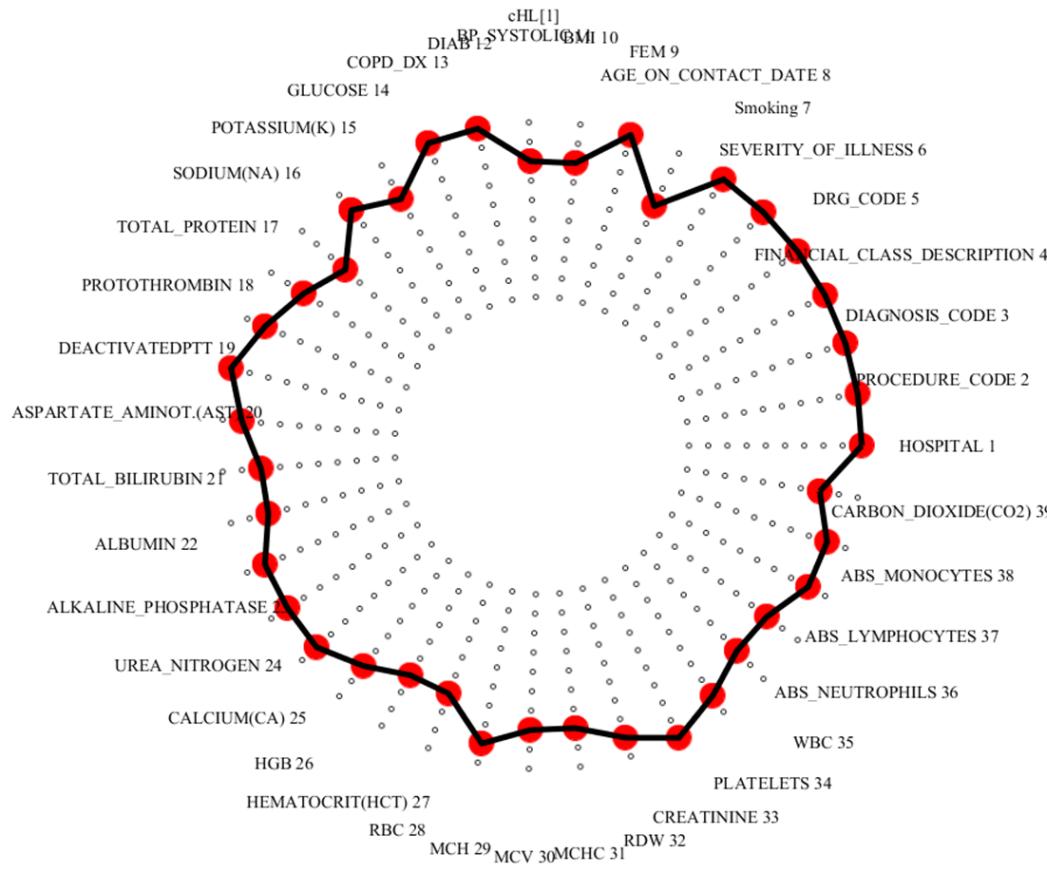


1 HOSPITAL  
2 PROCEDURE\_CODE  
3 DIAGNOSIS\_CODE  
4 FINANCIAL\_CLASS\_DESCRIPTION  
5 DRG\_CODE  
6 SEVERITY\_OF\_ILLNESS  
7 Smoking  
8 AGE\_ON\_CONTACT\_DATE  
9 FEMALE  
10 BMI  
11 BP\_SYSTOLIC  
12 DIAB  
13 COPD\_DX  
14 GLUCOSE  
15 POTASSIUM(K)  
16 SODIUM(NA)  
17 TOTAL\_PROTEIN  
18 PROTHROMBIN  
19 ACTIVATED\_PTT  
20 ASPARTATE\_AMINO.(AS)  
21 TOTAL\_BILIRUBIN  
22 ALBUMIN  
23 ALKALINE\_PHOSPHATASE  
24 UREA\_NITROGEN  
25 CALCIUM(CA)  
26 HEMATOCRIT(HC)  
27 RBC  
28 MCH  
29 MCV  
30 MCHC  
31 RDW  
32 WBC  
33 CREATININE  
34 PLATELETS  
35 ABS\_NEUTROPHILS  
36 ABS\_MONOCYTES  
37 ABS\_LYMPHOCYTES  
38 ABS\_NEUTROPHILS  
39 CARBON\_DIOXIDE(CO2)

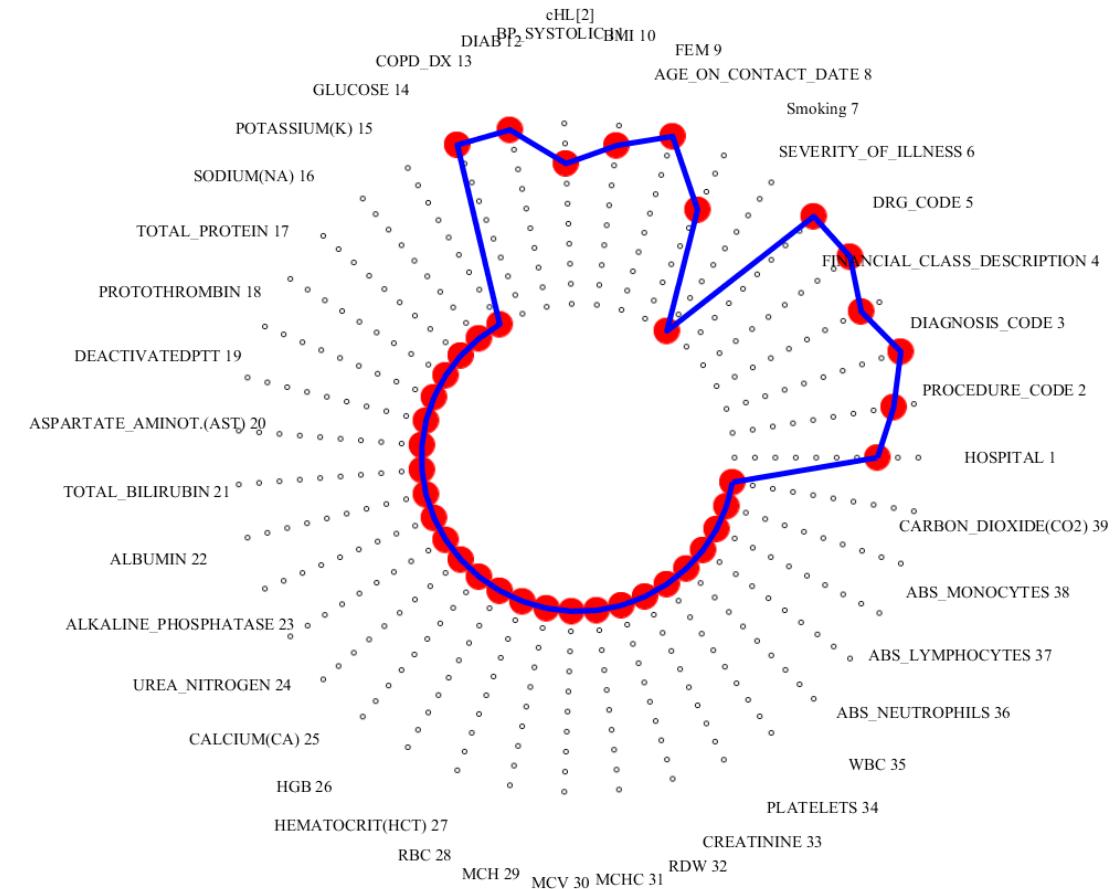
17 TOTAL\_PROTEIN  
18 PROTHROMBIN  
19 ACTIVATED\_PTT  
20 ASPARTATE\_AMINO.(AS)  
21 TOTAL\_BILIRUBIN  
22 ALBUMIN  
23 ALKALINE\_PHOSPHATASE  
24 UREA\_NITROGEN  
25 CALCIUM(CA)  
26 HGB  
27 HEMATOCRIT(HC)  
28 RBC  
29 MCH  
30 MCV  
31 MCHC  
32 RDW  
33 CREATININE  
34 PLATELETS  
35 WBC  
36 ABS\_NEUTROPHILS  
37 ABS\_LYMPHOCYTES  
38 ABS\_MONOCYTES



All data available



All but admission and demographic data missing

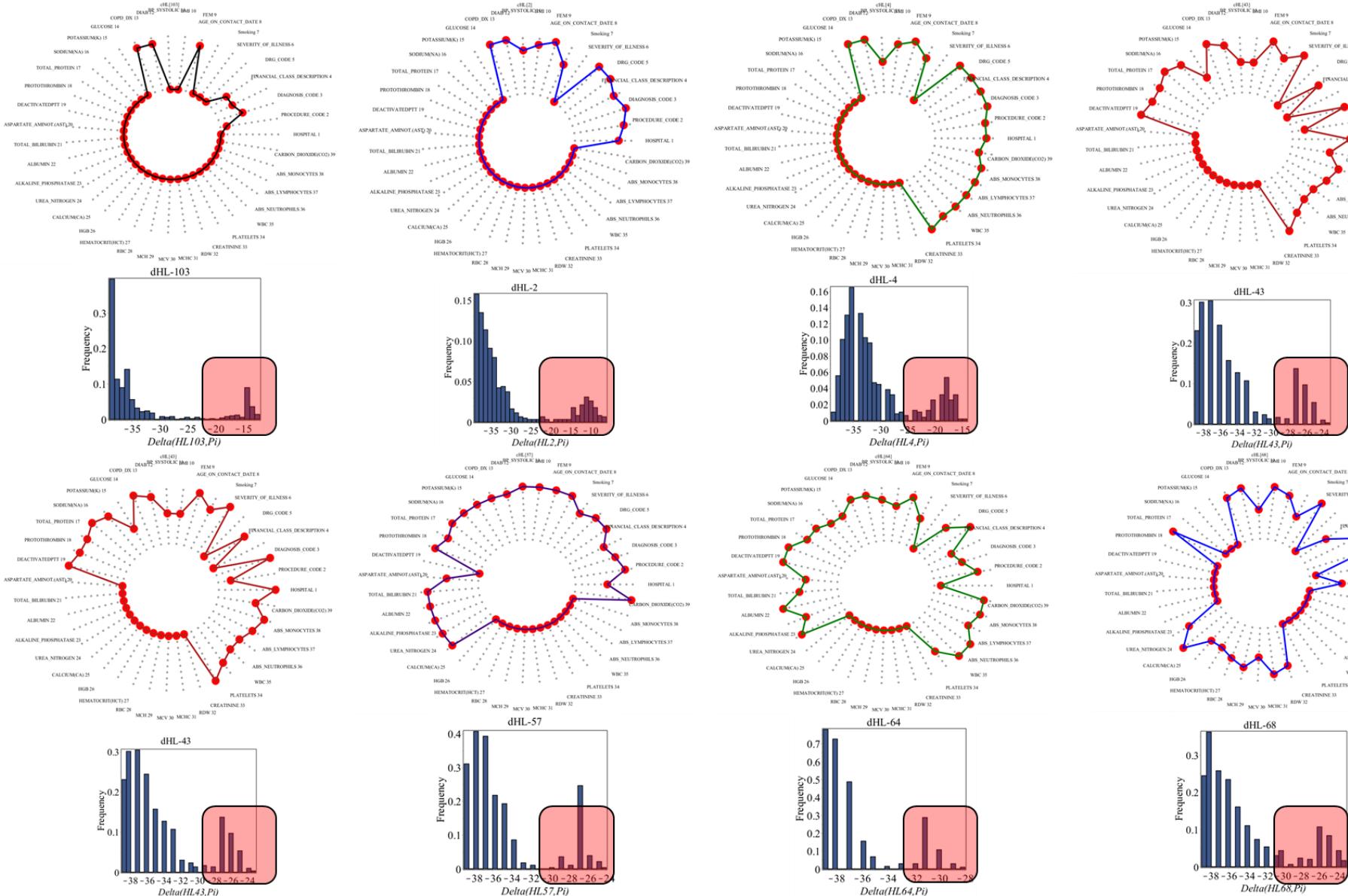


Graph representation of a personal clinical pattern preserves information about the value of missing clinical parameter in the relationships of remaining parameters = “natural imputation”

This imputation works until the missing data are not majority in the input information.

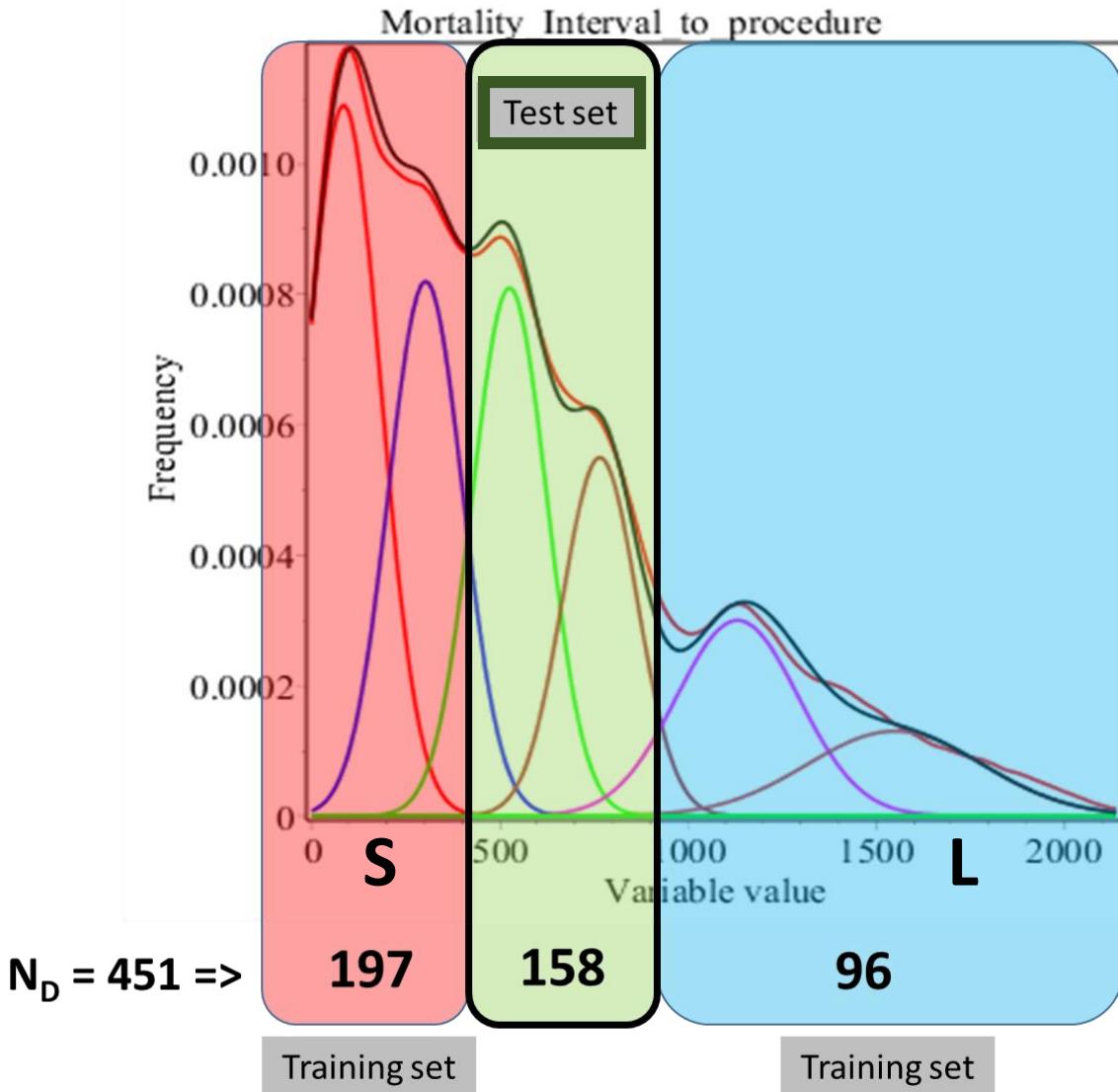
Problem is how to non-arbitrarily define “majority”.

By keeping the data for every patient together, our approach results in data-driven identification of the patients, whose information is incompatible with the majority od cases.



$$N_{\text{all}} = 1667, N_F = 351 (21\%), N_S = 1318$$

$$N_D = 559 (33.5\%) \quad N_{DF} = 108 (19.3\% \text{ of } N_D) \quad N_{DS} = 451 (34.2\% \text{ of } N_S)$$

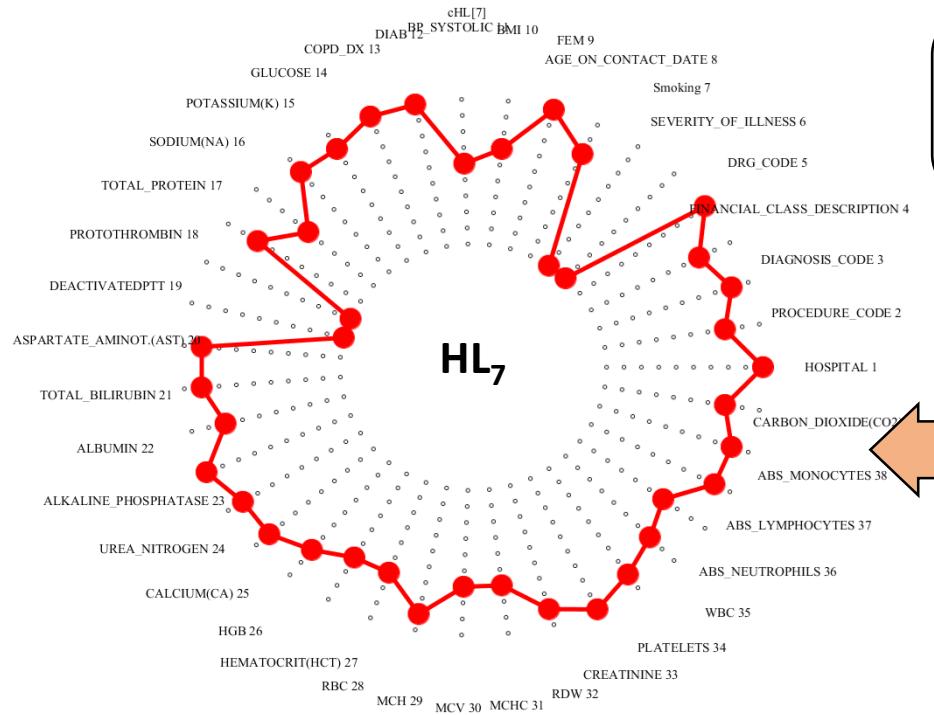


1. **Rationale:**

- A. Mortality = known information.
- B. Fact=Patients with the shortest survival and patients with the longest survival will have the largest differences in their clinical profiles.
- C. If we can identify clinical patterns, discriminating between groups **S** and **L**, then proportions of these patterns in the personal clinical profile is quantitative marker (**CPQM**) of the disease severity.

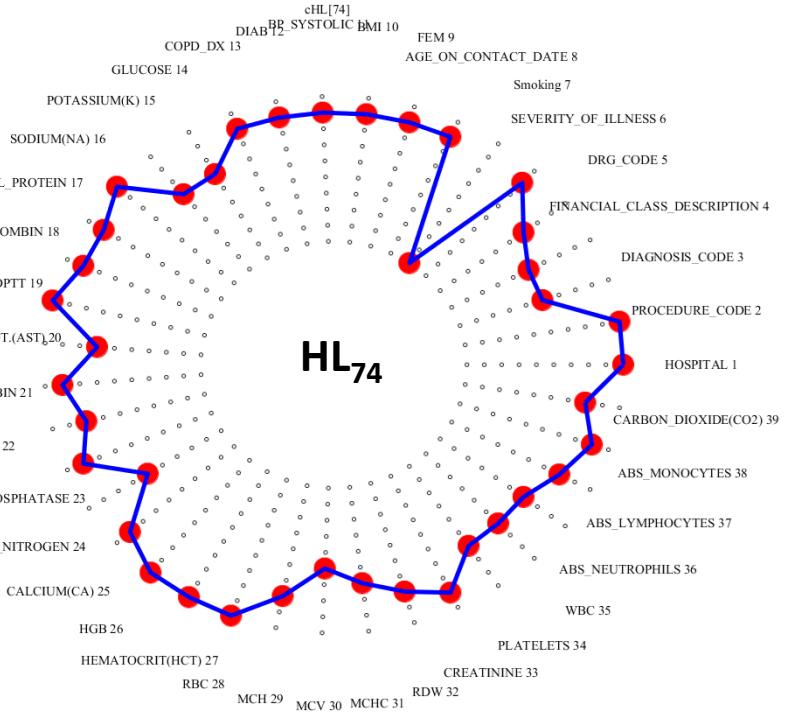
2. **Validation of clinical relevance of CPQM:**

By demonstrating, that personal clinical profiles of patients with intermediate survival are mixes of **S** and **L** clinical patterns.

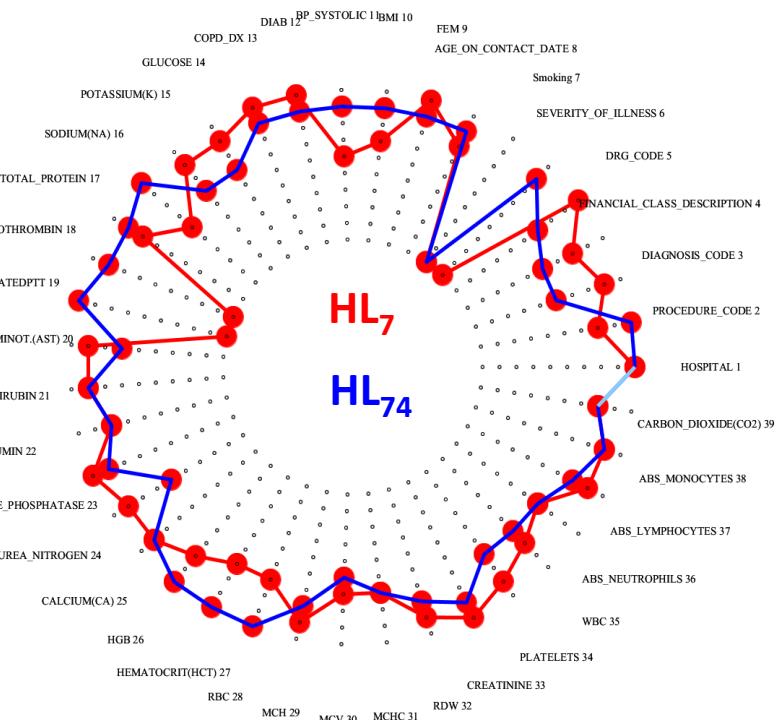
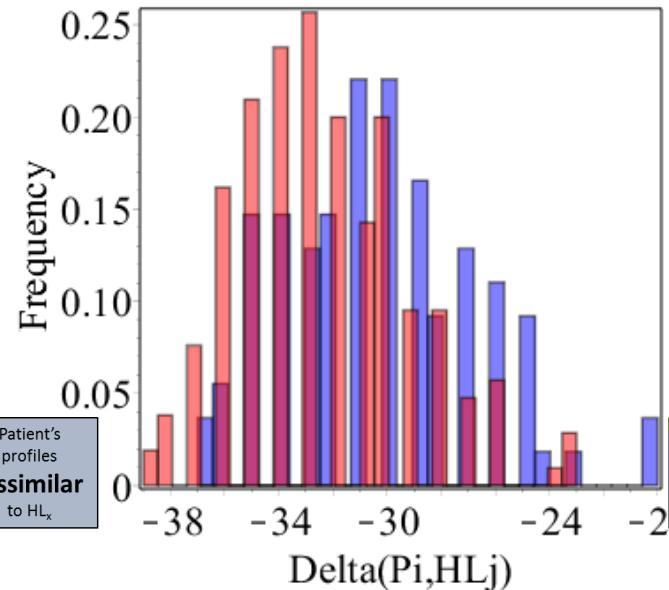


## 103 landmark clinical profiles (HL<sub>1</sub> ... HL<sub>103</sub>)

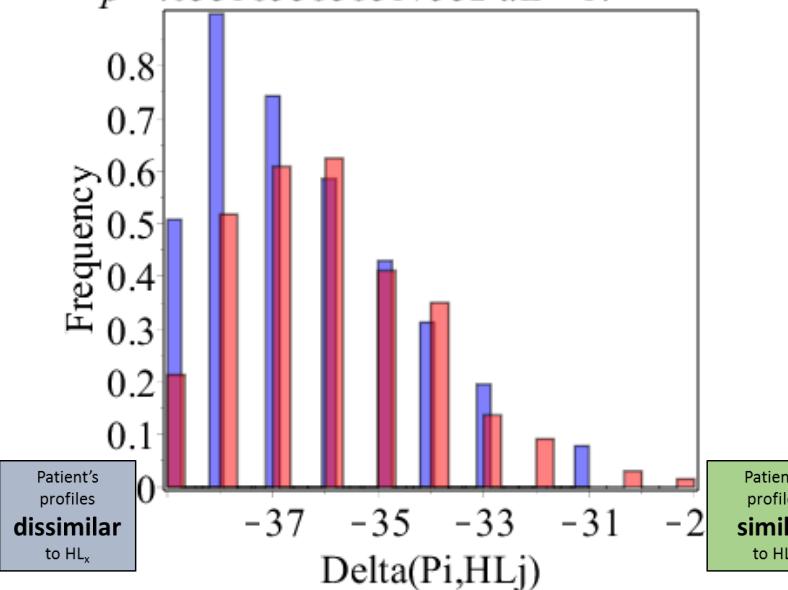
Systematic search for clinical profile landmarks, “grouping” the S and L patients with the highest differentiation.



$7 > HL7$  short red - $HL7$  long blue  $p = 6.51431900588653e-006$   $dE = -2.5$



$74 > HL74$  short red - $HL74$  long blue  $p = .0331853838317532$   $dE = 1.$



~ 3 x larger odds ratio for finding these relationships in short surviving patients (OR[S])

MCC = major complication or comorbidity, CC = complication or comorbidity

$\log(\text{OR}[\text{S}])$

Malignant neoplasm of bronchus and lung, unspecified	<b>DIAGNOSIS_CODE</b> 1629	<b>FINANCIAL_CLASS_DESCRIPTION_B/C</b> KEYSTONE	0.46596	*****
	<b>FINANCIAL_CLASS_DESCRIPTION_MEDICARE_PART_A</b>	MAJOR CHEST PROCEDURES W MCC	0.61722	*****
	<b>FINANCIAL_CLASS_DESCRIPTION_UPMC_HEALTH_NETWORK</b>	MAJOR CHEST PROCEDURES W CC	0.53290	*****
MAJOR CHEST PROCEDURES W MCC	<b>DRG_CODE</b> 163	<b>SEVERIY_OF_ILLNESS</b> 4	0.60426	*****
ECMO OR TRACH W MV >96 HRS OR PDX EXC FACE, MOUTH & NECK W MAJ O.R.	<b>DRG_CODE</b> 3	<b>SEVERIY_OF_ILLNESS</b> 4	0.53290	*****
	<b>SEVERIY_OF_ILLNESS</b> 2	Smoking Yes	0.46596	*****
	<b>SEVERIY_OF_ILLNESS</b> 4	Smoking Quit	0.57241	*****
	<b>SEVERIY_OF_ILLNESS</b> 4	Smoking Yes	0.59089	*****
	<b>SEVERIY_OF_ILLNESS</b> 4	Smoking N/A	0.56287	*****
	<b>AGE_ON_CONTACT_DATE</b> 48-59	FEMALE Male	0.46596	*****
	FEMALE Female	BMI N/A	0.59089	*****
	BMI 18-25	BP SYSTOLIC <102	0.68781	*****
	BMI 18-25	BP SYSTOLIC 102-114	0.50072	*****
	BMI 18-25	BP SYSTOLIC N/A	0.64205	*****
	BMI 25-31	BP SYSTOLIC 102-114	0.80175	*****
	BMI 31-38	BP SYSTOLIC 127-137	0.64205	*****
	BP SYSTOLIC 127-137	DIAB Yes	0.59089	*****
	DIAB Yes	COPD DX Yes	0.86390	*****
	GLUCOSE 88-107	POTASSIUM(K) <3.6	0.53290	*****
	POTASSIUM(K) <3.6	SODIUM(NA) -136-140	0.59089	*****
	POTASSIUM(K) 3.6-4.6	SODIUM(NA) 130-133	0.68781	*****
	SODIUM(NA) 133-136	TOTAL PROTEIN 6-7	0.53290	*****
	PROTOTHROMBIN 10-16	ACTIVATED PTT 34-42	0.46596	*****
	TOTAL_BILIRUBIN 0.45-0.75	ALBUMIN <2.8	0.64205	*****
	TOTAL_BILIRUBIN 0.45-0.75	ALBUMIN 2.8-3.5	0.61722	*****
	ALBUMIN <2.8	ALKALINE PHOSPHATASE 65-110	0.59089	*****
	ALBUMIN 2.8-3.5	ALKALINE PHOSPHATASE 110-175	0.83393	*****
	ALKALINE PHOSPHATASE 110-175	UREA NITROGEN 10-15.5	0.72920	*****
	UREA NITROGEN 10-15.5	CALCIUM(CA) <8.5	0.64205	*****
	UREA NITROGEN >33	CALCIUM(CA) 8.5-10	0.59089	*****
	CALCIUM(CA) <8.5	HGB 9-11	0.53290	*****
	HEMATOCRIT(HC) 28-34	RBC 4-4.9	0.59089	*****
	HEMATOCRIT(HC) 34-37	RBC 4-4.9	0.56287	*****
	MCH <28	MCV <81	0.46596	*****
	MCHC 33-34.2	RDW <13	0.64205	*****
	RDW N/A	CREATININE >1.3	0.46596	*****
	PLATELETS 320-485	WBC 5.2-7	0.46596	*****
	PLATELETS 320-485	WBC 7-11	0.46596	*****
	PLATELETS 320-485	WBC >14	0.46596	*****
	ABS LYMPHOCYTES >3	ABS MONOCYTES 0.3-10	0.46596	*****

~ 3 x larger odds ratio for finding these relationships in short surviving patients (OR[L])

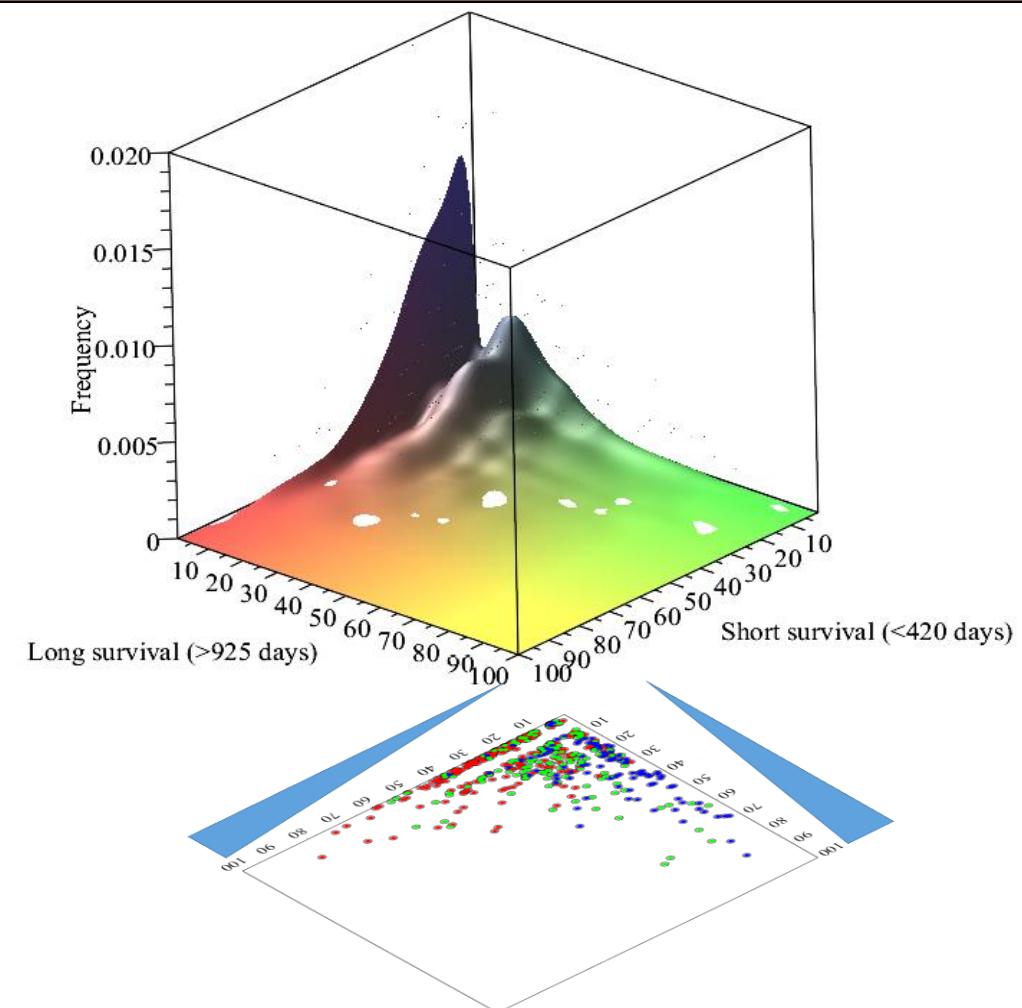
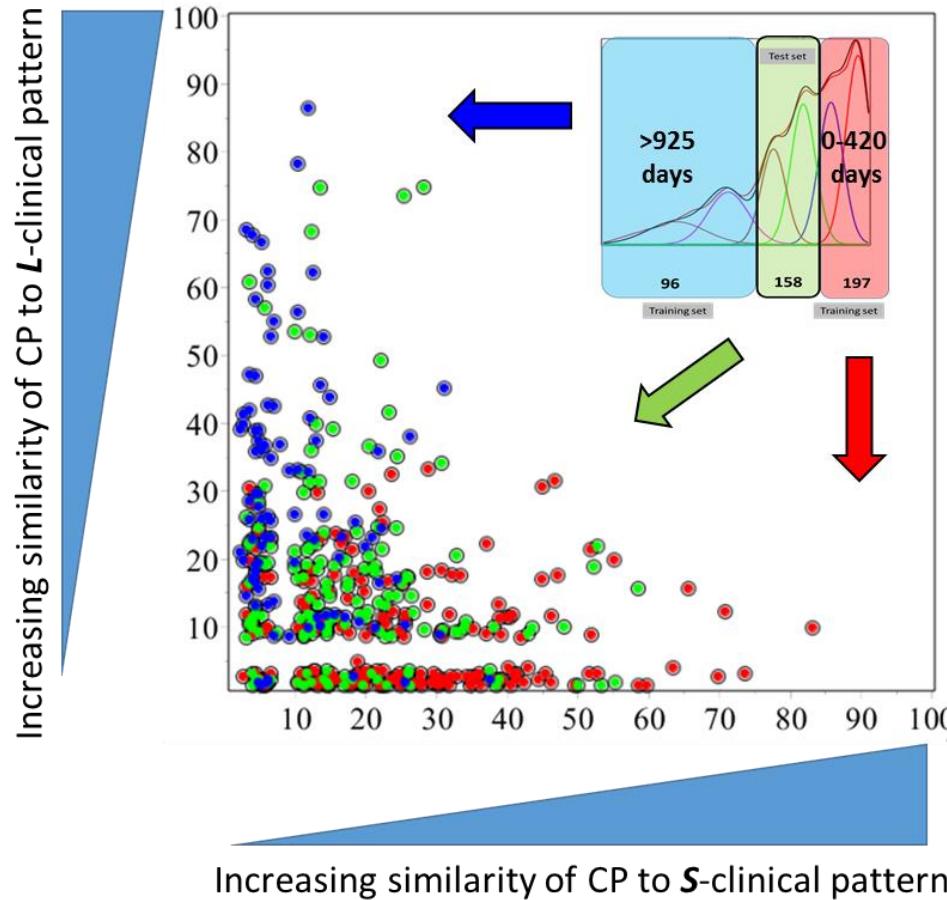
log(OR[L])

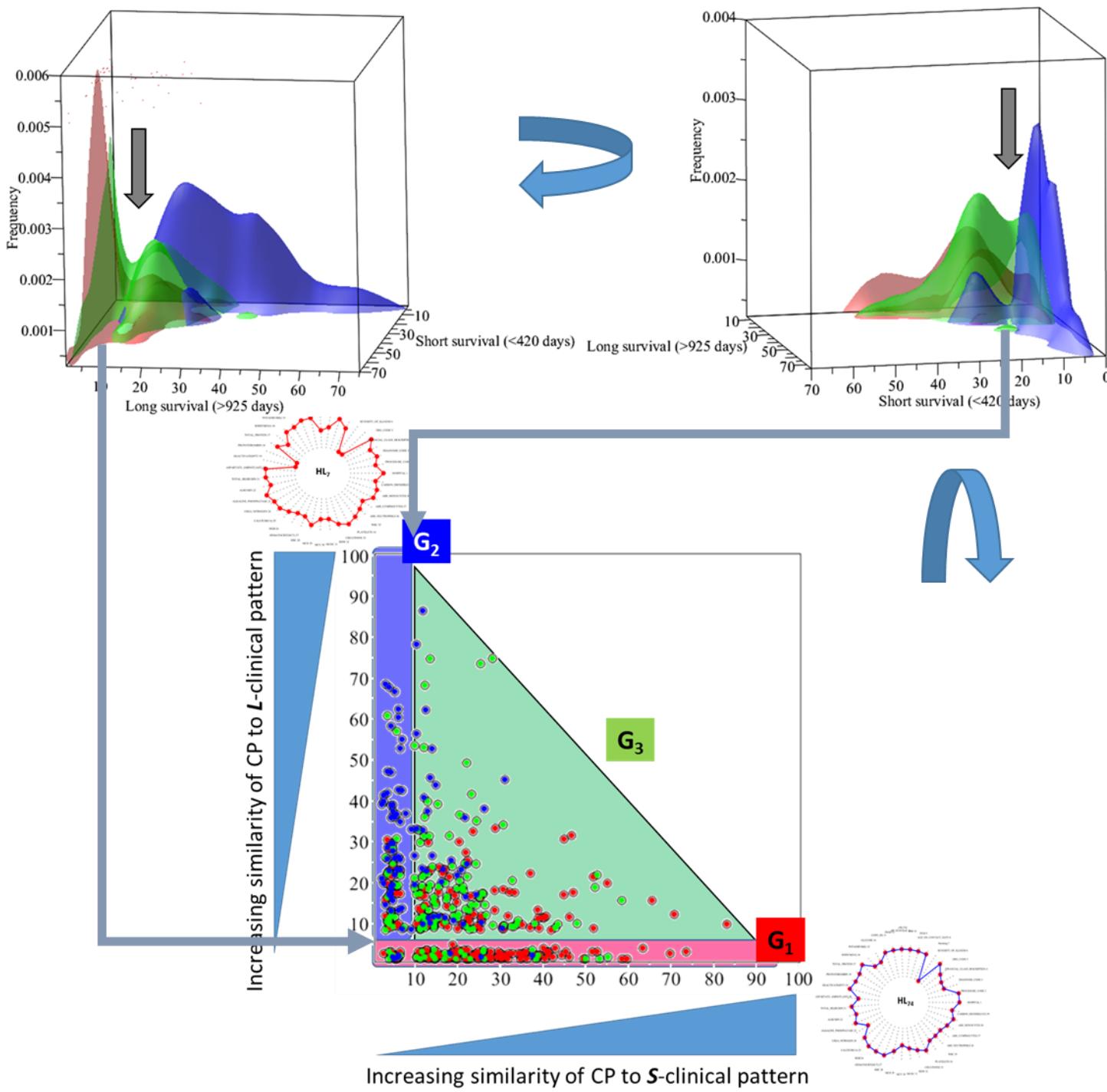
HOSPITAL PAS	-- Perc abln lung les/tiss	PROCEDURE_CODE 3224	-0.61322	*****
HOSPITAL PAS	-- Destroy loc lung les NEC	PROCEDURE_CODE 3239	-0.61322	*****
HOSPITAL SHY	-- Thorac seg lung resect	PROCEDURE_CODE 3230	-0.53404	*****
HOSPITAL NWH	-- Thorac exc lung lesion	PROCEDURE_CODE 3220	-0.61322	*****
Perc abln lung les/tiss	Malignant neoplasm of middle lobe, bronchus or lung	DIAGNOSIS_CODE 1624	-0.61322	*****
Destroy loc lung les NEC	--	DIAGNOSIS_CODE 1625	-0.48829	*****
Malignant neoplasm of upper lobe, bronchus or lung	Malignant neoplasm of lower lobe, bronchus or lung	DIAGNOSIS_CODE 1625	-0.61322	*****
DIAGNOSIS_CODE 1623	-- FINANCIAL_CLASS_DESCRIPTION ADVANTRA_MC_HMO	DRG_CODE 167	-0.61322	*****
FINANCIAL_CLASS_DESCRIPTION MEDICARE_PART_A OTHER RESP SYSTEM O.R. PROCEDURES W/CC	DRG_CODE 165	DRG_CODE 165	-0.61322	*****
FINANCIAL_CLASS_DESCRIPTION SECURITY_BLUE_HMO MAJOR CHEST PROCEDURES W/O CC/MCC	DRG_CODE 163	MAJOR CHEST PROCEDURES W MCC DRG_CODE 163	-0.78932	*****
FINANCIAL_CLASS_DESCRIPTION UPMC_HEALTH_NETWORK	DRG_CODE 163 MAJOR CHEST PROCEDURES W MCC	SEVERITY_OF_ILLNESS N/A	-0.45832	*****
	DRG_CODE 165 MAJOR CHEST PROCEDURES W/O CC/MCC	SEVERITY_OF_ILLNESS N/A	-0.91425	*****
	DRG_CODE 167 OTHER RESP SYSTEM O.R. PROCEDURES W CC	SEVERITY_OF_ILLNESS 1	-0.78932	*****
SEVERITY_OF_ILLNESS 1	--	Smoking N/A	-0.71014	*****
SEVERITY_OF_ILLNESS N/A	--	Smoking Yes	-0.61322	*****
Smoking Never	--	AGE_ON_CONTACT_DATE 59-69	-0.61322	*****
Smoking N/A	--	AGE_ON_CONTACT_DATE <48	-0.78932	*****
Smoking N/A	--	AGE_ON_CONTACT_DATE >80	-0.96541	*****
FEMALE Male	--	BMI N/A	-0.71014	*****
BMI 18-25	--	BP_SYSTOLIC 127-137	-0.51631	*****
BMI 18-25	--	BP_SYSTOLIC 137-148	-0.61322	*****
BMI 25-31	--	BP_SYSTOLIC N/A	-0.85626	*****
BMI 31-38	--	BP_SYSTOLIC <102	-0.78932	*****
BMI >38	--	BP_SYSTOLIC 148-160	-0.61322	*****
BMI N/A	--	BP_SYSTOLIC <102	-0.61322	*****
BMI N/A	--	BP_SYSTOLIC 114-127	-1.01116	*****
BP_SYSTOLIC <102	--	DIAB Yes	-0.91425	*****
COPD DX No	--	GLUCOSE <70	-0.78932	*****
POTASSIUM(K) >5.1	--	SODIUM(NA) -136-140	-0.61322	*****
SODIUM(NA) >140	--	TOTAL PROTEIN 6-7	-0.48829	*****
TOTAL PROTEIN 7.8-8.2	--	PROTHROMBIN N/A	-0.78932	*****
PROTHROMBIN <10	--	ACTIVATED_PTT <34	-0.61322	*****
PROTHROMBIN N/A	--	ACTIVATED_PTT <34	-0.49672	*****
ACTIVATED_PTT N/A	--	ASPARTATE AMINO.(AS) 28-36	-0.91425	*****
ASPARTATE_AMINO.(AS) 21-28	--	TOTAL_BILIRUBIN >0.75	-0.78932	*****
CALCIUM(CA) 8.5-10	--	HGB >15	-0.46710	*****
HGB >15	--	HEMATOCRIT(HC) 40-45	-0.78932	*****
HEMATOCRIT(HC) 37-40	--	RBC 3.5-4	-0.48829	*****
HEMATOCRIT(HC) 40-45	--	RBC >4.9	-0.45832	*****
RBC >4.9	--	MCH 28-34	-0.46710	*****
MCV 93-100	--	MCHC >35	-0.61322	*****
MCHC 34.2-35	--	RDW N/A	-0.61322	*****
CREATININE N/A	--	PLATELETS 140-275	-0.78932	*****
PLATELETS <140	--	WBC 5.2-7	-0.48829	*****
ABS_MONOCYTES >10	--	CARBON_DIOXIDE(CO2) 27-32	-0.48829	*****
CARBON_DIOXIDE(CO2) 24-27	--	HOSPITAL_SMH	-0.48829	*****
CARBON_DIOXIDE(CO2) 27-32	--	HOSPITAL_PUH	-0.45050	*****
CARBON_DIOXIDE(CO2) 27-32	--	HOSPITAL_NWH	-0.48829	*****

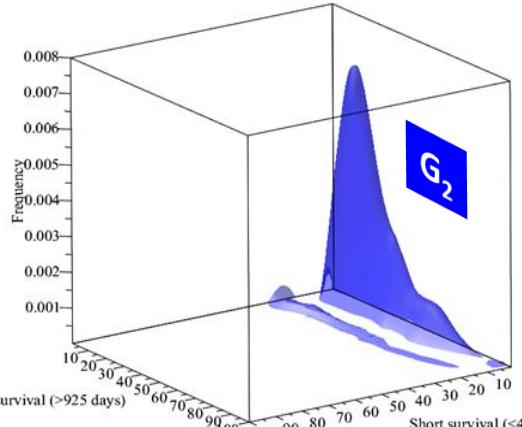
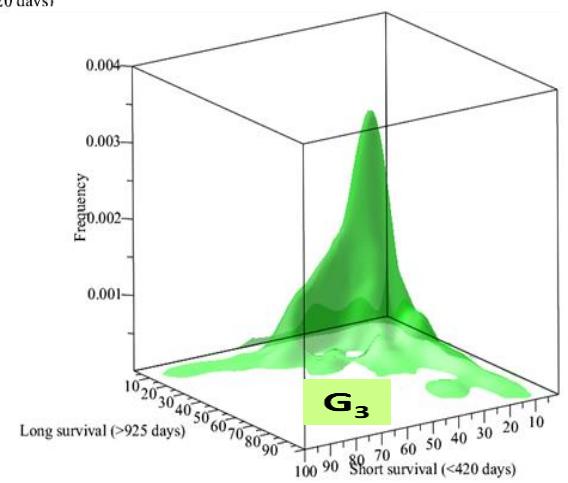
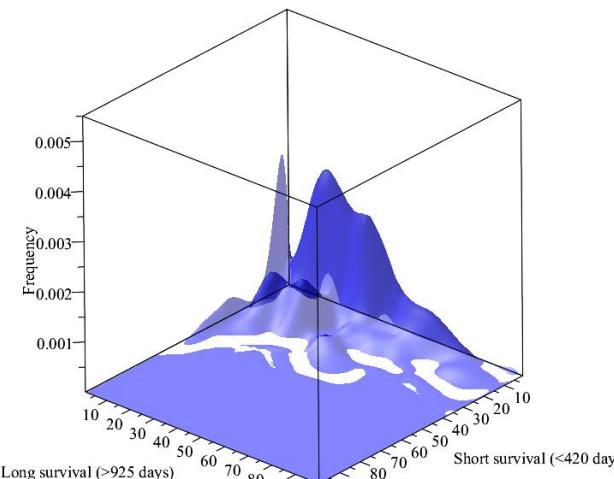
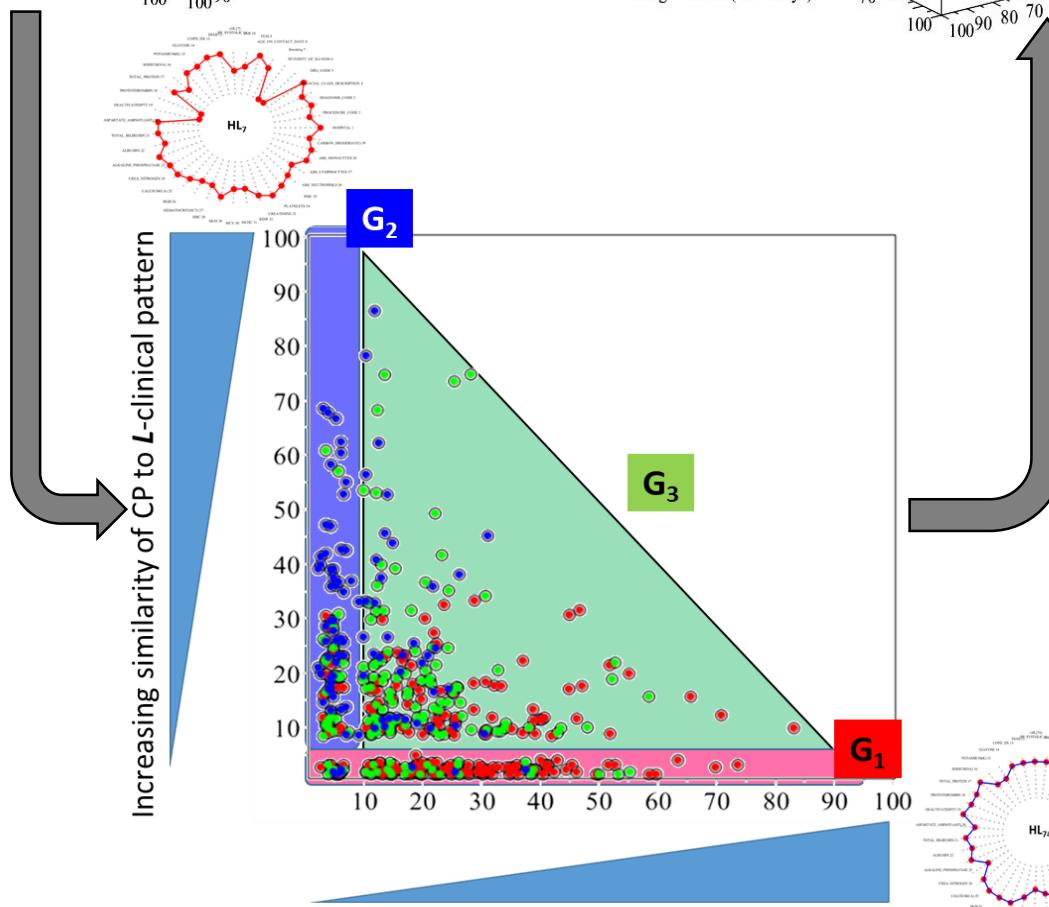
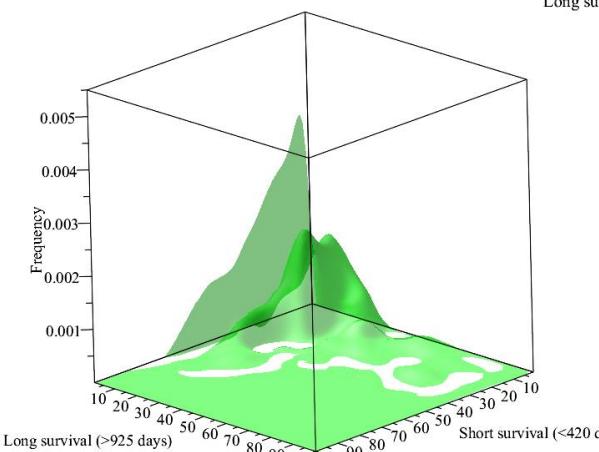
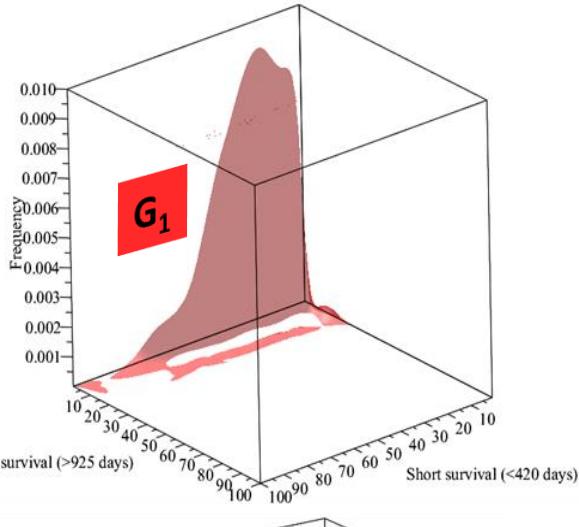
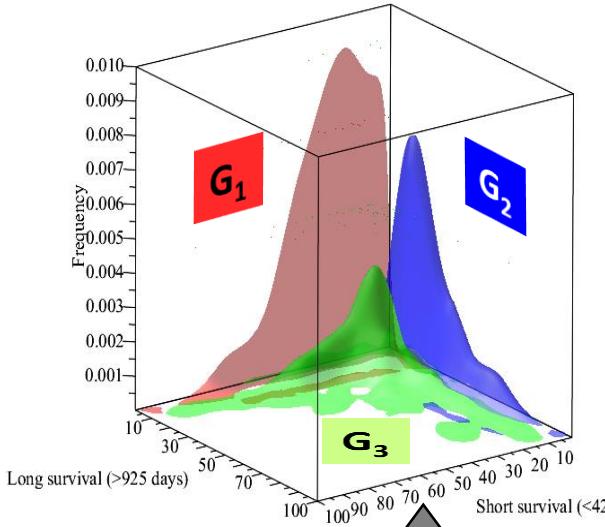
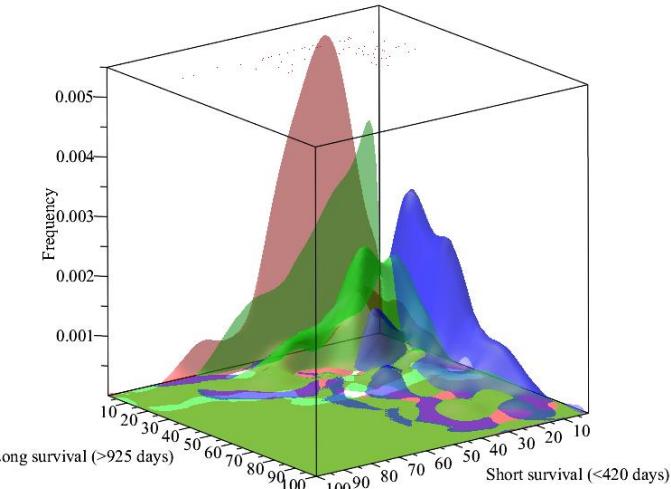
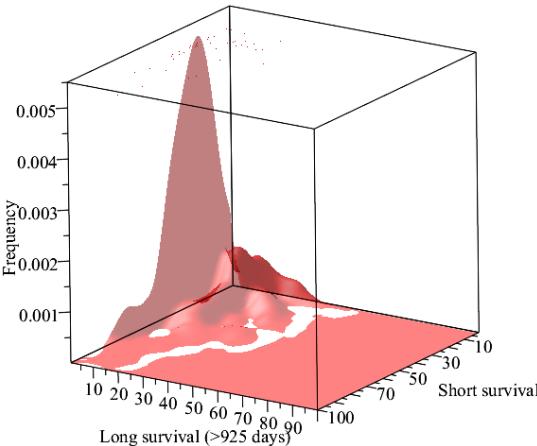
Visualization of the grouping of the **S** and **L** patients with the highest differentiation, identified by the significantly distinct differences and similarities of their clinical profiles to the two optimally clustering HL's.

## Results:

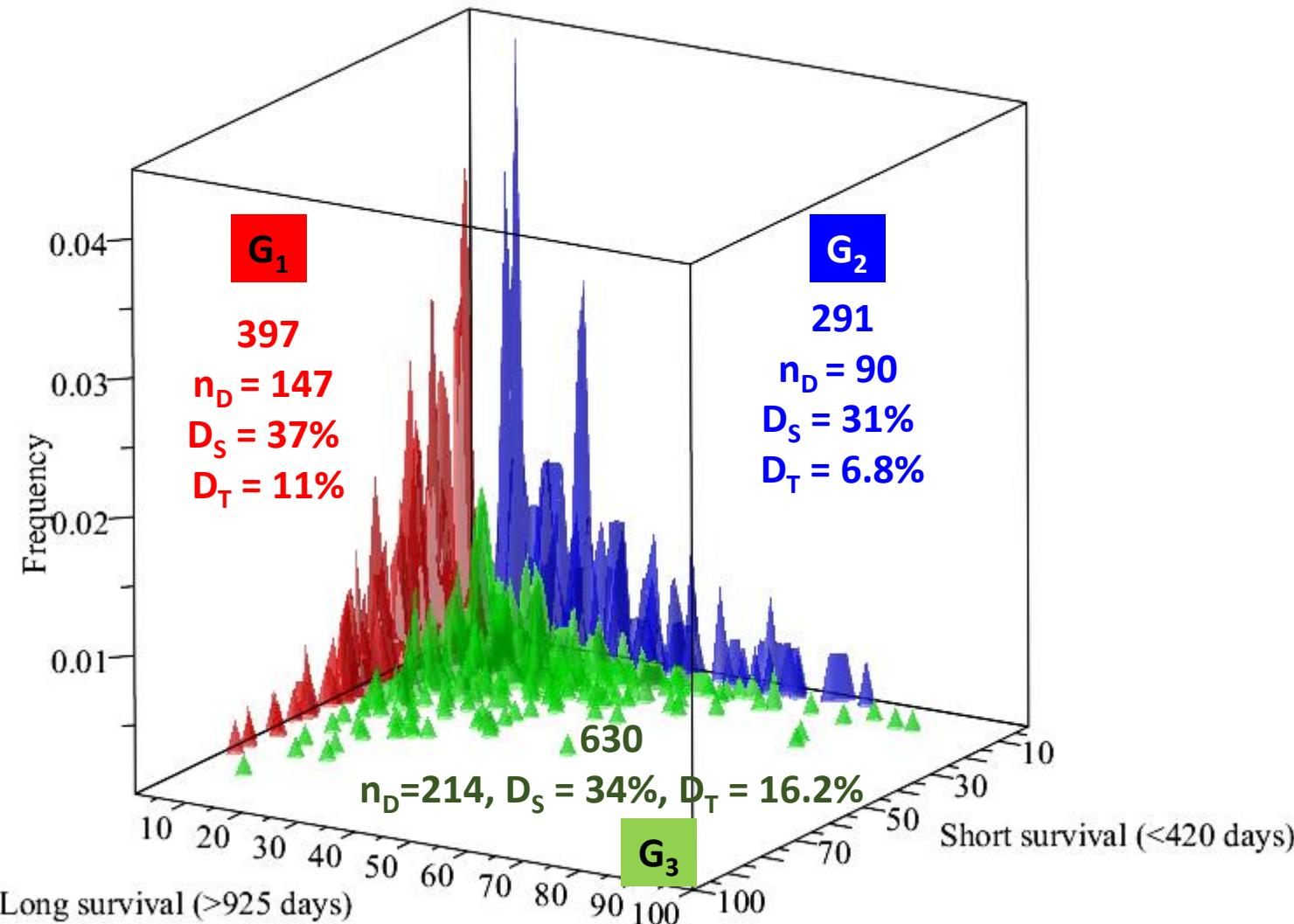
- Validation of the hypothesis that patients with the intermediate survival will have clinical profiles, which are intermediate mixes of features (unique combinations of relationships between clinical parameter values) found in “extremal” clinical profiles, characteristic for S and L patients.
  - The results identifies natural, data driven boundaries between the patient subgroups = “valleys” in the histograms of patients with given clinical profiles.





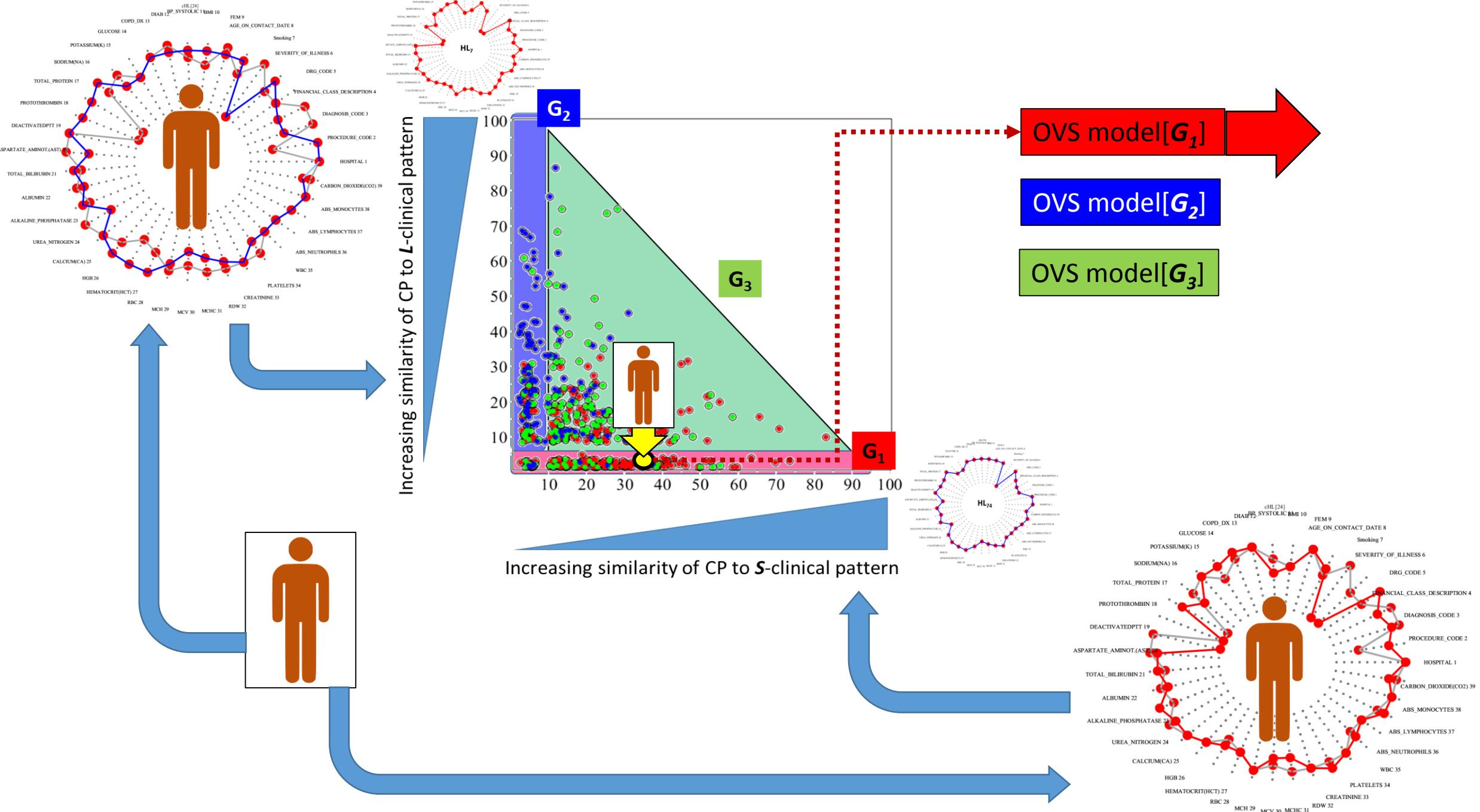


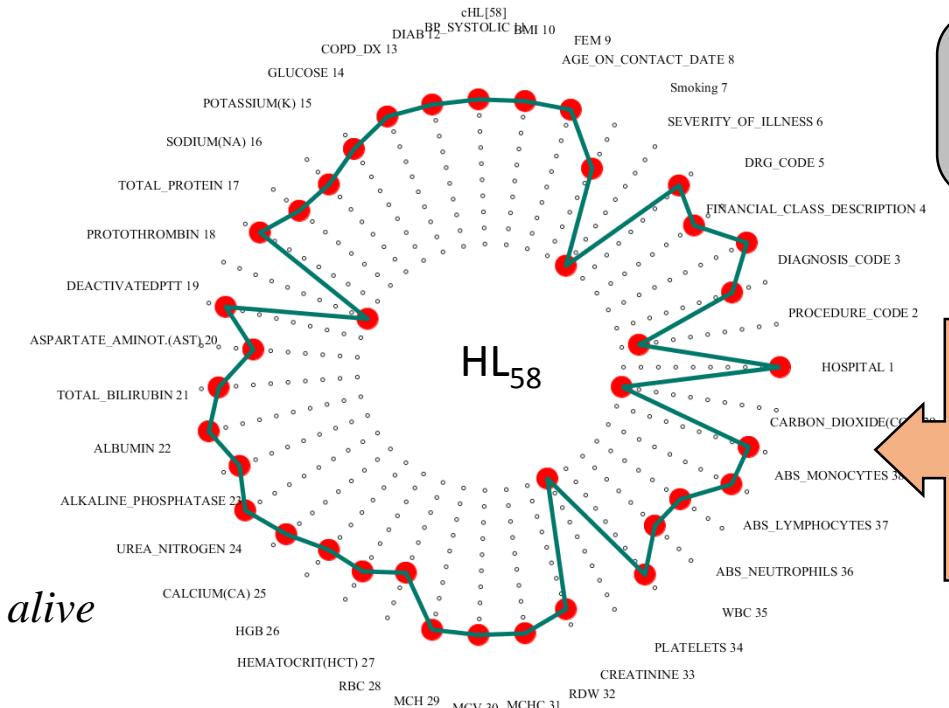
Complete set of N =1318 patients



This series of steps results in the straightforward algorithm, identifying for any patient the clinical subtypes G<sub>1</sub>, G<sub>2</sub> or G<sub>3</sub> of the lung cancer:

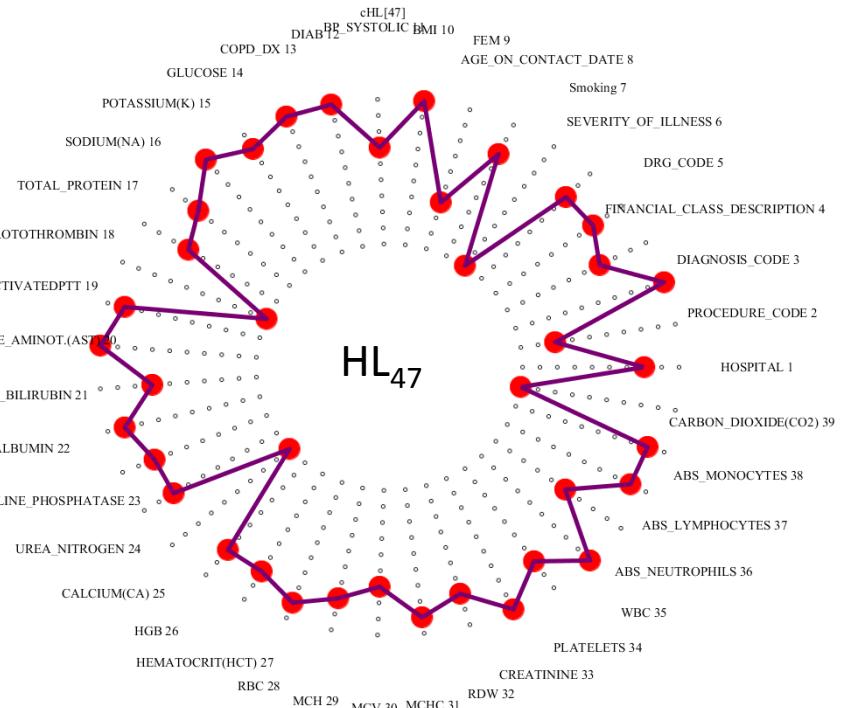
1. Input pts data, convert to PCp
2. Compare adjacency matrices of PCp to stored matrices, representing HL's and edge weights and compute x-y similarity coordinates
3. Identify where in boundaries PCp localizes – output G<sub>1</sub>, G<sub>2</sub>, G<sub>3</sub>
4. Output the clinical features characterizing the severity group with highlighted ones that match patient's PCp



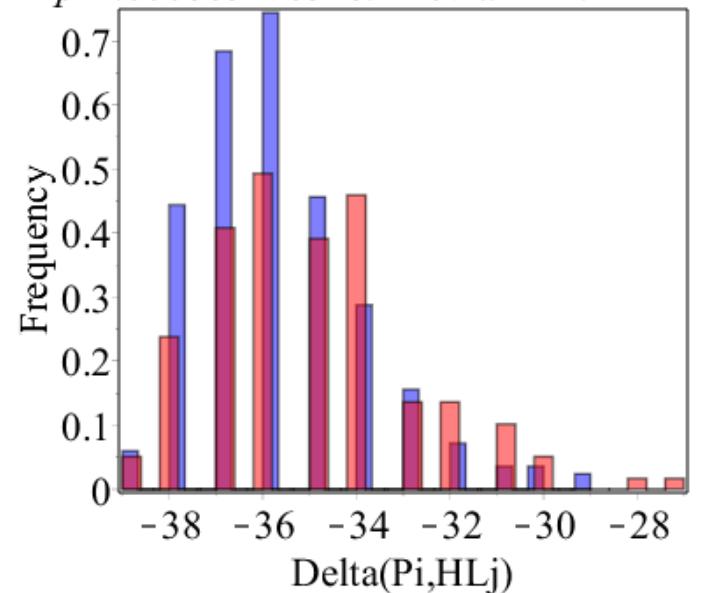


## 122 landmark clinical profiles (HL<sub>1</sub> ... HL<sub>122</sub>)

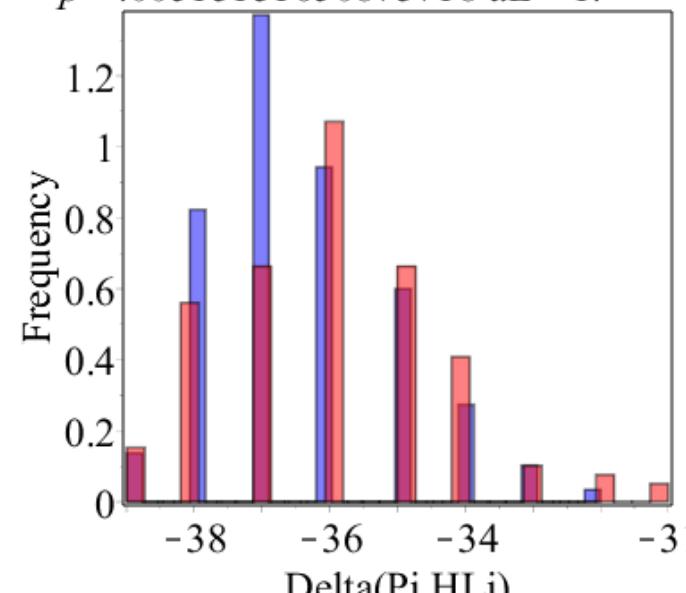
Systematic search for clinical profile landmarks, “grouping” the D and A patients with the highest differentiation.

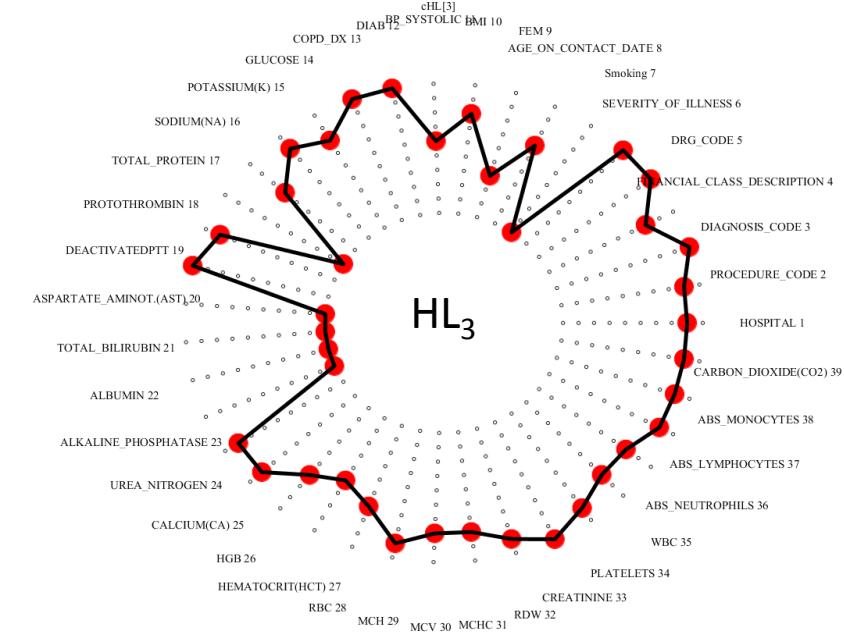


$58 > HL_{58}$  dead red -  $HL_{58}$  alive blue  
 $p = .00086317032891207$  dE = 1.

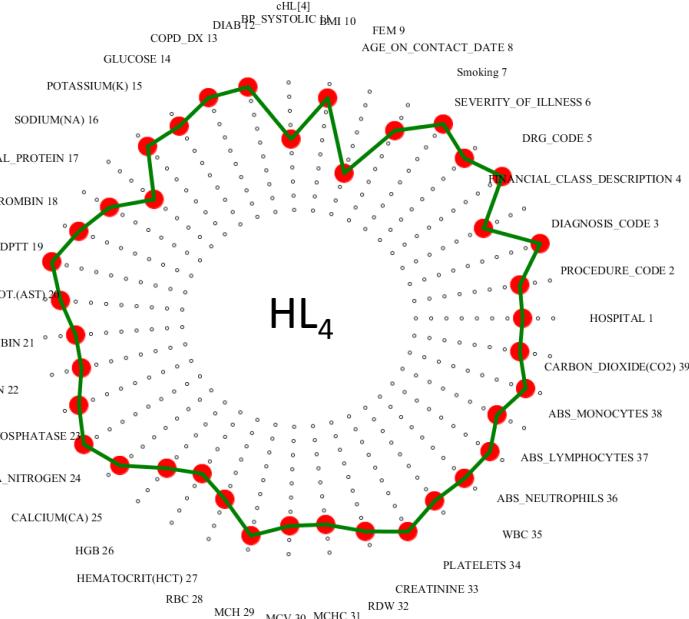
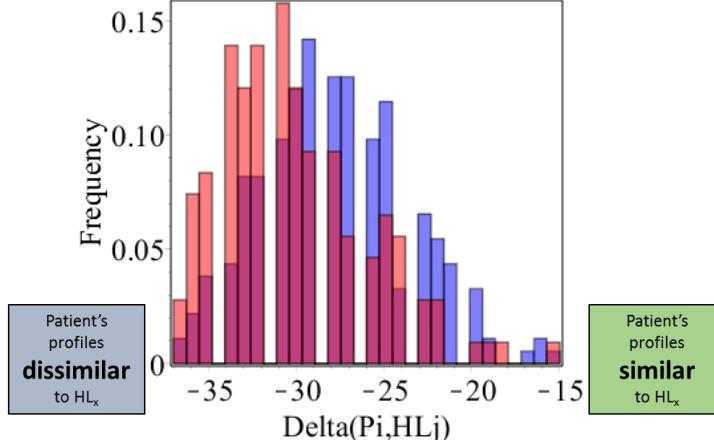


$47 > HL_{47}$  dead red -  $HL_{47}$  alive blue  
 $p = .00513131650873718$  dE = 1.

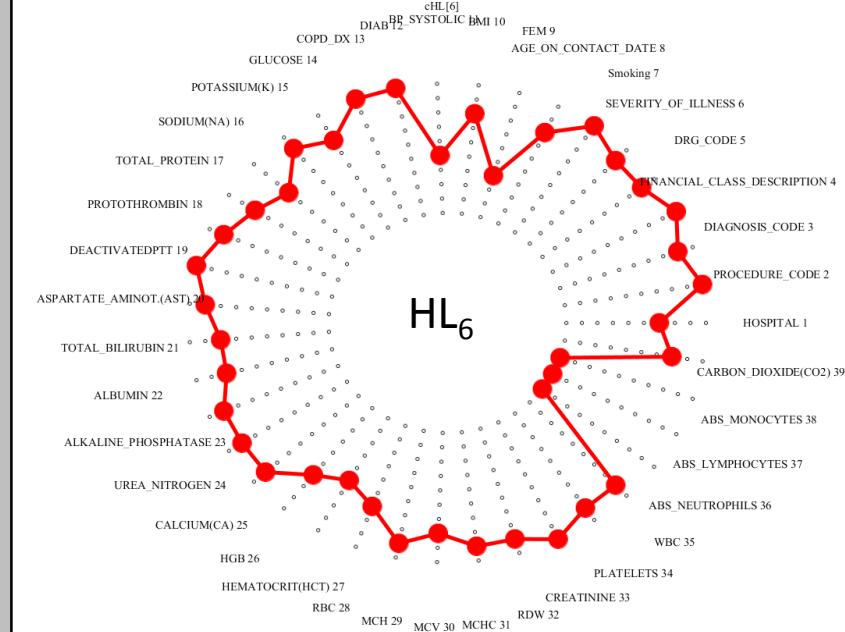
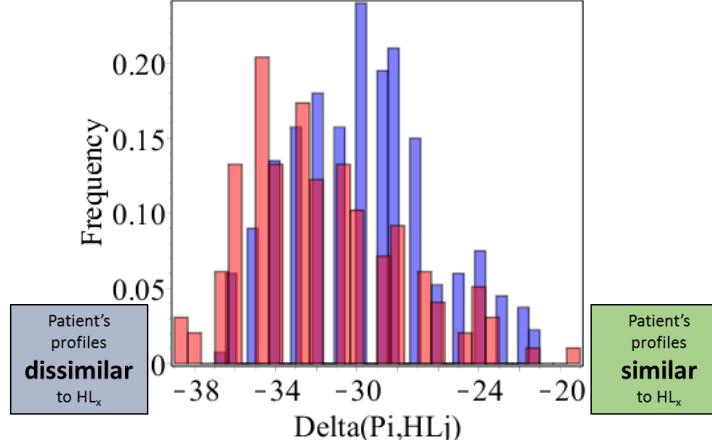


G<sub>1</sub>

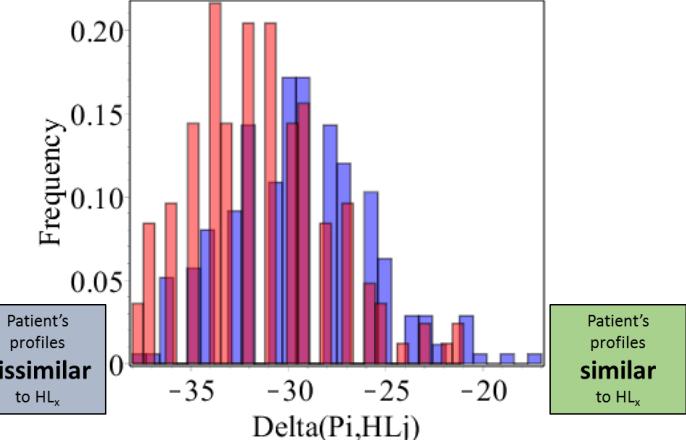
$3 > HL3$  dead red -  $HL3$  alive blue  $p = 2.70601374642982e-007$   $dE = -3.$

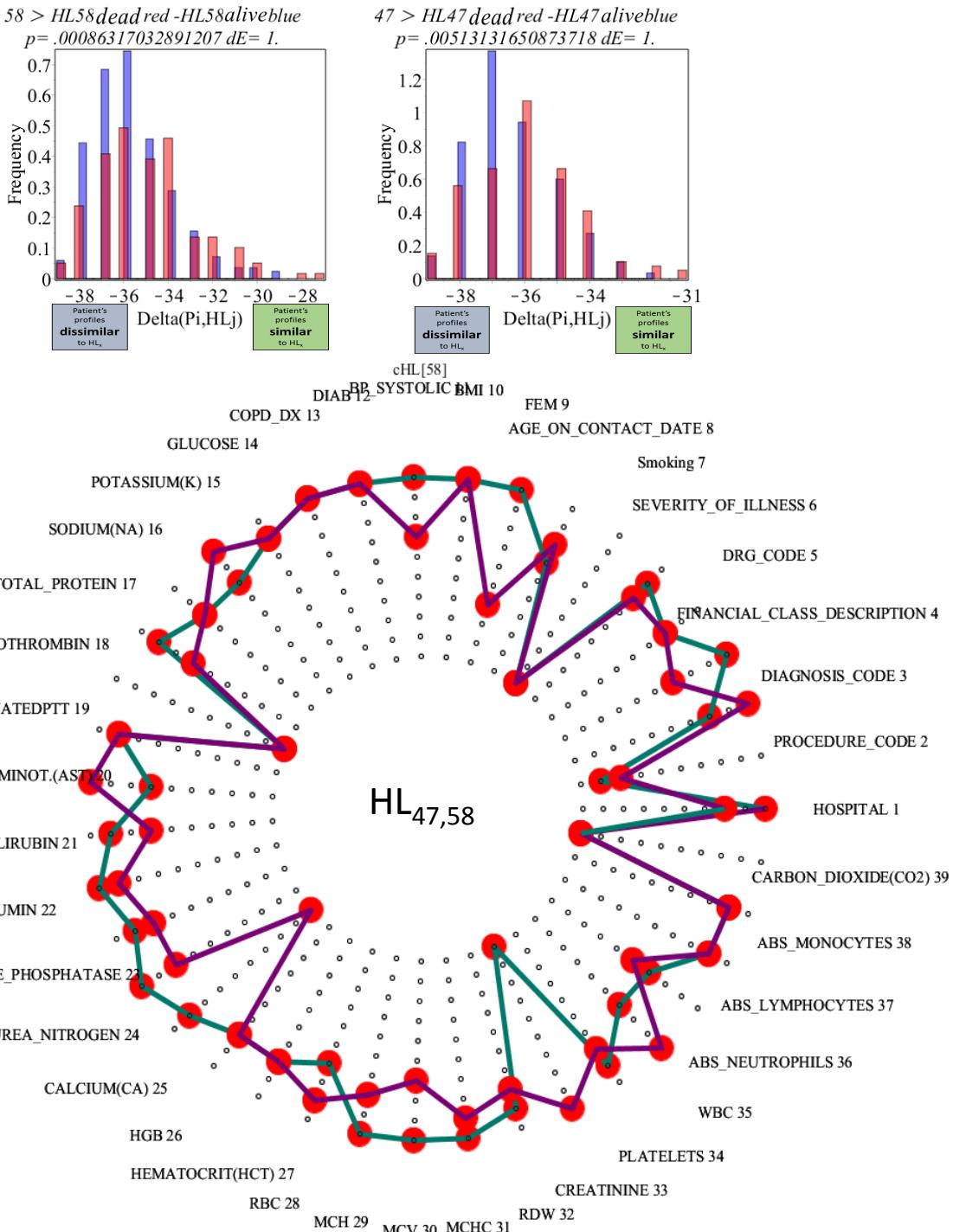
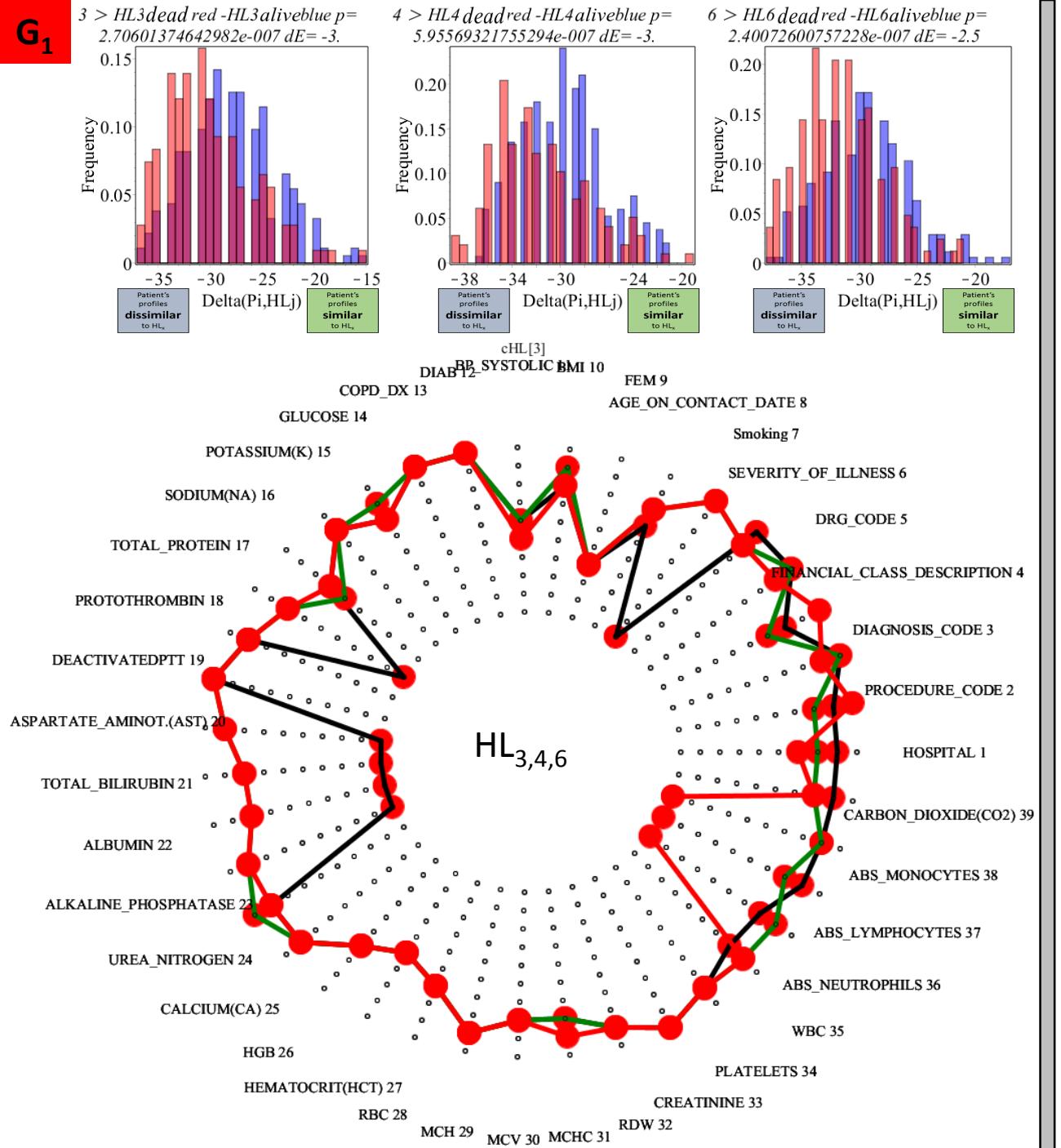


$4 > HL4$  dead red -  $HL4$  alive blue  $p = 5.95569321755294e-007$   $dE = -3.$



$6 > HL6$  dead red -  $HL6$  alive blue  $p = 2.40072600757228e-007$   $dE = -2.5$



**G<sub>1</sub>**

# Relationships of clinical parameter values, characteristic for death in G<sub>1</sub>

log(OR[D])

1	19	HOSPITAL PAS	--	PROCEDURE_CODE 3452	Thoracoscopc decort lung	0.53165	*****
3	17	HOSPITAL PUH	--	PROCEDURE_CODE 3259	Other pneumonectomy NOS	0.53165	*****
4	12	HOSPITAL SMH	--	PROCEDURE_CODE 3249	Lobectomy of lung NEC	0.53165	*****
4	13	HOSPITAL SMH	--	PROCEDURE_CODE 3220	Thorac exc lung lesion	0.53165	*****
4	14	HOSPITAL SMH	--	PROCEDURE_CODE 3230	Thorac seg lung resect	0.58281	*****
13	25	PROCEDURE_CODE 3220	Malignant neoplasm of other parts of bronchus or lung	DIAGNOSIS_CODE 1628		0.53165	*****
17	23	PROCEDURE_CODE 3259	Malignant neoplasm of bronchus and lung, unspecified	DIAGNOSIS_CODE 1629		0.53165	*****
Malignant neoplasm of bronchus and lung, unspecified				FINANCIAL_CLASS_DESCRIPTION UPMC_HP_MEDICARE_HMO		0.83268	*****
23	40	DIAGNOSIS_CODE 1629		FINANCIAL_CLASS_DESCRIPTION N/A		0.70774	*****
Malignant neoplasm of middle lobe, bronchus or lung				FINANCIAL_CLASS_DESCRIPTION SECURITY_BLUE_HMO		0.83268	*****
24	34	DIAGNOSIS_CODE 1624	--	FINANCIAL_CLASS_DESCRIPTION B/C_KEystone		0.53165	*****
31	43	FINANCIAL_CLASS_DESCRIPTION MEDICARE_PART_A	--	DRG_CODE 3	ECMO OR TRACH W MV >96 HRS OR PDX EXC FACE, MOUTH & NECK W MA	0.53165	*****
32	43	FINANCIAL_CLASS_DESCRIPTION SECURITY_BLUE_HMO	--	DRG_CODE 3	O.R.	0.70774	*****
33	43	FINANCIAL_CLASS_DESCRIPTION UPMC_HP_MEDICARE_HMO	--	DRG_CODE 3		0.70774	*****
34	42	FINANCIAL_CLASS_DESCRIPTION B/C_Keystone	--	DRG_CODE 163	MAJOR CHEST PROCEDURES W MCC	0.77469	*****
42	53	MAJOR CHEST PROCEDURES W MCC	DRG_CODE 163	SEVERITY_OF_ILLNESS 4		0.87408	*****
43	53	ECMOTR TRACH W MV >96 HRS OR PDX EXC FACE, MOUTH & NECK W MA O.R.	DRG_CODE 3	SEVERITY_OF_ILLNESS 4		0.77469	*****
43	60	DRG_CODE 3		SEVERITY_OF_ILLNESS N/A		0.53165	*****
53	61	SEVERITY_OF_ILLNESS 4	--		Smoking Quit	1.23062	*****
53	70	SEVERITY_OF_ILLNESS 4	--		Smoking N/A	1.13371	*****
60	61	SEVERITY_OF_ILLNESS N/A	--		Smoking Quit	0.53165	*****
61	80	Smoking Quit	--	AGE_ON_CONTACT_DATE	N/A	0.70774	*****
63	72	Smoking Never	--	AGE_ON_CONTACT_DATE	48-59	0.53165	*****
81	92	FEMALE Male	--	BMI	18-25	0.63811	*****
91	102	BMI <18	--	BP_SYSTOLIC	102-114	0.53165	*****
91	103	BMI <18	--	BP_SYSTOLIC	114-127	0.53165	*****
91	104	BMI <18	--	BP_SYSTOLIC	127-137	0.70774	*****
104	112	BP_SYSTOLIC 127-137	--	DIAB	Yes	0.62856	*****
135	143	GLUCOSE 124-144	--	POTASSIUM(K)	4.6-5.1	0.70774	*****
136	141	GLUCOSE >144	--	POTASSIUM(K)	<3.6	0.70774	*****
142	151	POTASSIUM(K) 3.6-4.6	--	SODIUM(NA)	<130	0.53165	*****
152	163	SODIUM(NA) 130-133	--	TOTAL_PROTEIN	7-7.8	0.70774	*****
152	170	SODIUM(NA) 130-133	--	TOTAL_PROTEIN	N/A	0.83268	*****
161	180	TOTAL_PROTEIN <6	--	PROTHROMBIN	N/A	0.53165	*****
173	190	PROTHROMBIN >16	--	ACTIVATED_PTT	N/A	0.92959	*****
182	191	ACTIVATED_PTT 34-42	--	ASPARTATE_AMINO_(AS)	<14	0.88384	*****
182	195	ACTIVATED_PTT 34-42	--	ASPARTATE_AMINO_(AS)	>36	0.70774	*****
183	191	ACTIVATED_PTT >42	--	ASPARTATE_AMINO_(AS)	<14	0.53165	*****
190	195	ACTIVATED_PTT N/A	--	ASPARTATE_AMINO_(AS)	>36	0.53165	*****
191	201	ASPARTATE_AMINO_(AS) <14	--	TOTAL_BILIRUBIN	<0.25	0.62856	*****
195	204	ASPARTATE_AMINO_(AS) >36	--	TOTAL_BILIRUBIN	>0.75	0.70774	*****
201	211	TOTAL_BILIRUBIN <0.25	--	ALBUMIN	<2.8	0.70774	*****
201	212	TOTAL_BILIRUBIN <0.25	--	ALBUMIN	2.8-3.5	1.00877	*****
202	211	TOTAL_BILIRUBIN 0.25-0.45	--	ALBUMIN	<2.8	0.83268	*****
211	222	ALBUMIN <2.8	--	ALKALINE_PHOSPHATASE	65-110	1.07572	*****
211	224	ALBUMIN <2.8	--	ALKALINE_PHOSPHATASE	>175	0.53165	*****
223	234	ALKALINE_PHOSPHATASE 110-175	--	UREA_NITROGEN	22.5-33	0.53165	*****
235	242	UREA_NITROGEN >33	--	CALCIUM(CA)	8.5-10	0.83268	*****
242	251	CALCIUM(CA) 8.5-10	--	HGB	<9	0.77469	*****
251	261	HGB <9	--	HEMATOCRIT(HC)	<28	0.70774	*****
254	266	HGB 13.5-15	--	HEMATOCRIT(HC)	>45	0.53165	*****
261	271	HEMATOCRIT(HC) <28	--	RBC	<2.9	0.88384	*****
271	282	RBC <2.9	--	MCH	28-34	0.70774	*****
273	283	RBC 3.5-4	--	MCH	>34	0.53165	*****
295	302	MCV >100	--	MCHC	32-33	0.53165	*****
305	320	MCHC >35	--	RDW	N/A	0.70774	*****
313	322	RDW 15-17	--	CREATININE	>1.3	0.53165	*****
321	335	CREATININE <1.3	--	PLATELETS	>485	0.62856	*****
322	331	CREATININE >1.3	--	PLATELETS	<140	0.83268	*****
322	333	CREATININE >1.3	--	PLATELETS	275-320	0.53165	*****
334	345	PLATELETS 320-485	--	WBC	>14	0.83268	*****
345	355	WBC >14	--	ABS_NEUTROPHILS	>10	0.62856	*****
354	361	ABS_NEUTROPHILS 6.5-10	--	ABS_LYMPHOCYTES	<0.95	0.83268	*****
355	361	ABS_NEUTROPHILS >10	--	ABS_LYMPHOCYTES	<0.95	0.70774	*****
381	5	CARBON_DIOXIDE(CO2) <24	--	HOSPITAL_MER		0.59860	*****
381	10	CARBON_DIOXIDE(CO2) <24	--	HOSPITAL_N/A		0.53165	*****
384	4	CARBON_DIOXIDE(CO2) >32	--	HOSPITAL_SMH		0.53165	*****

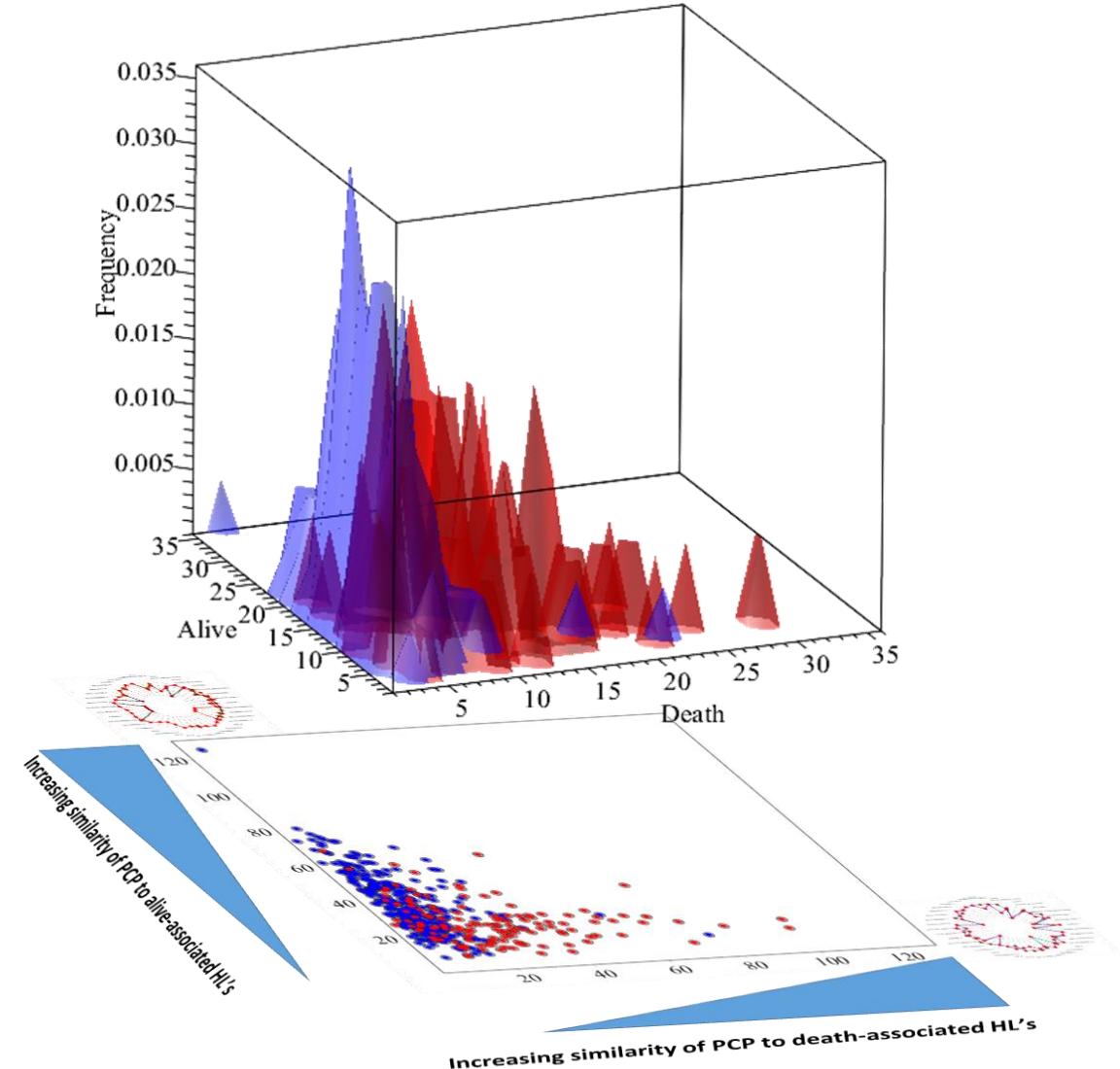
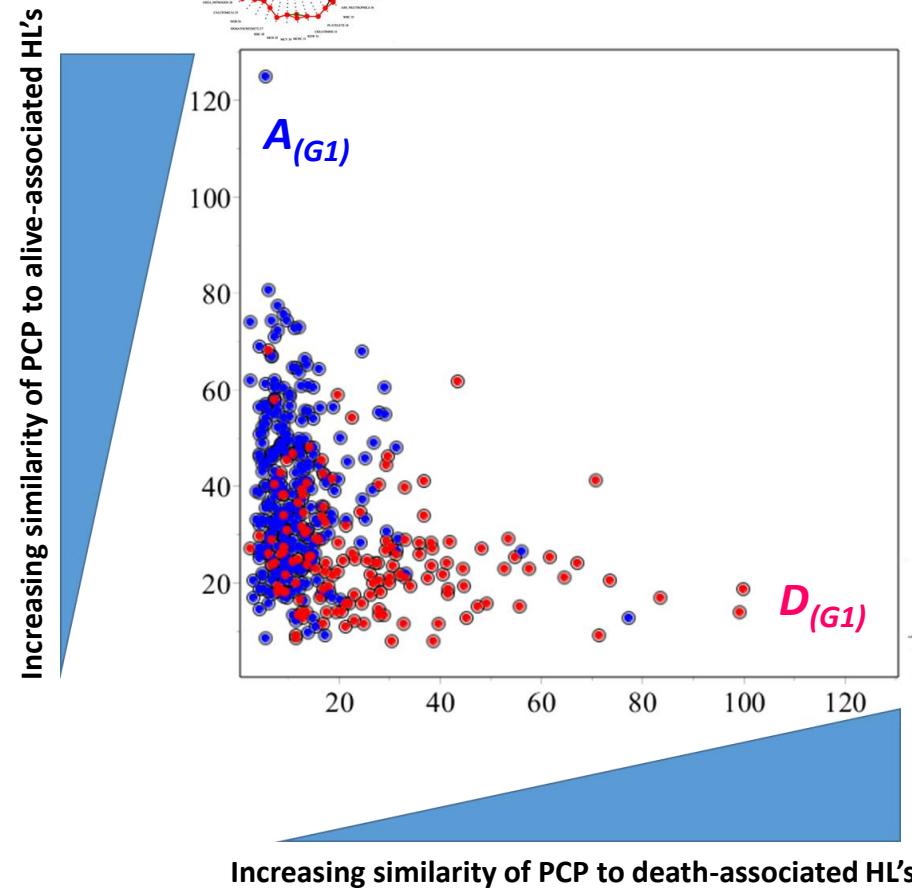
# Relationships of clinical parameter values, characteristic for alive outcome in G<sub>1</sub>

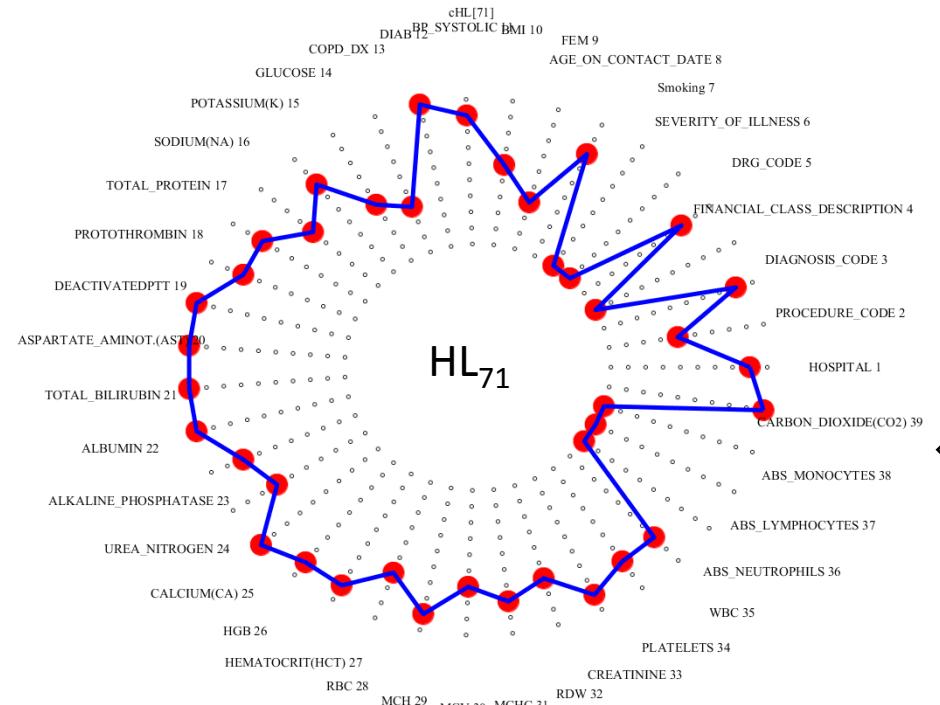
log(OR[D])

2	11	HOSPITAL SHY	--	PROCEDURE_CODE 3241 Thorac lobectomy lung	-0.31345 *****
2	18	HOSPITAL SHY	--	PROCEDURE_CODE 3239 Oth seg lung resect NOS	-0.54753 *****
5	11	HOSPITAL MER	--	PROCEDURE_CODE 3241 Thorac lobectomy lung	-0.37144 *****
8	11	HOSPITAL HRY	--	PROCEDURE_CODE 3241 Thorac lobectomy lung	-0.37144 *****
8	14	HOSPITAL HRY	--	PROCEDURE_CODE 3230 Thorac seg lung resect	-0.54753 *****
9	13	HOSPITAL HAM	--	PROCEDURE_CODE 3220 Thorac exc lung lesion	-0.37144 *****
10	11	HOSPITAL N/A	--	PROCEDURE_CODE 3241 Thorac lobectomy lung	-0.37144 *****
13	21	PROCEDURE_CODE 3220 Thorac exc lung lesion	--	DIAGNOSIS_CODE 1623 Malignant neoplasm of upper lobe, bronchus or lung	-0.50974 *****
18	21	PROCEDURE_CODE 3239 Oth seg lung resect NOS	--	DIAGNOSIS_CODE 1623 Malignant neoplasm of upper lobe, bronchus or lung	-0.61448 *****
21	Malignant neoplasm of upper lobe, bronchus or lung	DIAGNOSIS_CODE 1623	--	FINANCIAL_CLASS_DESCRIPTION UPMC_HEALTH_NETWORK	-0.43838 *****
31	44	FINANCIAL_CLASS_DESCRIPTION MEDICARE_PART_A	--	DRG_CODE 165	-0.31345 *****
33	44	FINANCIAL_CLASS_DESCRIPTION UPMC_HP_MEDICARE_HMO	--	DRG_CODE 165	-0.31345 *****
35	44	FINANCIAL_CLASS_DESCRIPTION UPMC_HEALTH_NETWORK	--	DRG_CODE 165 MAJOR CHEST PROCEDURES W/O CC/MCC	-0.61448 *****
40	44	FINANCIAL_CLASS_DESCRIPTION N/A	--	DRG_CODE 165	-0.37144 *****
44	51	DRG_CODE 165	MAJOR CHEST PROCEDURES W/O CC/MCC	SEVERITY_OF_ILLNESS 2	-0.39777 *****
44	54	DRG_CODE 165	MAJOR CHEST PROCEDURES W/O CC/MCC	SEVERITY_OF_ILLNESS 1	-0.50974 *****
51	62	SEVERITY_OF_ILLNESS 2	--	Smoking Yes	-0.48259 *****
54	62	SEVERITY_OF_ILLNESS 1	--	Smoking Yes	-0.31345 *****
62	73	Smoking Yes	--	AGE_ON_CONTACT_DATE 59-69	-0.45062 *****
63	74	Smoking Never	--	AGE_ON_CONTACT_DATE 69-80	-0.43838 *****
82	95	FEMALE Female	--	BMI >38	-0.81077 *****
93	106	BMI 25-31	--	BP_SYSTOLIC 148-160	-0.64444 *****
94	106	BMT 31-38	--	BP_SYSTOLIC 148-160	-0.67247 *****
95	103	BMI >38	--	BP_SYSTOLIC 114-127	-0.54753 *****
100	110	BMI N/A	--	BP_SYSTOLIC N/A	-0.37144 *****
106	111	BP_SYSTOLIC 148-160	--	DIAB No	-0.45362 *****
155	170	SODIUM(NA) >140	--	TOTAL_PROTEIN N/A	-0.48538 *****
173	182	PROTOTHROMBIN >16	--	ACTIVATED PTT 34-42	-0.61448 *****
181	194	ACTIVATED PTT <34	--	ASPARTATE_AMINO_(AS) 28-36	-0.67247 *****
203	212	TOTAL_BILIRUBIN 0.45-0.75	--	ALBUMIN 2.8-3.5	-0.33365 *****
230	233	ALKALINE_PHOSPHATASE N/A	--	UREA_NITROGEN 15.5-22.5	-0.59868 *****
231	241	UREA_NITROGEN <10	--	CALCIUM(CA) <8.5	-0.37144 *****
233	241	UREA_NITROGEN 15.5-22.5	--	CALCIUM(CA) <8.5	-0.37144 *****
233	250	UREA_NITROGEN 15.5-22.5	--	CALCIUM(CA) N/A	-0.37144 *****
253	265	HGB 11-13.5	--	HEMATOCRIT(HC) 40-45	-0.72362 *****
274	283	RBC 4-4.9	--	MCH >34	-0.46835 *****
301	313	MCHC <32	--	RDW 15-17	-0.46835 *****
302	312	MCHC 32-33	--	RDW 13-15	-0.33365 *****
303	320	MCHC 33-34.2	--	RDW N/A	-0.46835 *****
341	352	WBC <5.2	--	ABS_NEUTROPHILS 3-4.5	-0.42259 *****
342	351	WBC 5.2-7	--	ABS_NEUTROPHILS <3	-0.46835 *****
351	361	ABS_NEUTROPHILS <3	--	ABS LYMPHOCYTES <0.95	-0.67247 *****
351	363	ABS_NEUTROPHILS <3	--	ABS LYMPHOCYTES 2-3	-0.42259 *****
380	382	ABS_MONOCYTES N/A	--	CARBON_DIOXIDE(CO2) 24-27	-0.39777 *****
382	10	CARBON_DIOXIDE(CO2) 24-27	--	HOSPITAL N/A	-0.46835 *****
383	8	CARBON_DIOXIDE(CO2) 27-32	--	HOSPITAL HRY	-0.31345 *****

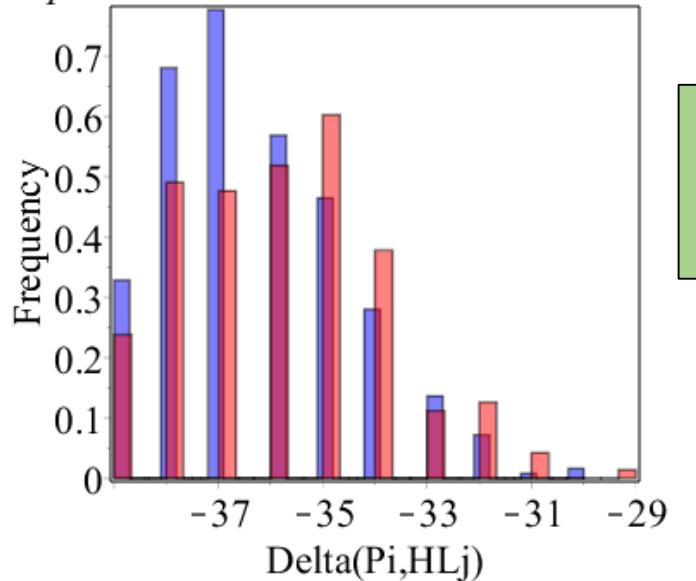
Model and algorithm, specific for G<sub>1</sub> patients, identifying odds for death after their lung cancer surgery

1. Compare adjacency matrices of PCp to stored matrices, representing G<sub>1</sub>-specific informative HL's and edge weights and compute x-y similarity coordinates
2. Identify where in red/blue (death/alive) boundaries PCp localizes – output odds for adverse event for the patient
3. Output the clinical features characterizing the death/alive section identified for the patient, with highlighted ones that match patient's PCp





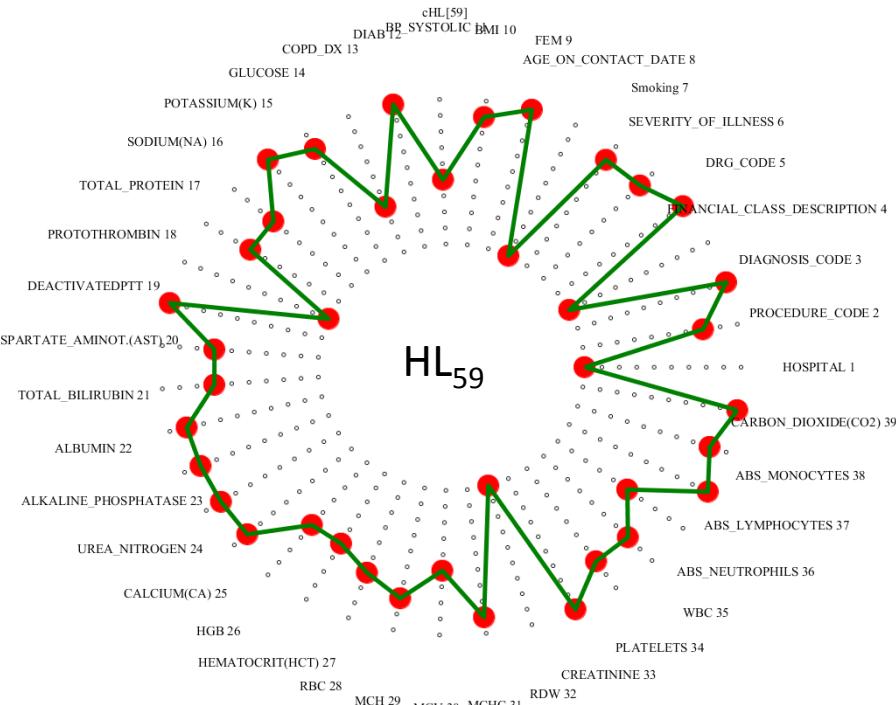
*71 > HL71 dead red -HL71alive blue  
 $p = .00226810786596532$  dE = 1.*



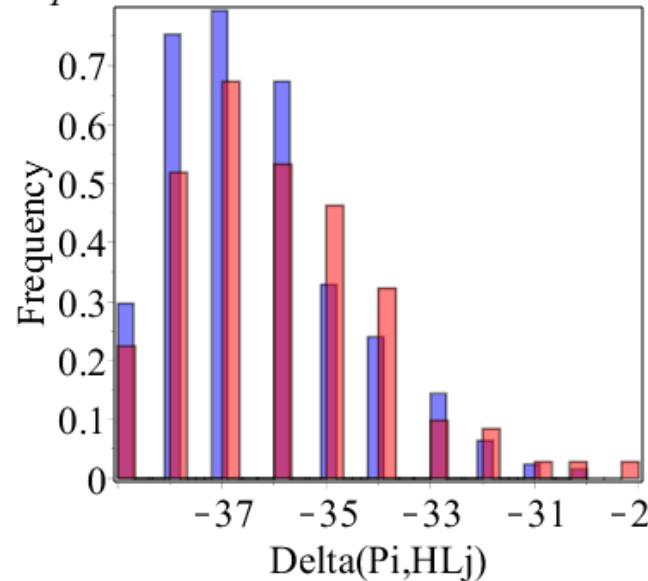
Patient's profiles  
**dissimilar**  
to HL<sub>71</sub>

## 122 landmark clinical profiles (HL<sub>1</sub> ... HL<sub>122</sub>)

Systematic search for clinical profile landmarks, “grouping” the D and A patients with the highest differentiation.



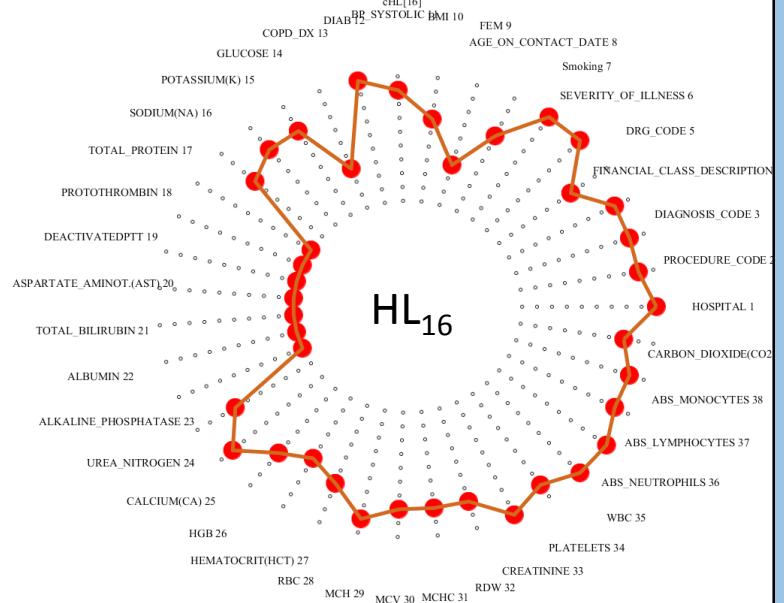
*59 > HL59 dead red -HL59alive blue  
 $p = .0149292183517677$  dE = 1.*



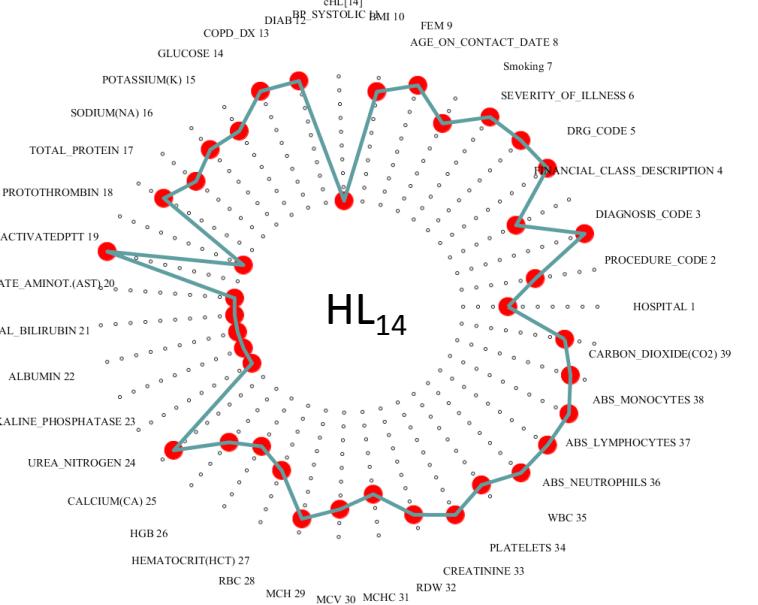
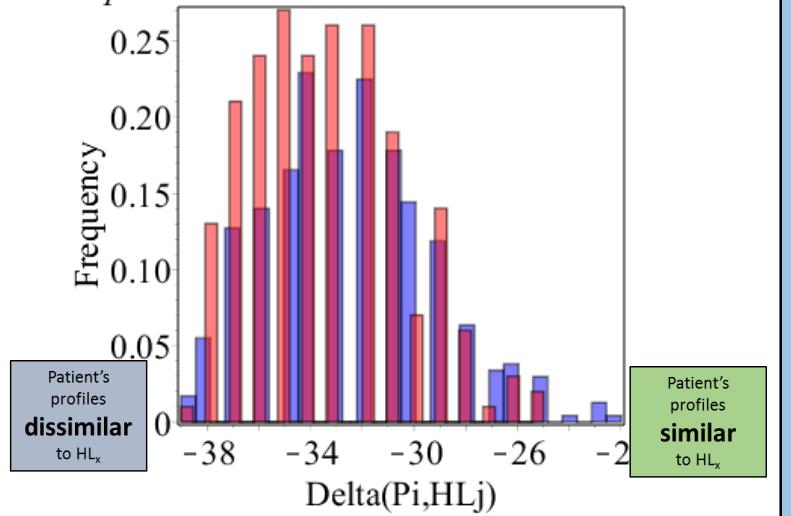
Patient's profiles  
**similar**  
to HL<sub>71</sub>

Patient's profiles  
**dissimilar**  
to HL<sub>59</sub>

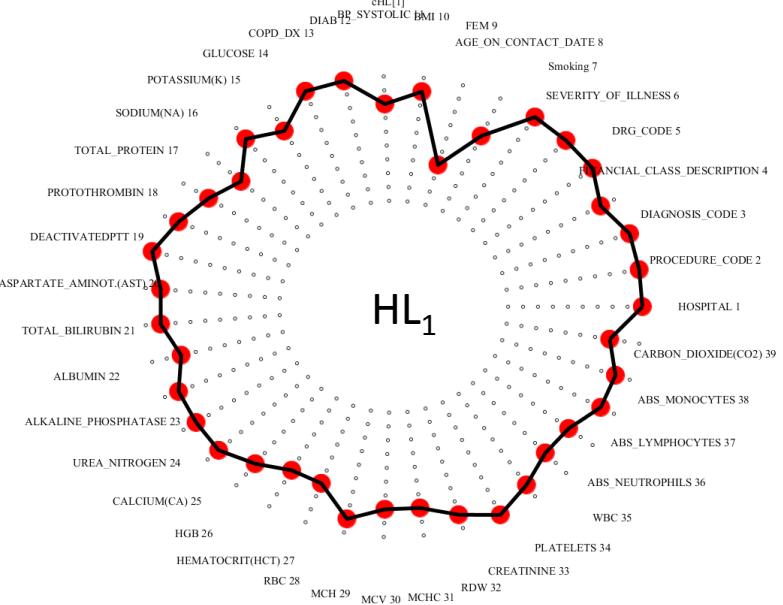
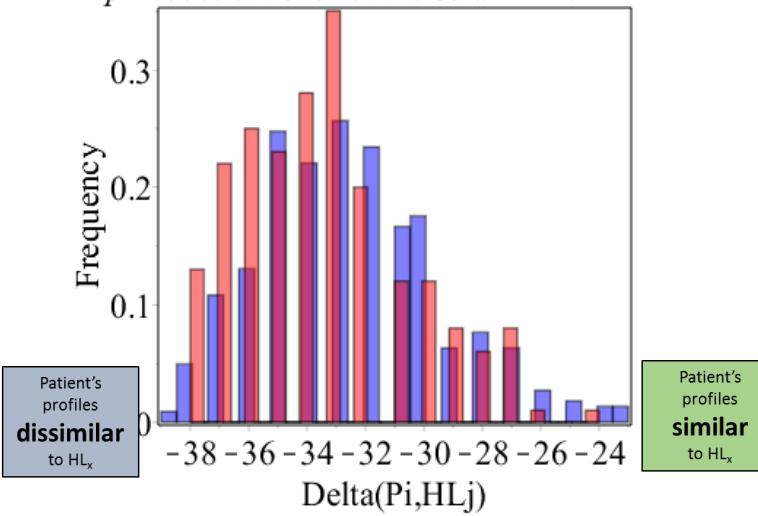
Patient's profiles  
**similar**  
to HL<sub>59</sub>



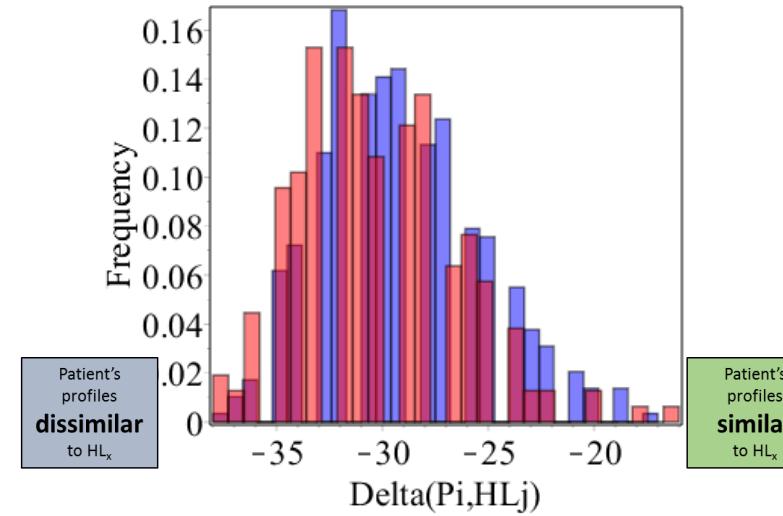
*16 > HL16 dead red -HL16 alive blue  
p = .000422294094554362 dE = -1.*

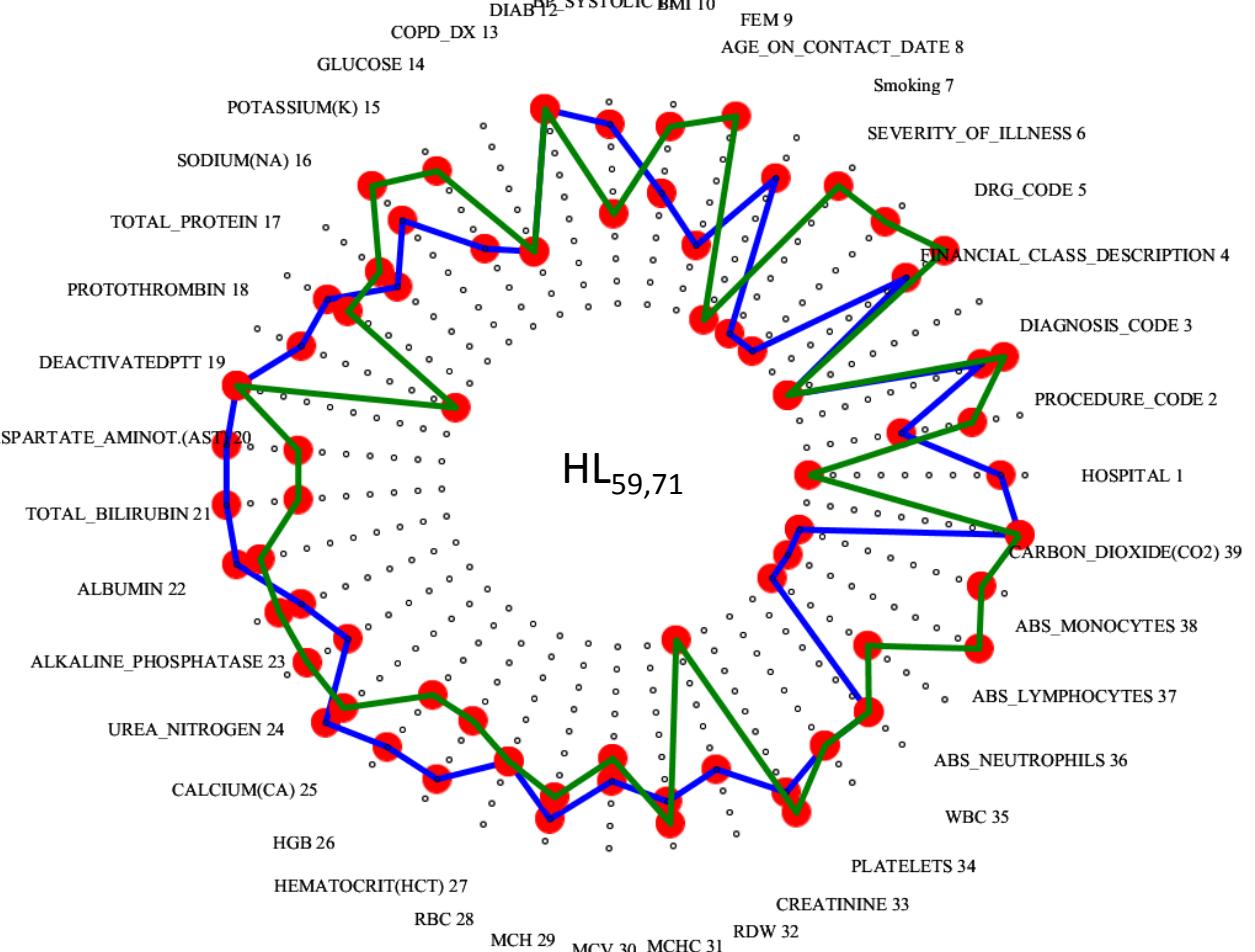
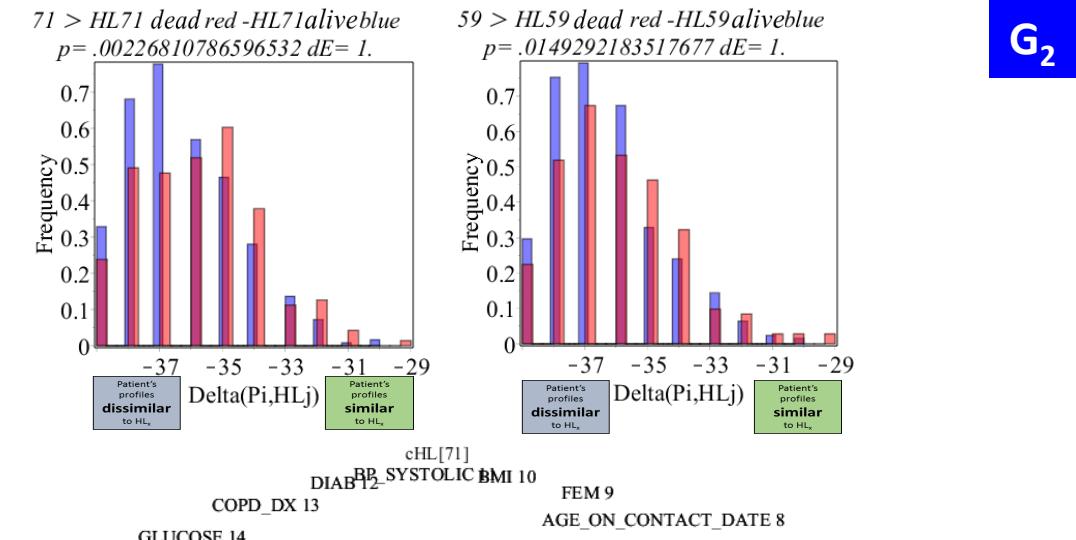
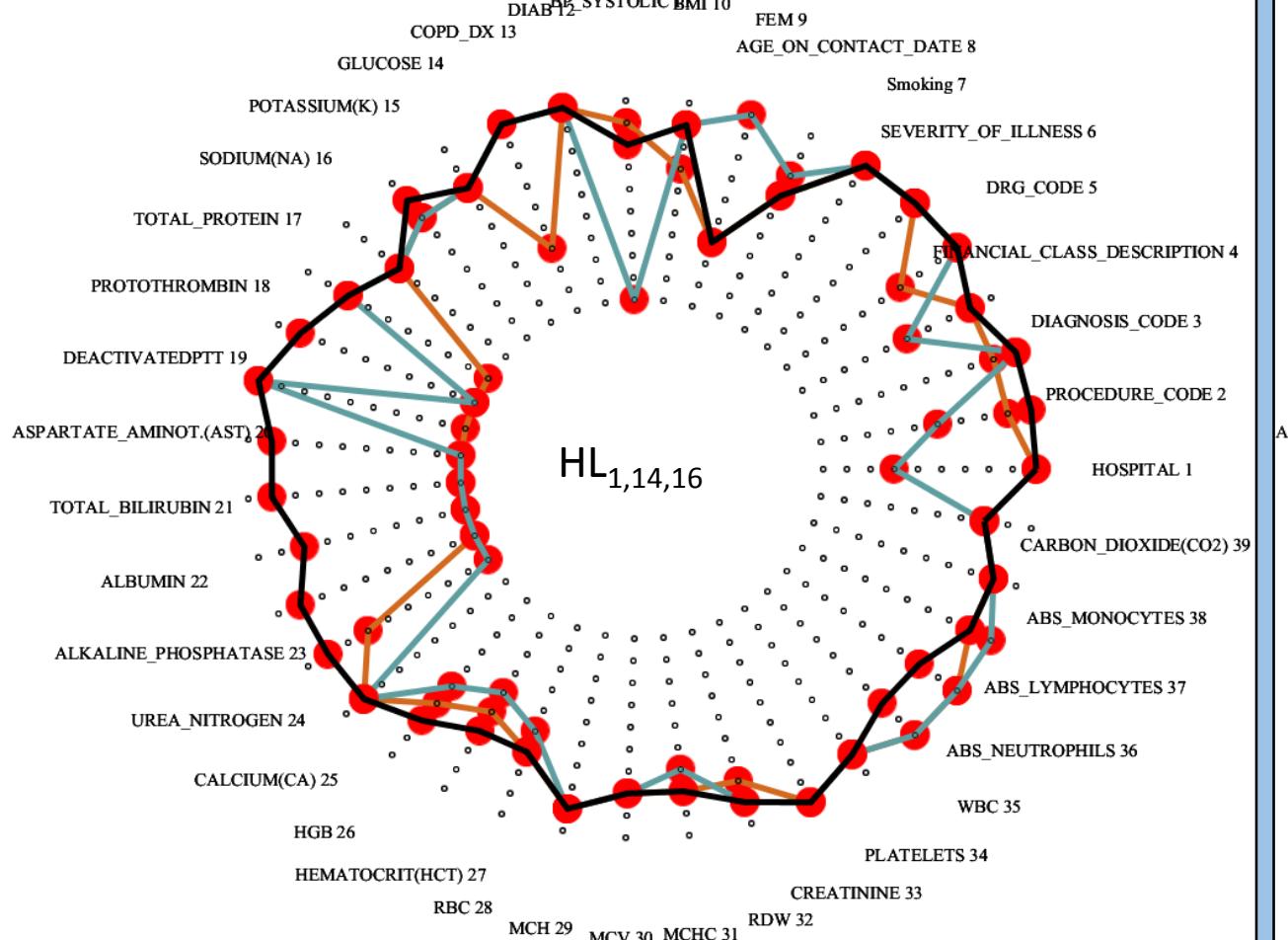
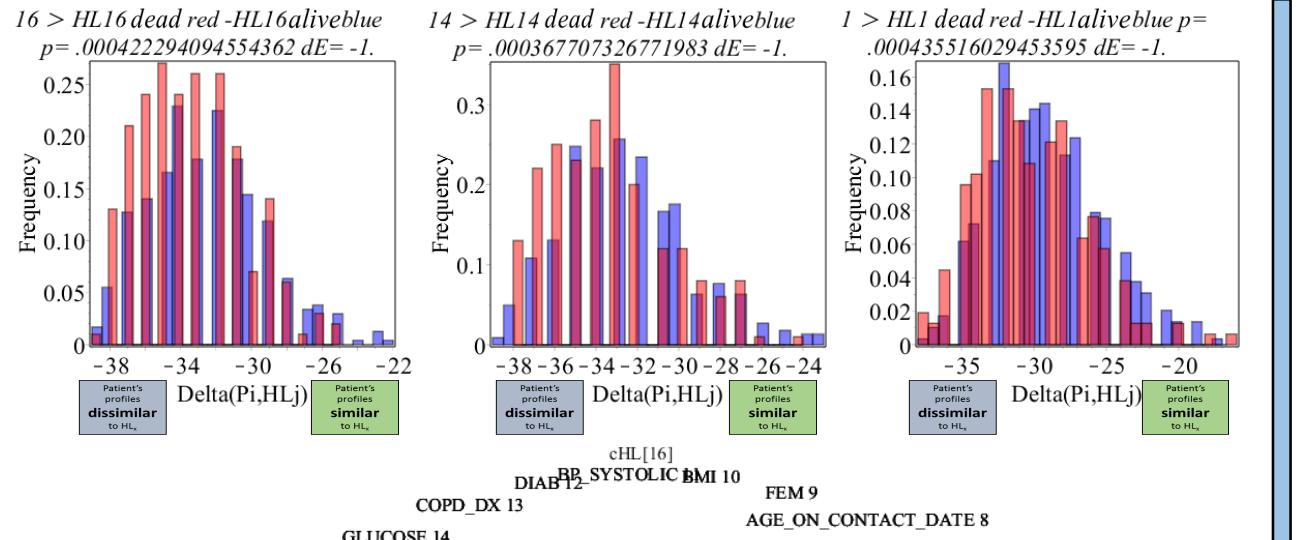


*14 > HL14 dead red -HL14 alive blue  
p = .000367707326771983 dE = -1.*



*1 > HL1 dead red -HL1 alive blue p = .000435516029453595 dE = -1.*





# Relationships of clinical parameter values, characteristic for death in G<sub>2</sub>

log(OR[D])

1	15	HOSPITAL PAS	--	PROCEDURE_CODE 3224	Perc abltn lung les/tiss	1.13378	*****
3	15	HOSPITAL PUH	--	PROCEDURE_CODE 3224	Destroy loc lung les NEC	0.58971	*****
3	16	HOSPITAL PUH	--	PROCEDURE_CODE 3229	Perc abltn lung les/tiss	0.76580	*****
7	15	HOSPITAL NWH	--	PROCEDURE_CODE 3224	Thorac seg lung resect	0.94189	*****
8	14	HOSPITAL HRY	--	PROCEDURE_CODE 3220	Malignant neoplasm of bronchus and lung, unspecified	0.58971	*****
13	23	PROCEDURE_CODE 3224	Thorac exc lung lesion	DIAGNOSIS_CODE 1629	Malignant neoplasm of upper lobe, bronchus or lung	0.68662	*****
15	21	PROCEDURE_CODE 3224	Perc abltn lung les/tiss	DIAGNOSIS_CODE 1623	Malignant neoplasm of lower lobe, bronchus or lung	0.72801	*****
15	22	PROCEDURE_CODE 3224	Other pneumonectomy NOS	DIAGNOSIS_CODE 1625	Malignant neoplasm of bronchus and lung, unspecified	0.72801	*****
17	22	PROCEDURE_CODE 3259	--	DIAGNOSIS_CODE 1629	Other pneumonectomy NOS	0.76580	*****
Malignant neoplasm of bronchus and lung, unspecified		DIAGNOSIS_CODE 1629	--	FINANCIAL_CLASS DESCRIPTION MEDICARE_PART_A	--	0.83275	*****
31	46	FINANCIAL_CLASS DESCRIPTION MEDICARE_PART_A	--	DRG_CODE 168	OTHER RESP SYSTEM O.R. PROCEDURES W/O CC/MCC	1.06683	*****
32	43	FINANCIAL_CLASS DESCRIPTION SECURITY_BLUE_HMO	--	DRG_CODE 3	ECMO OR TRACH W MV >96 HRS OR PDX EXC FACE, MOUTH & NECK W MAJ O.R.	0.76580	*****
32	45	FINANCIAL_CLASS DESCRIPTION SECURITY_BLUE_HMO	--	DRG_CODE 167	OTHER RESP SYSTEM O.R. PROCEDURES W CC	0.58971	*****
33	43	FINANCIAL_CLASS DESCRIPTION UPMC_HP_MEDICARE_HMO	--	DRG_CODE 3	ECMO OR TRACH W MV >96 HRS OR PDX EXC FACE, MOUTH & NECK W MAJ O.R.	0.89074	*****
34	43	FINANCIAL_CLASS DESCRIPTION B/C_KEYSTONE	--	DRG_CODE 3	ECMO OR TRACH W MV >96 HRS OR PDX EXC FACE, MOUTH & NECK W MAJ O.R.	0.76580	*****
36	42	FINANCIAL_CLASS DESCRIPTION ADVANTRA_MC_HMO	--	DRG_CODE 163	MAJOR CHEST PROCEDURES W MCC	0.51053	*****
40	43	FINANCIAL_CLASS DESCRIPTION N/A	--	DRG_CODE 3	ECMO OR TRACH W MV >96 HRS OR PDX EXC FACE, MOUTH & NECK W MAJ O.R.	0.76580	*****
43	53	DRG_CODE 3	--	SEVERITY_OF_ILLNESS 4	--	1.28868	*****
43	60	DRG_CODE 3	--	SEVERITY_OF_ILLNESS_N/A	--	0.58971	*****
45	51	DRG_CODE 167	OTHER RESP SYSTEM O.R. PROCEDURES W CC	SEVERITY_OF_ILLNESS 2	--	0.58971	*****
46	54	DRG_CODE 168	OTHER RESP SYSTEM O.R. PROCEDURES W/O CC/MCC	SEVERITY_OF_ILLNESS 1	--	0.68662	*****
53	70	SEVERITY_OF_ILLNESS 4	--	Smoking	N/A	0.76580	*****
70	71	Smoking N/A	--	AGE_ON_CONTACT_DATE	<48	0.76580	*****
80	81	AGE_ON_CONTACT_DATE N/A	--	FEMALE	Male	0.76580	*****
80	82	AGE_ON_CONTACT_DATE N/A	--	FEMALE	Female	0.53172	*****
81	100	FEMALE	Male	BMI	N/A	0.70365	*****
82	91	FEMALE	Female	BMI	<18	0.76580	*****
92	101	BMI	18-25	BP_SYSTOLIC	<102	0.53172	*****
95	102	BMI	>38	BP_SYSTOLIC	102-114	0.58971	*****
101	112	BP_SYSTOLIC	<102	DIAB	Yes	0.68662	*****
122	135	COPD_DX	Yes	GLUCOSE	124-144	0.53172	*****
131	142	GLUCOSE	<70	POTASSIUM(K)	3.6-4.6	0.58971	*****
134	144	GLUCOSE	107-124	POTASSIUM(K)	>5.1	0.58971	*****
143	151	POTASSIUM(K)	4.6-5.1	SODIUM(NA)	<130	0.58971	*****
144	155	POTASSIUM(K)	>5.1	SODIUM(NA)	>140	0.89074	*****
153	164	SODIUM(NA)	133-136	TOTAL_PROTEIN	7.8-8.2	0.58971	*****
160	163	SODIUM(NA)	N/A	TOTAL_PROTEIN	7-7.8	0.58971	*****
165	180	TOTAL_PROTEIN	>8.2	PROTHROMBIN	N/A	0.68662	*****
170	173	TOTAL_PROTEIN	N/A	PROTHROMBIN	>16	0.76580	*****
173	181	PROTHROMBIN	>16	ACTIVATED_PTT	<34	0.89074	*****
173	182	PROTHROMBIN	>16	ACTIVATED_PTT	34-42	0.68662	*****
182	194	ACTIVATED_PTT	34-42	ASPARTATE_AMINO_(AS)	28-36	0.98765	*****
203	211	TOTAL_BILIRUBIN	0.45-0.75	ALBUMIN	<2.8	0.89074	*****
211	222	ALBUMIN	<2.8	ALKALINE_PHOSPHATASE	65-110	0.51053	*****
221	235	ALKALINE_PHOSPHATASE	<65	UREA_NITROGEN	>33	0.76580	*****
222	235	ALKALINE_PHOSPHATASE	65-110	UREA_NITROGEN	>33	0.51053	*****
224	232	ALKALINE_PHOSPHATASE	>175	UREA_NITROGEN	10-15.5	0.58971	*****
231	241	UREA_NITROGEN	<10	CALCIUM(CA)	<8.5	0.65666	*****
231	250	UREA_NITROGEN	<10	CALCIUM(CA)	N/A	0.76580	*****
251	261	HGB	<9	HEMATOCRIT(HC)	<28	0.89074	*****
252	261	HGB	9-11	HEMATOCRIT(HC)	<28	0.58971	*****
322	331	CREATININE	>1.3	PLATELETS	<140	0.51053	*****
322	334	CREATININE	>1.3	PLATELETS	320-485	0.58971	*****
330	334	CREATININE	N/A	PLATELETS	320-485	0.58971	*****
331	344	PLATELETS	<140	WBC	11-14	0.58971	*****
334	341	PLATELETS	320-485	WBC	<5.2	0.76580	*****
334	345	PLATELETS	320-485	WBC	>14	0.89074	*****
362	371	ABS_LYMPHOCYTES	0.95-2	ABS_MONOCYTES	<0.3	0.58971	*****
380	384	AES_MONOCYTES	N/A	CARBON_DIOXIDE(CO2)	>32	0.58971	*****
381	7	CARBON_DIOXIDE(CO2)	<24	HOSPITAL_NWH	--	0.58971	*****
384	2	CARBON_DIOXIDE(CO2)	>32	HOSPITAL_SHY	--	0.58971	*****
390	5	CARBON_DIOXIDE(CO2)	N/A	HOSPITAL_MER	--	0.58971	*****

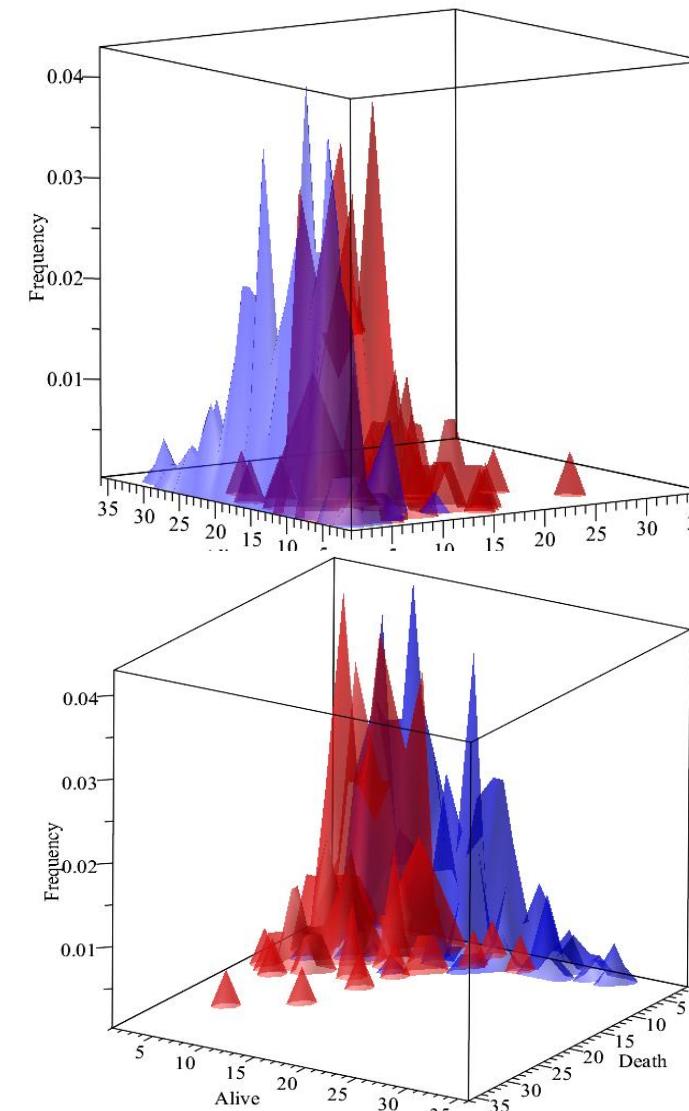
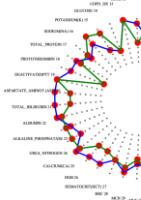
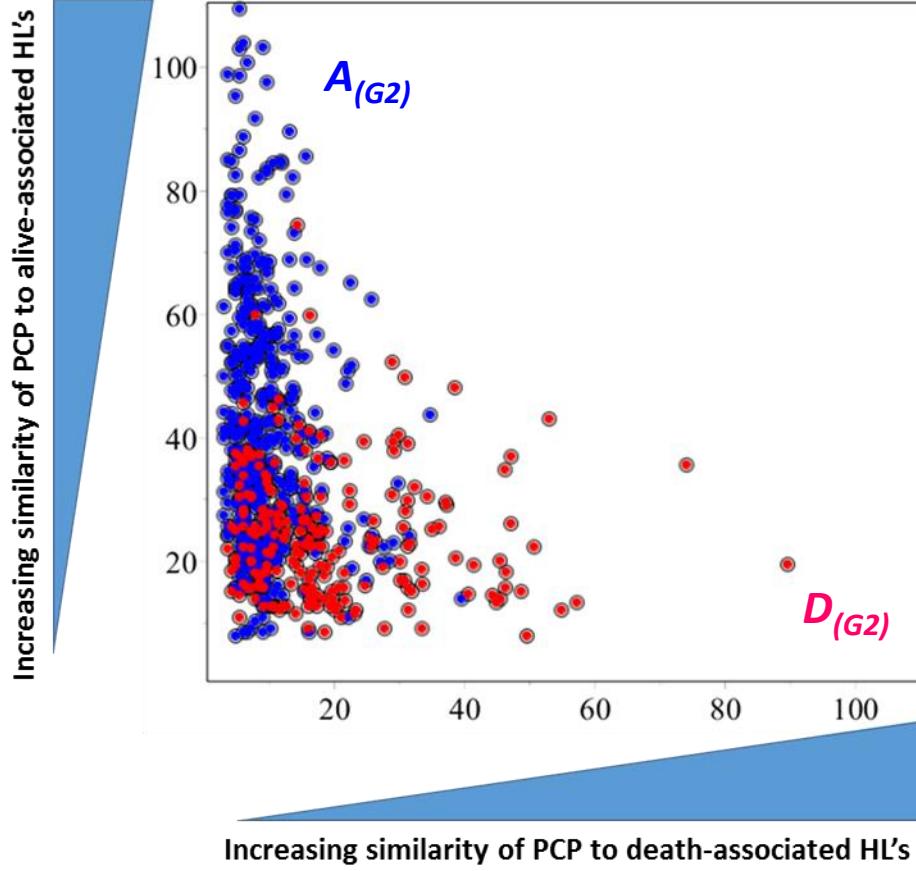
# Relationships of clinical parameter values, characteristic for alive outcome in G<sub>2</sub>

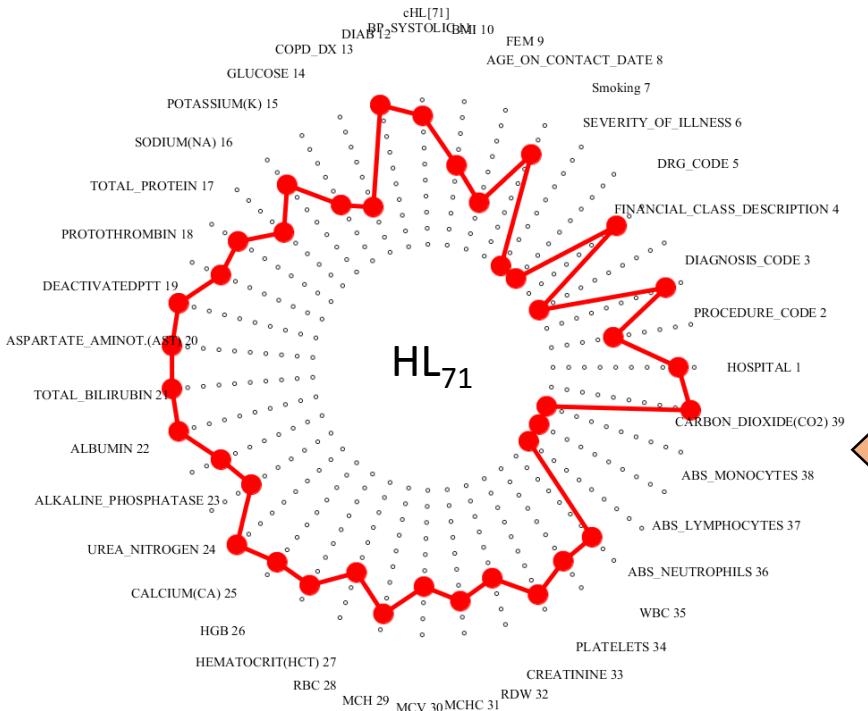
log(OR[D])

2	11	HOSPITAL SHY	--	PROCEDURE_CODE 3241 Thorac lobectomy lung	-0.34814 *****
3	14	HOSPITAL PUH	--	PROCEDURE_CODE 3230 Thorac seg lung resect	-0.48947 *****
3	18	HOSPITAL PUH	--	PROCEDURE_CODE 3239 Oth seg lung resect NOS	-0.55642 *****
4	11	HOSPITAL SMH	--	PROCEDURE_CODE 3241 Thorac lobectomy lung	-0.54062 *****
7	14	HOSPITAL NWH	--	PROCEDURE_CODE 3230 Thorac seg lung resect	-0.41029 *****
10	26	Malignant neoplasm of lower lobe, bronchus or lung	DIAGNOSIS_CODE 1625	FINANCIAL_CLASS_DESCRIPCION UPMC_HEALTH_NETWORK	-0.31338 *****
11	26	Malignant neoplasm of bronchus and lung, unspecified	DIAGNOSIS_CODE 1629	FINANCIAL_CLASS_DESCRIPCION UPMC_HEALTH_NETWORK	-0.55642 *****
12	26	Malignant neoplasm of middle lobe, bronchus or lung	DIAGNOSIS_CODE 1624	FINANCIAL_CLASS_DESCRIPCION MEDICARE_PART_A	-0.48947 *****
31	44	FINANCIAL_CLASS_DESCRIPCION MEDICARE_PART_A	--	DRG_CODE 165	-0.55642 *****
32	44	FINANCIAL_CLASS_DESCRIPCION SECURITY_BLUE_HMO	--	DRG_CODE 165 MAJOR CHEST PROCEDURES W/O CC/MCC	-0.73251 *****
33	44	FINANCIAL_CLASS_DESCRIPCION UPMC_MEDICARE_HMO	--	DRG_CODE 165	-0.88741 *****
35	41	FINANCIAL_CLASS_DESCRIPCION UPMC_HEALTH_NETWORK	--	DRG_CODE 164 MAJOR CHEST PROCEDURES W CC	-0.38033 *****
35	44	FINANCIAL_CLASS_DESCRIPCION UPMC_HEALTH_NETWORK	--	DRG_CODE 165 MAJOR CHEST PROCEDURES W/O CC/MCC	-0.75271 *****
40	44	FINANCIAL_CLASS_DESCRIPCION N/A	--	DRG_CODE 165	-0.46465 *****
41	54	MAJOR CHEST PROCEDURES W CC	DRG_CODE 164	SEVERITY_OF_ILLNESS 1	-0.38801 *****
44	51	MAJOR CHEST PROCEDURES W/O CC/MCC	DRG_CODE 165	SEVERITY_OF_ILLNESS 2	-0.79946 *****
51	61	SEVERITY_OF_ILLNESS 2	--	Smoking Quit	-0.37513 *****
51	62	SEVERITY_OF_ILLNESS 2	--	Smoking Yes	-0.37750 *****
51	63	SEVERITY_OF_ILLNESS 2	--	Smoking Never	-0.75271 *****
54	63	SEVERITY_OF_ILLNESS 1	--	Smoking Never	-0.79050 *****
61	72	Smoking Quit	--	AGE_ON_CONTACT_DATE 48-59	-0.31338 *****
62	72	Smoking Yes	--	AGE_ON_CONTACT_DATE 48-59	-0.31338 *****
63	73	Smoking Never	--	AGE_ON_CONTACT_DATE 59-69	-0.34814 *****
63	75	Smoking Never	--	AGE_ON_CONTACT_DATE >80	-0.66556 *****
72	82	AGE_ON_CONTACT_DATE 48-59	--	FEMALE Female	-0.36453 *****
82	95	FEMALE Female	--	BMI >38	-0.61441 *****
92	110	BMI 18-25	--	BP_SYSTOLIC N/A	-0.34814 *****
93	110	BMI 25-31	--	BP_SYSTOLIC N/A	-0.34814 *****
94	110	BMI 31-38	--	BP_SYSTOLIC N/A	-0.36453 *****
100	103	BMI N/A	--	BP_SYSTOLIC 114-127	-0.31338 *****
105	112	BP_SYSTOLIC 137-148	--	DIAB Yes	-0.45168 *****
122	140	COPD_DX Yes	--	GLUCOSE N/A	-0.55642 *****
133	141	GLUCOSE 88-107	--	POTASSIUM(K) <3.6	-0.37408 *****
133	143	GLUCOSE 88-107	--	POTASSIUM(K) 4.6-5.1	-0.31338 *****
134	141	GLUCOSE 107-124	--	POTASSIUM(K) <3.6	-0.31338 *****
135	141	GLUCOSE 124-144	--	POTASSIUM(K) <3.6	-0.48947 *****
136	143	GLUCOSE >144	--	POTASSIUM(K) 4.6-5.1	-0.31338 *****
136	144	GLUCOSE >144	--	POTASSIUM(K) >5.1	-0.31338 *****
141	155	POTASSIUM(K) <3.6	--	SODIUM(NA) >140	-0.80823 *****
143	155	POTASSIUM(K) 4.6-5.1	--	SODIUM(NA) >140	-0.38801 *****
152	170	SODIUM(NA) 130-133	--	TOTAL_PROTEIN N/A	-0.41029 *****
160	162	SODIUM(NA) N/A	--	TOTAL_PROTEIN 6-7	-0.66556 *****
165	172	TOTAL_PROTEIN >8.2	--	PROTOTHROMBIN 10-16	-0.41029 *****
170	172	TOTAL_PROTEIN N/A	--	PROTOTHROMBIN 10-16	-0.32056 *****
192	204	ASPARTATE_AMINO.(AS) 14-21	--	TOTAL_BILIRUBIN >0.75	-0.64074 *****
221	231	ALKALINE_PHOSPHATASE <65	--	UREA_NITROGEN <10	-0.85745 *****
234	243	UREA_NITROGEN 22.5-33	--	CALCIUM(CA) >10	-0.31338 *****
240	243	UREA_NITROGEN N/A	--	CALCIUM(CA) >10	-0.31338 *****
243	252	CALCIUM(CA) >10	--	HGB 9-11	-0.31338 *****
250	254	CALCIUM(CA) N/A	--	HGB 13.5-15	-0.31338 *****
254	266	HGB 13.5-15	--	HEMATOCRIT(HC) >45	-0.48947 *****
273	281	RBC 3.5-4	--	MCH <28	-0.41029 *****
281	292	MCH <28	--	MCV 81-88	-0.31338 *****
295	304	MCV >100	--	MCHC 34.2-35	-0.41029 *****
301	314	MCHC <32	--	RDW >17	-0.55642 *****
321	340	CREATININE <1.3	--	PLATELETS N/A	-0.31338 *****
331	342	PLATELETS <140	--	WBC 5.2-7	-0.48947 *****
332	345	PLATELETS 140-275	--	WBC >14	-0.31338 *****
333	344	PLATELETS 275-320	--	WBC 11-14	-0.36453 *****
341	351	WBC <5.2	--	ABS_NEUTROPHILS <3	-0.42101 *****
351	362	ABS_NEUTROPHILS <3	--	ABS_LYMPHOCYTES 0.95-2	-0.69660 *****
352	364	ABS_NEUTROPHILS 3-4.5	--	ABS_LYMPHOCYTES >3	-0.71132 *****
364	372	ABS_LYMPHOCYTES >3	--	ABS_MONOCYTES 0.3-10	-0.31338 *****
373	383	ABS_MONOCYTES >10	--	CARBON_DIOXIDE(CO2) 27-32	-0.31338 *****
381	4	CARBON_DIOXIDE(CO2) <24	--	HOSPITAL_SMH	-0.55642 *****
383	9	CARBON_DIOXIDE(CO2) 27-32	--	HOSPITAL_HAM	-0.61441 *****

Model and algorithm, specific for G<sub>2</sub> patients, identifying odds for death after their lung cancer surgery

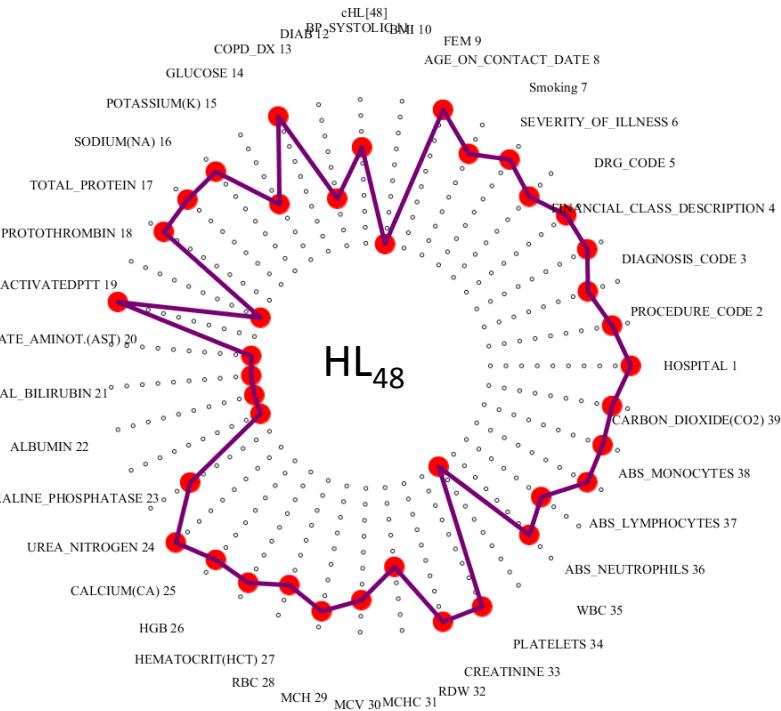
1. Compare adjacency matrices of PCp to stored matrices, representing G<sub>2</sub>-specific informative HL's and edge weights and compute x-y similarity coordinates
2. Identify where in red/blue (death/alive) boundaries PCp localizes – output odds for adverse event for the patient
3. Output the clinical features characterizing the death/alive section identified for the patient, with highlighted ones that match patient's PCp



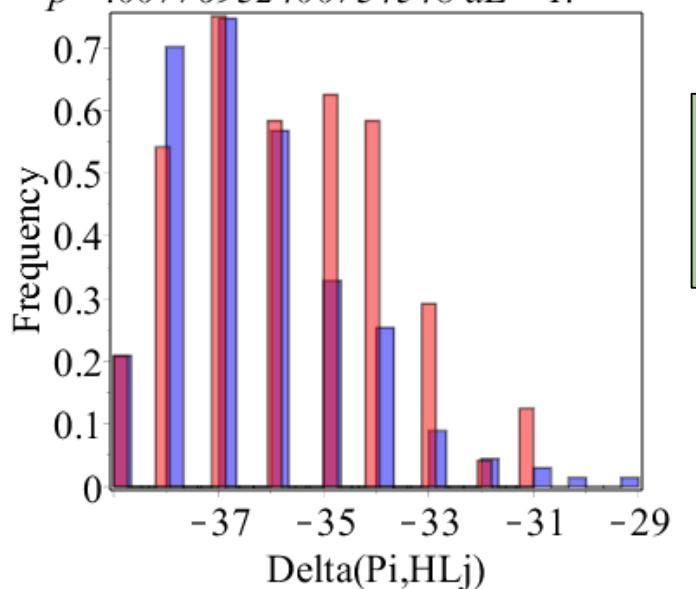


## 122 landmark clinical profiles (HL<sub>1</sub> ... HL<sub>122</sub>)

Systematic search for clinical profile landmarks, “grouping” the D and A patients with the highest differentiation.

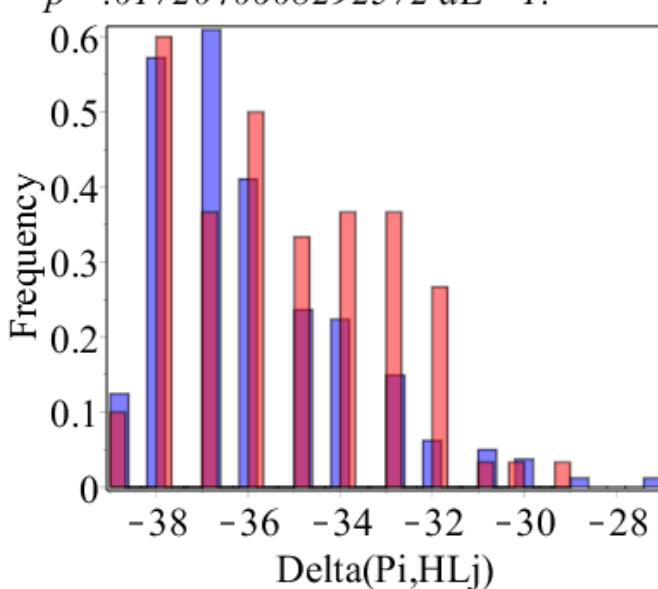


71 > HL71 dead red -HL71 alive blue  
p = .00776932400734548 dE = 1.

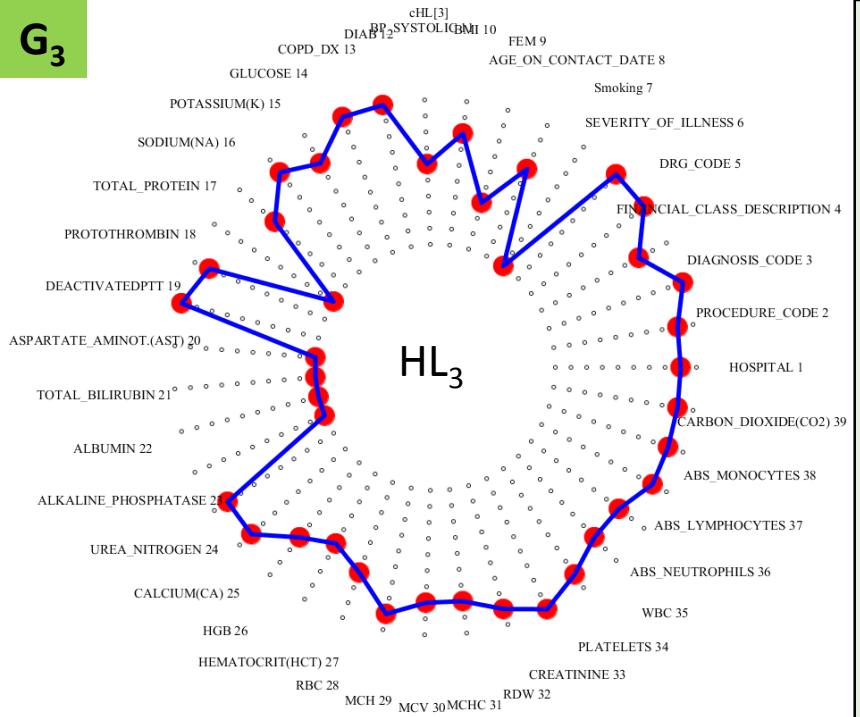


Patient's profiles similar to HL<sub>71</sub>

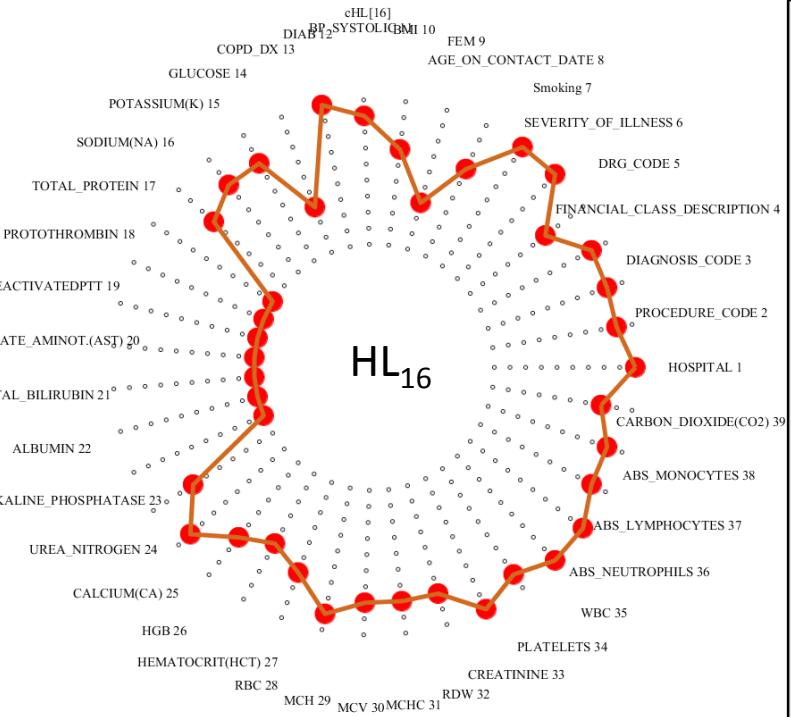
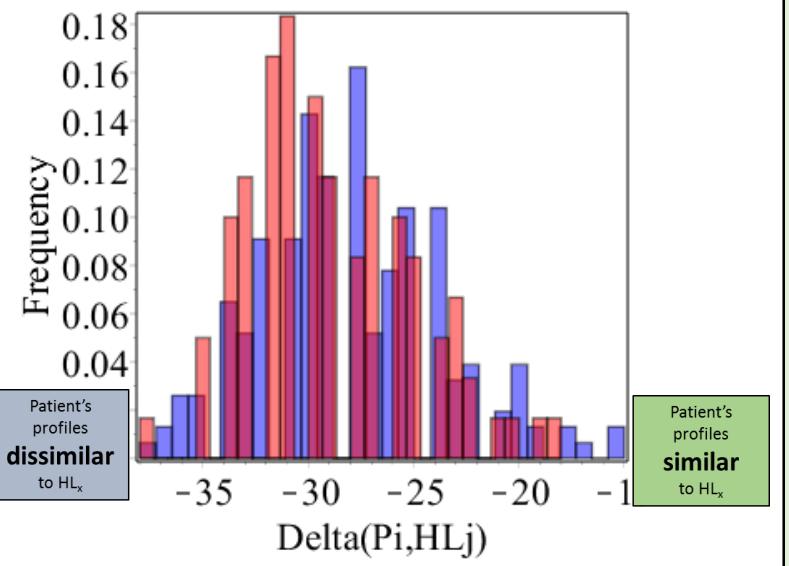
48 > HL48 dead red -HL48 alive blue  
p = .0172040608292572 dE = 1.



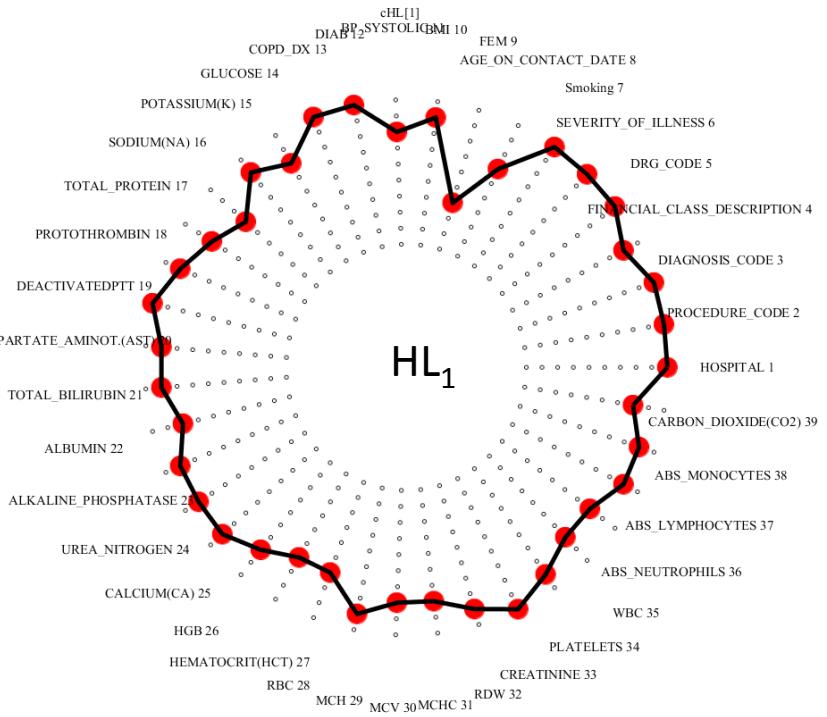
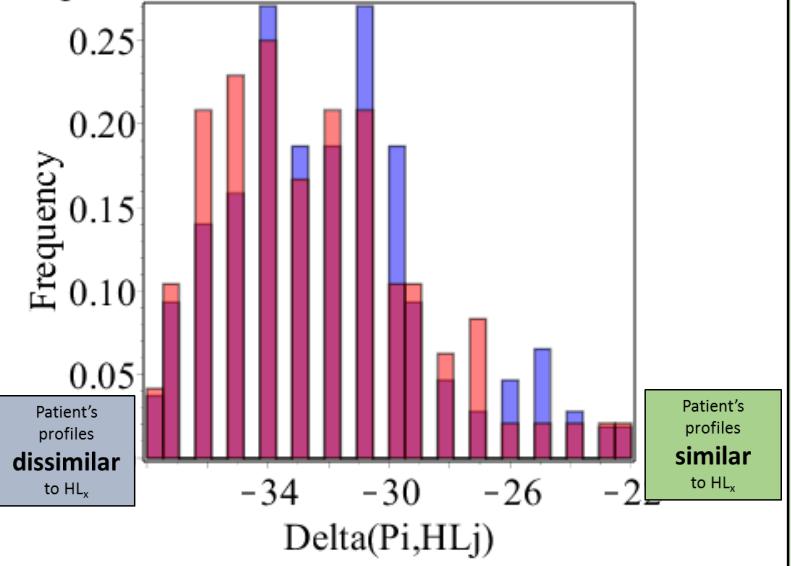
Patient's profiles similar to HL<sub>48</sub>

G<sub>3</sub>

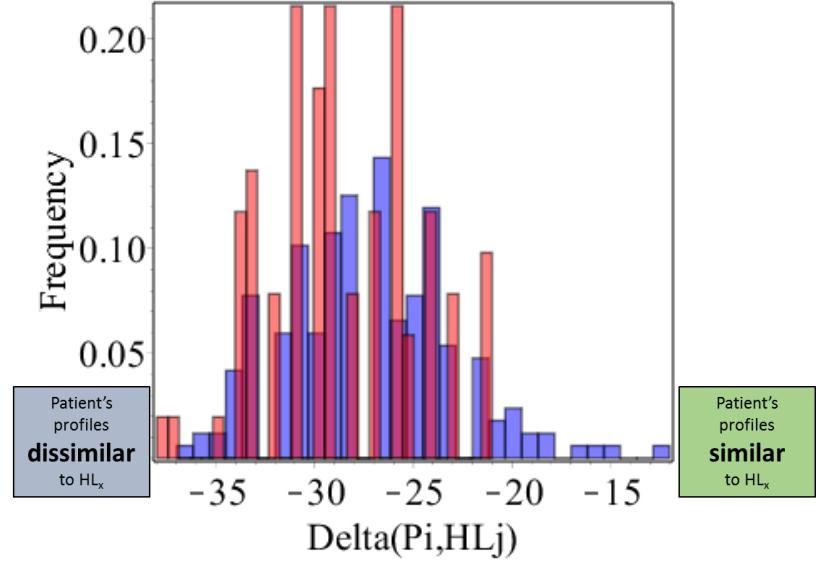
$3 > HL3$  dead red - $HL3$  alive blue  $p = .0633255952315562$   $dE = -2$ .

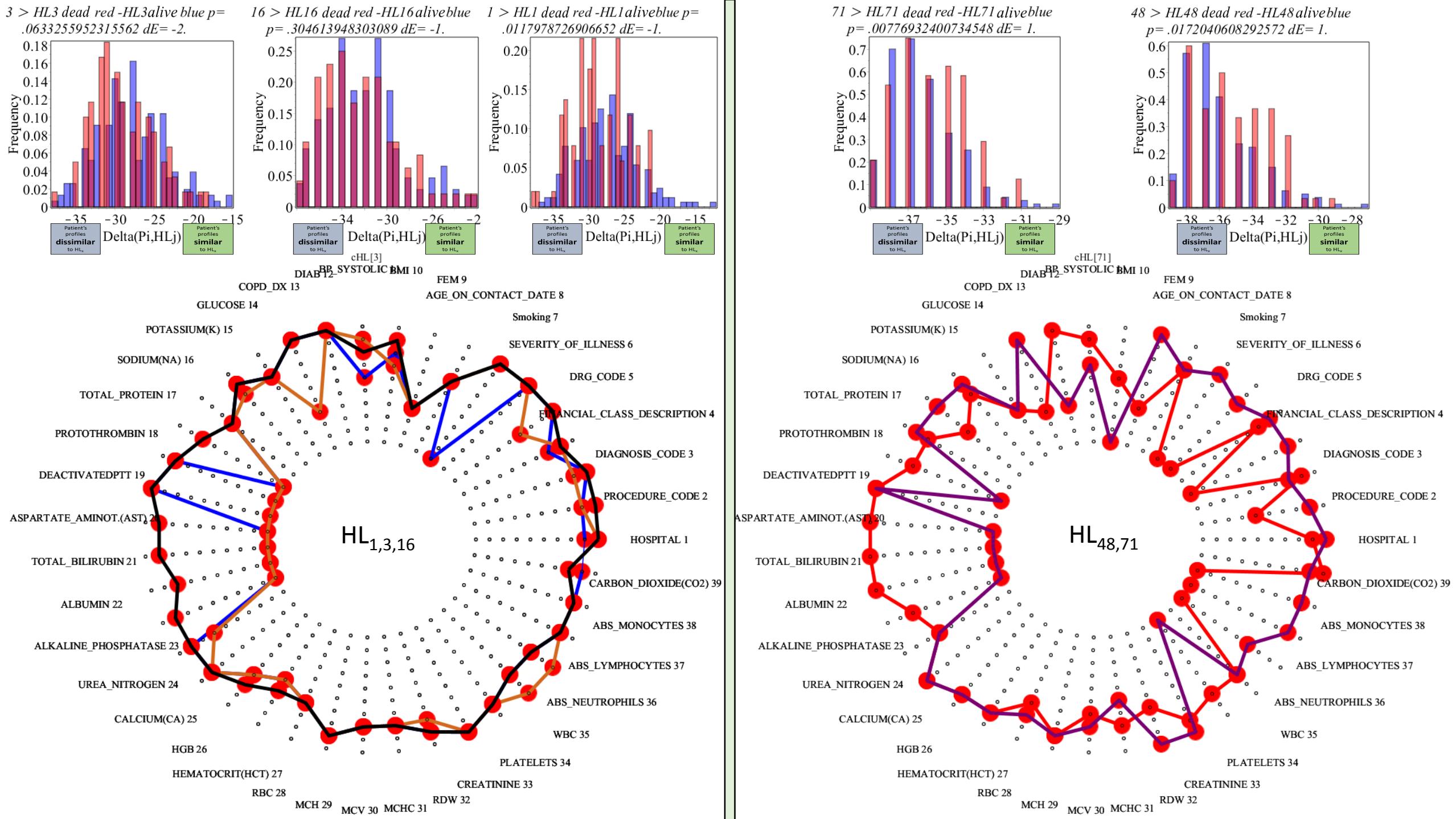


$16 > HL16$  dead red - $HL16$  alive blue  $p = .304613948303089$   $dE = -1$ .



$1 > HL1$  dead red - $HL1$  alive blue  $p = .0117978726906652$   $dE = -1$ .





# Relationships of clinical parameter values, characteristic for death in G<sub>3</sub>

log(OR[D])

HOSPITAL PAS	--	PROCEDURE_CODE 3224	Perc abltn lung les/tiss	0.52504	*****
HOSPITAL SHY	--	PROCEDURE_CODE 3229	Destroy loc lung les NEC	0.82607	*****
HOSPITAL PUH	--	PROCEDURE_CODE 3229	Destroy loc lung les NEC	0.64998	*****
HOSPITAL SMH	--	PROCEDURE_CODE 3220	Thorac exc lung lesion	0.52504	*****
HOSPITAL MER	--	PROCEDURE_CODE 3220	Thorac exc lung lesion	0.89302	*****
HOSPITAL NWH	--	PROCEDURE_CODE 3224	Perc abltn lung les/tiss	0.82607	*****
HOSPITAL N/A	--	PROCEDURE_CODE 3220	Thorac exc lung lesion	0.52504	*****
PROCEDURE_CODE 3229	--	DIAGNOSIS_CODE 1623	Malignant neoplasm of upper lobe, bronchus or lung	0.57080	*****
Destroy loc lung les NEC	PROCEDURE_CODE 3229	DIAGNOSIS_CODE 1625	Malignant neoplasm of lower lobe, bronchus or lung	0.82607	*****
		PROCEDURE_CODE 3259	DIAGNOSIS_CODE 1629	0.64998	*****
Malignant neoplasm of lower lobe, bronchus or lung	DIAGNOSIS_CODE 1625	FINANCIAL_CLASS_DESCRIPION OTHER_MC_HMO	0.64998	*****	
Malignant neoplasm of bronchus and lung, unspecified	DIAGNOSIS_CODE 1629	FINANCIAL_CLASS_DESCRIPION MEDICARE_PART_A	0.52504	*****	
	DIAGNOSIS_CODE 1629	FINANCIAL_CLASS_DESCRIPION SECURITY_BLUE_HMO	0.52504	*****	
		DRG_CODE 167	OTHER RESP SYSTEM O.R. PROCEDURES W CC	0.52504	*****
FINANCIAL_CLASS_DESCRIPION MEDICARE_PART_A	--	DRG_CODE 167	0.64998	*****	
FINANCIAL_CLASS_DESCRIPION UPMC_HP_MEDICARE_HMO	--	DRG_CODE 163	MAJOR CHEST PROCEDURES W MCC	0.64998	*****
FINANCIAL_CLASS_DESCRIPION ADVAÑTRA_MC_HMO	--	SEVERITY_OF_ILLNESS N/A	0.51376	*****	
MAJOR CHEST PROCEDURES W CC DRG_CODE 164	--	SEVERITY_OF_ILLNESS N/A	0.52504	*****	
MAJOR CHEST PROCEDURES W MCC DRG_CODE 163	--	Smoking Yes	1.04792	*****	
SEVERITY_OF_ILLNESS N/A	--	AGE_ON_CONTACT_DATE 59-69	0.57080	*****	
	Smoking Yes	AGE_ON_CONTACT_DATE <48	0.64998	*****	
	Smoking Never	AGE_ON_CONTACT_DATE >80	0.54525	*****	
	Smoking N/A	FEMALE Male	0.76393	*****	
AGE_ON_CONTACT_DATE >80	--	FEMALE Female	0.64998	*****	
AGE_ON_CONTACT_DATE N/A	--	BMI 18-25	0.50865	*****	
	FEMALE Male	BMI N/A	1.08932	*****	
	BMI 31-38	BP_SYSTOLIC <102	0.82607	*****	
	BMI >38	BP_SYSTOLIC 148-160	0.64998	*****	
	GLUCOSE 88-107	POTASSIUM(K) >5.1	0.64998	*****	
	GLUCOSE 124-144	POTASSIUM(K) <3.6	0.64998	*****	
	POTASSIUM(K) 3.6-4.6	SODIUM(NA) <130	0.64998	*****	
	POTASSIUM(K) 4.6-5.1	SODIUM(NA) >140	0.57080	*****	
	POTASSIUM(K) >5.1	SODIUM(NA) -136-140	0.64998	*****	
	SODIUM(NA) <130	TOTAL_PROTEIN 6-7	0.64998	*****	
	SODIUM(NA) N/A	TOTAL_PROTEIN 7-7.8	0.52504	*****	
	TOTAL_PROTEIN 6-7	PROTHROMBIN >16	0.64998	*****	
	ACTIVATED_PTT N/A	ASPARTATE_AMINO.(AS) >36	0.52504	*****	
ASPARTATE_AMINO.(AS) <14	--	TOTAL_BILIRUBIN <0.25	0.52504	*****	
ASPARTATE_AMINO.(AS) >36	--	TOTAL_BILIRUBIN >0.75	0.52504	*****	
TOTAL_BILIRUBIN <0.25	--	ALBUMIN >3.5	0.82607	*****	
ALKALINE_PHOSPHATASE 110-175	--	UREA_NITROGEN <10	0.64998	*****	
ALKALINE_PHOSPHATASE 110-175	--	UREA_NITROGEN 22.5-33	0.82607	*****	
ALKALINE_PHOSPHATASE N/A	--	UREA_NITROGEN 15.5-22.5	0.58304	*****	
UREA_NITROGEN 15.5-22.5	--	CALCIUM(CA) N/A	0.82607	*****	
	CALCIUM(CA) >10	HGB 11-13.5	0.64998	*****	
	HGB 9-11	HEMATOCRIT(HC) 28-34	0.55307	*****	
	HGB 13.5-15	HEMATOCRIT(HC) >45	0.64998	*****	
HEMATOCRIT(HC) 28-34	--	RBC 3.5-4	0.59199	*****	
	RBC 3.5-4	MCH <28	0.64998	*****	
	RBC 4-4.9	MCH >34	0.57080	*****	
	MCHC 32-33	RDW 15-17	0.52504	*****	
	MCHC >35	RDW N/A	0.64998	*****	
	RDW 15-17	CREATININE >1.3	0.82607	*****	
	RDW 15-17	CREATININE N/A	0.64998	*****	
CREATININE N/A	--	PLATELETS 275-320	0.52504	*****	
PLATELETS 140-275	--	WBC >14	0.82607	*****	
CARBON_DIOXIDE(CO2) <24	--	HOSPITAL MER	0.64998	*****	
CARBON_DIOXIDE(CO2) 27-32	--	HOSPITAL MER	0.52504	*****	

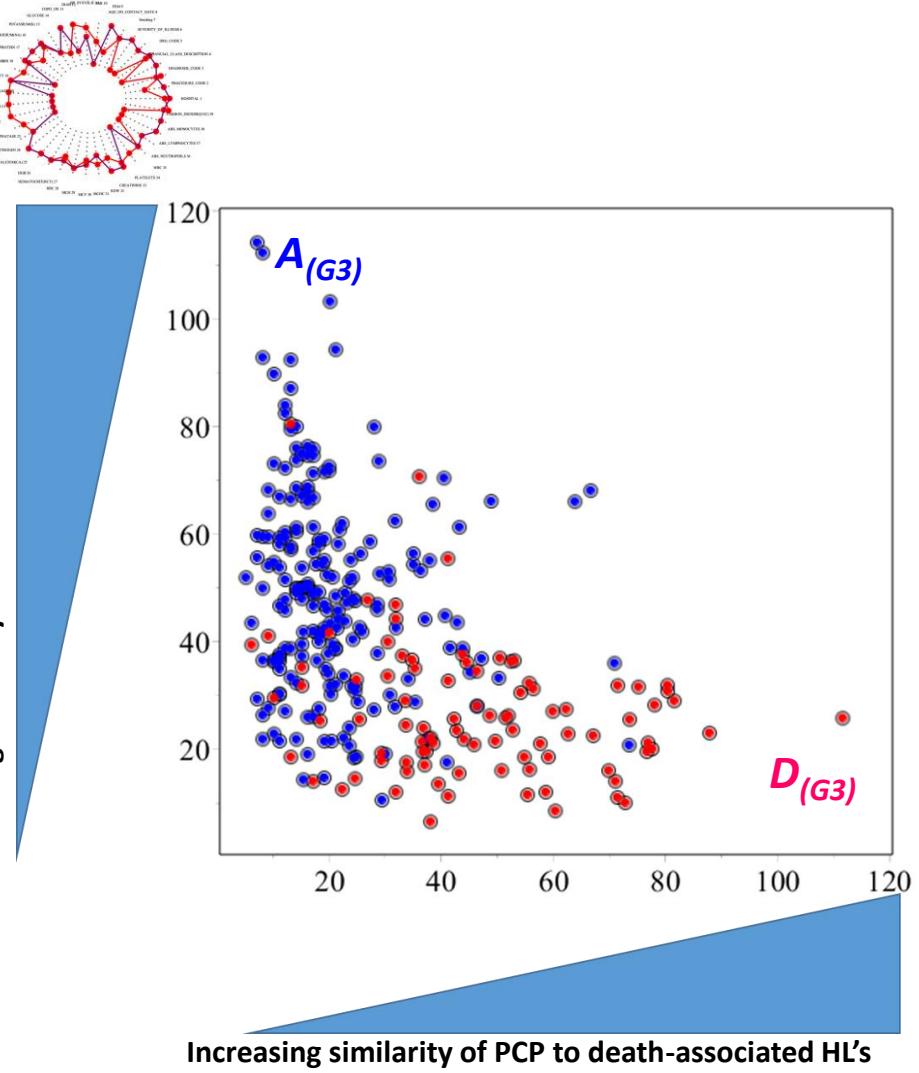
# Relationships of clinical parameter values, characteristic for alive outcome in G<sub>3</sub>

log(OR[D])

1	11	HOSPITAL PAS	--	PROCEDURE_CODE 3241 Thorac lobectomy lung	-0.46396 *****
2	11	HOSPITAL SHY	--	PROCEDURE_CODE 3241 Thorac lobectomy lung	-0.45268 *****
3	14	HOSPITAL PUH	--	PROCEDURE_CODE 3230 Thorac seg lung resect	-0.35002 *****
3	15	HOSPITAL PUH	--	PROCEDURE_CODE 3224 Perc abltn lung les/tiss	-0.35002 *****
11	21	PROCEDURE_CODE 3241 Thorac lobectomy lung	--	DIAGNOSIS_CODE 1623 Malignant neoplasm of upper lobe, bronchus or lung	-0.30959 *****
11	22	PROCEDURE_CODE 3241 Thorac lobectomy lung	--	DIAGNOSIS_CODE 1625 Malignant neoplasm of lower lobe, bronchus or lung	-0.46396 *****
21	Malignant neoplasm of upper lobe, bronchus or lung	DIAGNOSIS_CODE 1623	--	FINANCIAL_CLASS_DESCRIPCION ADVANTRA_MC_HMO	-0.42920 *****
22	Malignant neoplasm of lower lobe, bronchus or lung	DIAGNOSIS_CODE 1625	--	FINANCIAL_CLASS_DESCRIPCION N/A	-0.35002 *****
23	Malignant neoplasm of bronchus and lung, unspecified	DIAGNOSIS_CODE 1629	--	FINANCIAL_CLASS_DESCRIPCION N/A	-0.35002 *****
31	44	FINANCIAL_CLASS_DESCRIPCION MEDICARE_PART_A	--	DRG_CODE 165 MAJOR CHEST PROCEDURES W/O CC/MCC	-0.60529 *****
34	44	FINANCIAL_CLASS_DESCRIPCION B/C KEYSTONE	--	DRG_CODE 165 MAJOR CHEST PROCEDURES W/O CC/MCC	-0.69244 *****
36	41	FINANCIAL_CLASS_DESCRIPCION ADVANTRA_MC_HMO	--	DRG_CODE 164 MAJOR CHEST PROCEDURES W CC	-0.42920 *****
42	51	MAJOR CHEST PROCEDURES W MCC DRG_CODE 163	--	SEVERITY_OF_ILLNESS 2	-0.49614 *****
44	51	MAJOR CHEST PROCEDURES W/O CC/MCC DRG_CODE 165	--	SEVERITY_OF_ILLNESS 2	-0.60529 *****
44	54	MAJOR CHEST PROCEDURES W/O CC/MCC DRG_CODE 165	--	SEVERITY_OF_ILLNESS 1	-0.49614 *****
51	61	SEVERITY_OF_ILLNESS 2	--	Smoking Quit	-0.77326 *****
51	63	SEVERITY_OF_ILLNESS 2	--	Smoking Never	-0.39141 *****
54	61	SEVERITY_OF_ILLNESS 1	--	Smoking Quit	-0.55414 *****
61	72	Smoking Quit	--	AGE_ON_CONTACT_DATE 48-59	-0.73023 *****
61	74	Smoking Quit	--	AGE_ON_CONTACT_DATE 69-80	-0.40437 *****
63	73	Smoking Never	--	AGE_ON_CONTACT_DATE 59-69	-0.46396 *****
72	82	AGE_ON_CONTACT_DATE 48-59	--	FEMALE Female	-0.44693 *****
74	82	AGE_ON_CONTACT_DATE 69-80	--	FEMALE Female	-0.34124 *****
75	82	AGE_ON_CONTACT_DATE >80	--	FEMALE Female	-0.65105 *****
82	93	FEMALE Female	--	BMI 25-31	-0.47223 *****
82	94	FEMALE Female	--	BMI 31-38	-0.35002 *****
82	95	FEMALE Female	--	BMI >38	-0.35002 *****
93	101	BMI 25-31	--	BP_SYSTOLIC <102	-0.42920 *****
93	103	BMI 25-31	--	BP_SYSTOLIC 114-127	-0.30426 *****
93	106	BMI 25-31	--	BP_SYSTOLIC 148-160	-0.35002 *****
94	106	BMI 31-38	--	BP_SYSTOLIC 148-160	-0.49614 *****
135	142	GLUCOSE 124-144	--	POTASSIUM(K) 3.6-4.6	-0.46396 *****
160	170	SODIUM(NA) N/A	--	TOTAL PROTEIN N/A	-0.42920 *****
64	172	TOTAL PROTEIN 7.8-8.2	--	PROTHROMBIN 10-16	-0.60529 *****
171	181	PROTHROMBIN <10	--	ACTIVATED_PTT <34	-0.35002 *****
172	190	PROTHROMBIN 10-16	--	ACTIVATED_PTT N/A	-0.39923 *****
191	202	ASPARTATE_AMINO_(AS) <14	--	TOTAL_BILIRUBIN 0.25-0.45	-0.52611 *****
92	204	ASPARTATE_AMINO_(AS) 14-21	--	TOTAL_BILIRUBIN >0.75	-0.65105 *****
221	231	ALKALINE_PHOSPHATASE <65	--	UREA_NITROGEN <10	-0.30426 *****
221	240	ALKALINE_PHOSPHATASE <65	--	UREA_NITROGEN N/A	-0.35002 *****
222	234	ALKALINE_PHOSPHATASE 65-110	--	UREA_NITROGEN 22.5-33	-0.39141 *****
230	232	ALKALINE_PHOSPHATASE N/A	--	UREA_NITROGEN 10-15.5	-0.30426 *****
241	253	CALCIUM(CA) <8.5	--	HGB 11-13.5	-0.35002 *****
243	254	CALCIUM(CA) >10	--	HGB 13.5-15	-0.42920 *****
92	304	MCV 81-88	--	MCHC 34.2-35	-0.60529 *****
304	311	MCHC 34.2-35	--	RDW <13	-0.35002 *****
321	340	CREATININE <1.3	--	PLATELETS N/A	-0.49614 *****
331	341	PLATELETS <140	--	WBC <5.2	-0.35002 *****
332	344	PLATELETS 140-275	--	WBC 11-14	-0.60529 *****
341	360	WBC <5.2	--	ABS_NEUTROPHILS N/A	-0.55414 *****
344	354	WBC 11-14	--	ABS_NEUTROPHILS 6.5-10	-0.35002 *****
354	363	ABS_NEUTROPHILS 6.5-10	--	ABS_LYMPHOCYTES 2-3	-0.35002 *****
355	364	ABS_NEUTROPHILS >10	--	ABS_LYMPHOCYTES >3	-0.32005 *****
364	373	ABS_LYMPHOCYTES >3	--	ABS_MONOCYTES >10	-0.32005 *****
372	390	ABS_MONOCYTES 0.3-10	--	CARBON_DIOXIDE(CO2) N/A	-0.35002 *****
382	2	CARBON_DIOXIDE(CO2) 24-27	--	HOSPITAL_SHY	-0.42920 *****
383	8	CARBON_DIOXIDE(CO2) 27-32	--	HOSPITAL_HRY	-0.35002 *****

Model and algorithm, specific for G<sub>3</sub> patients, identifying odds for death after their lung cancer surgery

Increasing similarity of PCP to alive-associated HL's



1. Compare adjacency matrices of PCp to stored matrices, representing G<sub>3</sub>-specific informative HL's and edge weights and compute x-y similarity coordinates
2. Identify where in red/blue (death/alive) boundaries PCp localizes – output odds for adverse event for the patient
3. Output the clinical features characterizing the death/alive section identified for the patient, with highlighted ones that match patient's PCp

