Outcomes associated with practice patterns in peritoneal dialysis catheter cares in France:

Data from the catheter section of the French Language Peritoneal Dialysis Registry

Nephrology, Dialysis and Transplantation department
Caen, Normandy, FRANCE

self-care dialysis symposium
Brussels – 6 & 7 June, 2018

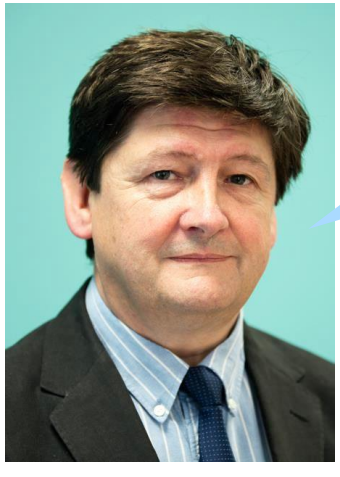
Antoine.lanot@gadz.org
@AntLanot
#NDTCaen

Peritoneal dialysis and center effect

Are Peritoneal Dialysis Center Characteristics a Modifiable Risk Factor to Improve Peritoneal Dialysis Outcomes?

Mark Lambie and Simon J. Davies

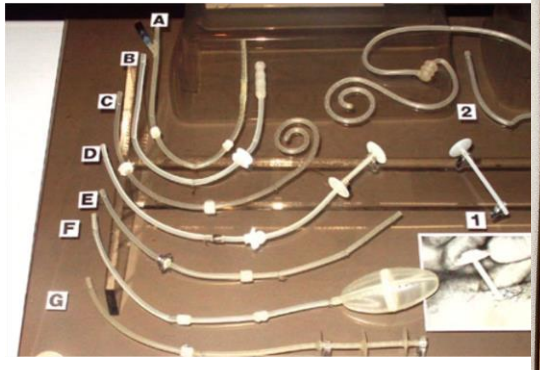
Clin J Am Soc Nephrol 12: 1032–1034, 2017. doi: https://doi.org/10.2215/CJN.05260517

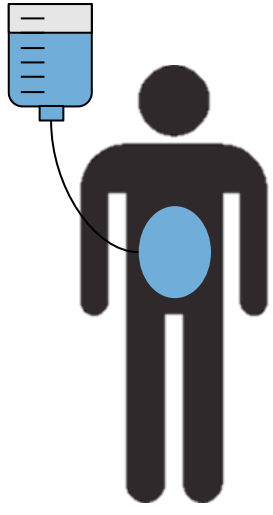


*If we are to improve outcomes in PD, then **technique failure must be tackled**, and this will require both the **identification of the best practices** and solutions that **ameliorate cause-specific technique failure** and the **uniform implementation of these practices**.*

Lambie M, Davies SJ. Are Peritoneal Dialysis centers characteristics a modifiable risk factor to improve peritoneal dialysis outcomes? Clin J Am Soc Nephrol 2017;12:1032-1034

Practices in peritoneal dialysis





Catheter

1 or 2 cuff(s)
Weighted or not
Straight or coiled
Straight or swann neck
Exit-site location

Dialysis modality

Assisted or self PD
APD / CAPD
Type of dialysate

Aims of the study

Identify clusters of centers with similar practices

Estimate whether these clusters are associated with differences in outcomes

Events of interest

Primary: **Technique failure (= transfer to HD)**

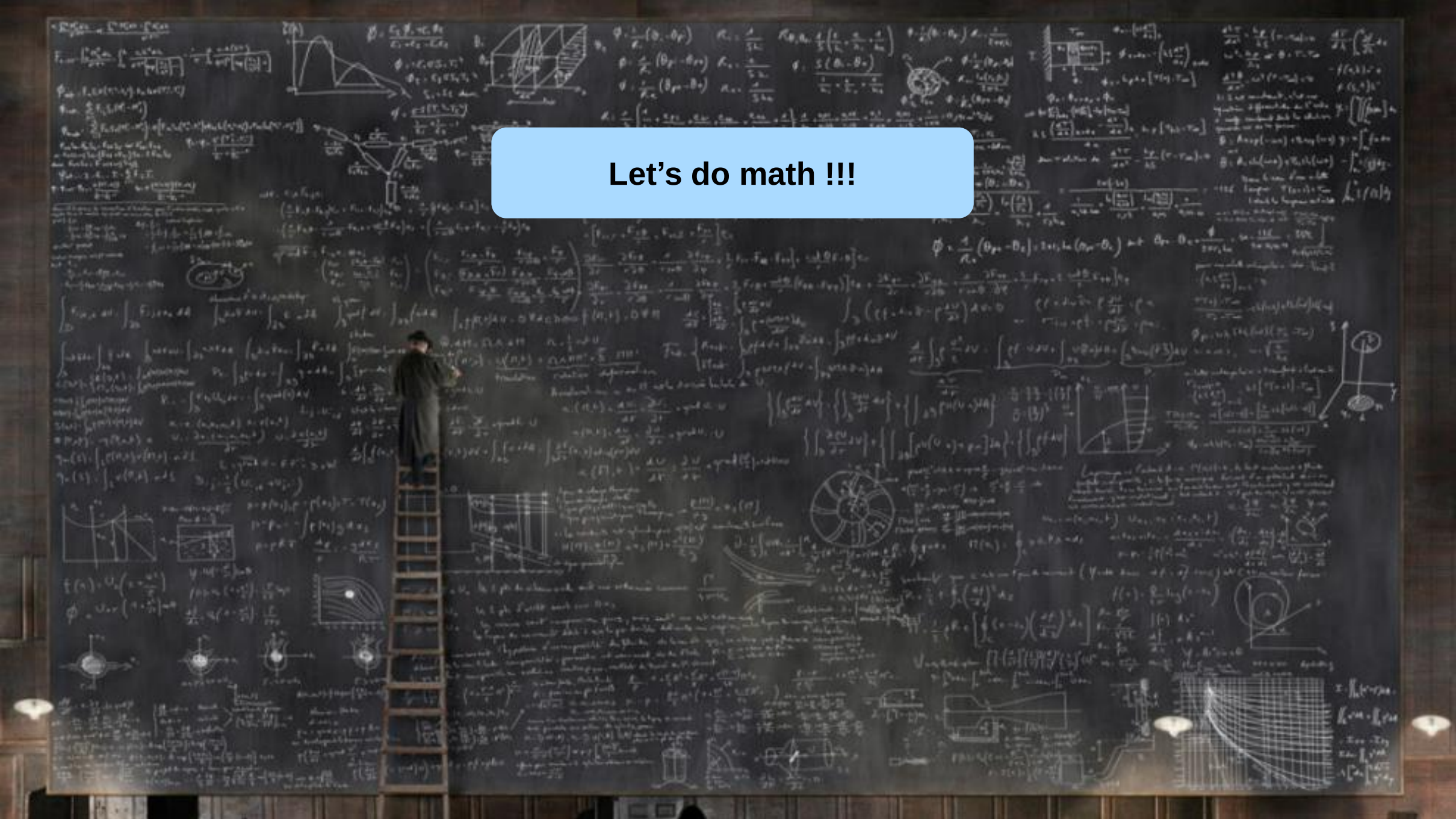
Survival analysis

Cox model : Cause specific Hazard Ratio (cs-HR)
Fine & Gray model : Sub distribution Hazard Ratio (sd-HR)

Hierarchical analysis

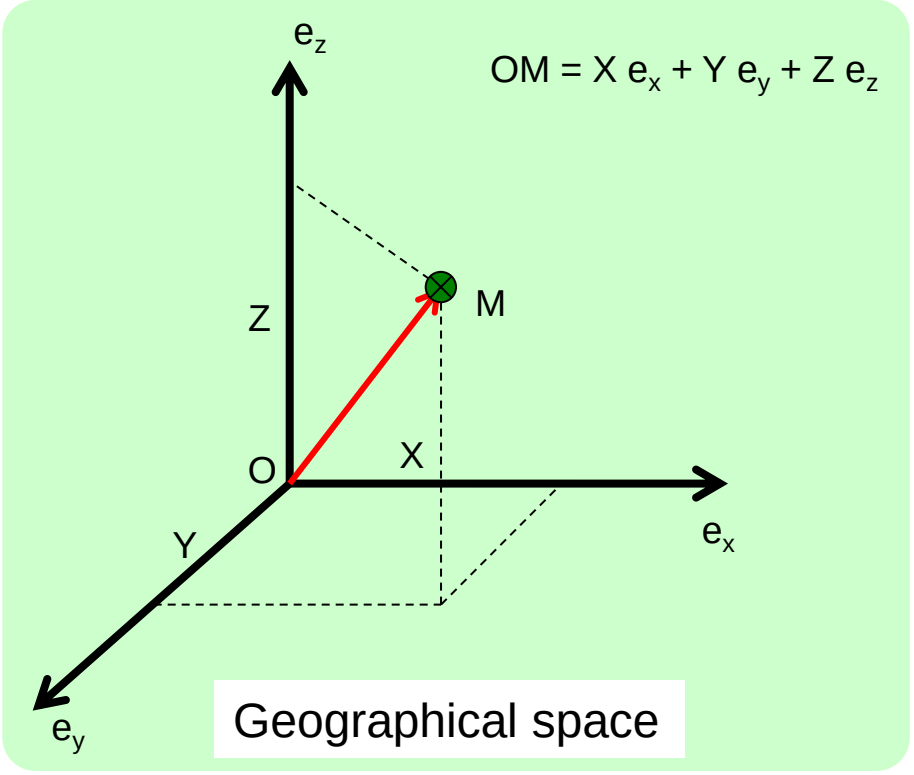
Multi level Cox model with center as random effect

Methods


Let’s do math !!!

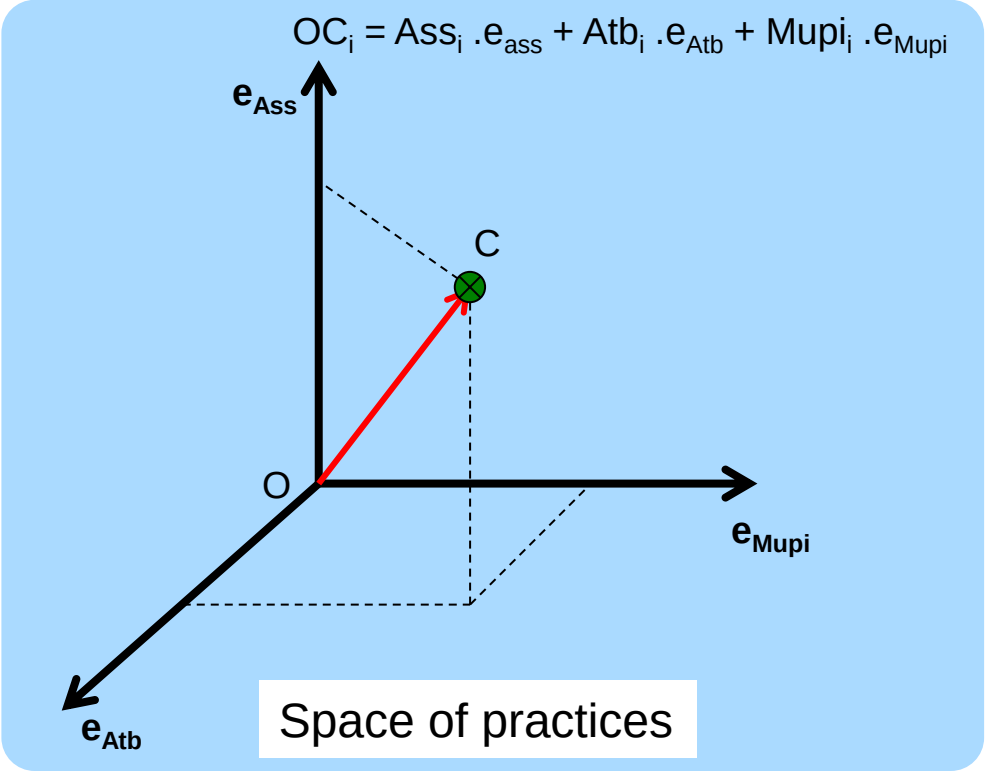
Let’s move in a virtual space of practices ?

How to locate a point in the geographical space ?



We can build a space where dimensions are the practices !

There can be more than 3 dimensions !!!



How to locate a PD-unit ?

Caen (Normandy, France) :

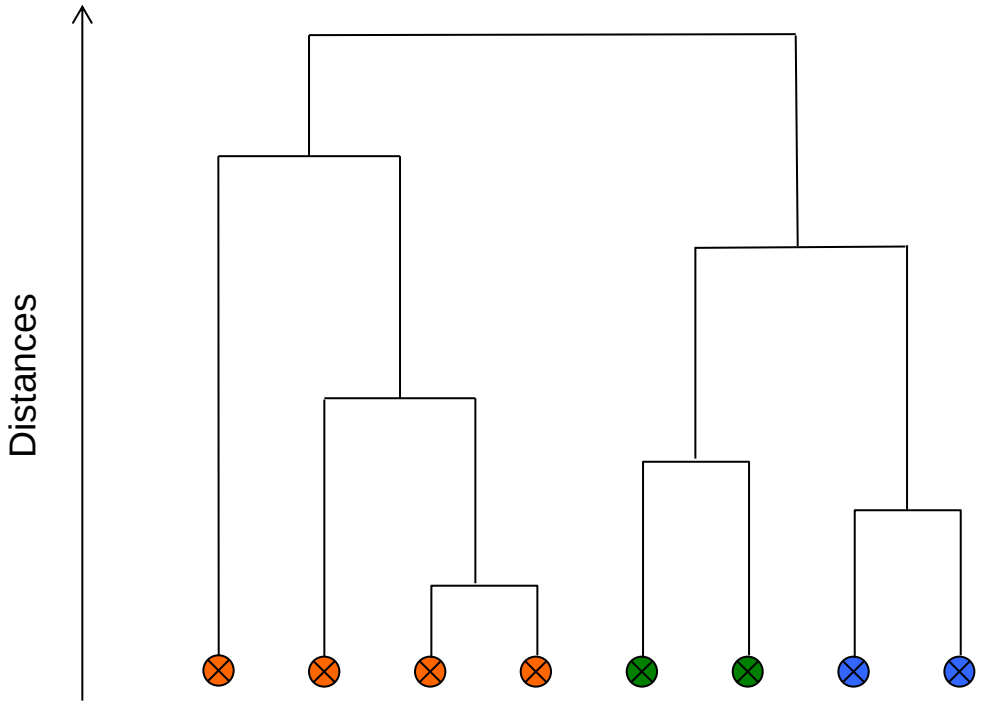
Latitude:	49.18°
Longitude:	-0.35°
Altitude:	3 m

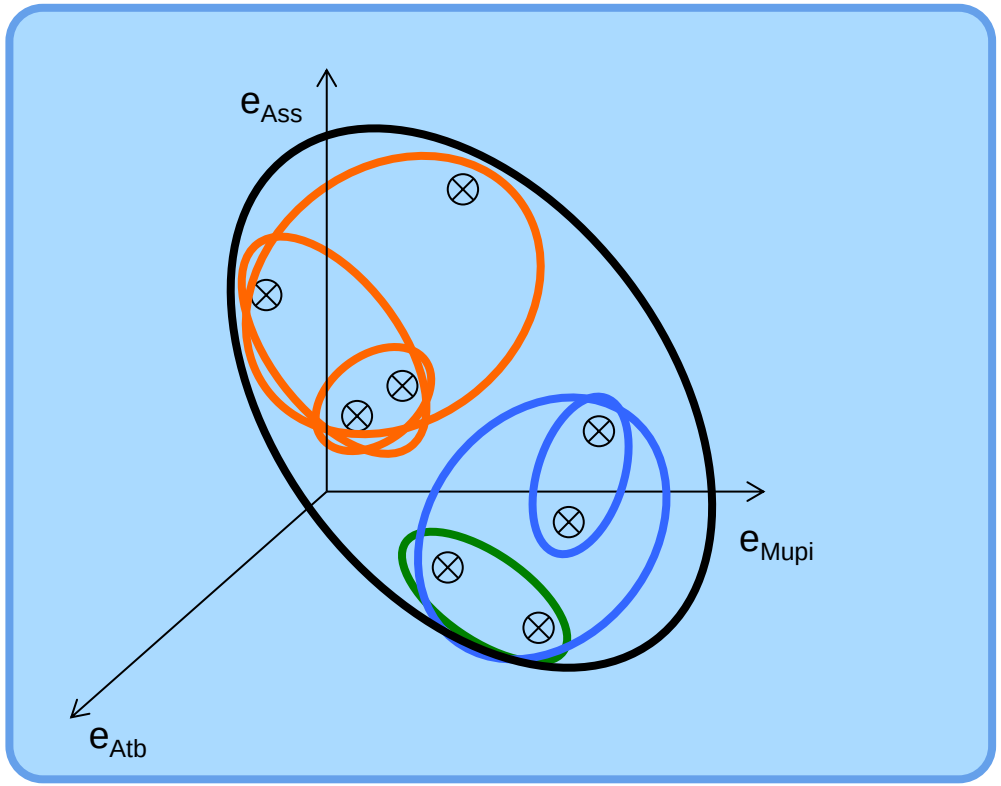
PD modality :	0	(No standard)
Mupirocin :	1	(Yes)
Prophylactic Atb :	2	(Cefazolin)
Catheter type :	3	(Straight – coiled)
Surgeon :	2	(specialized)
…	…	…

Hierarchical ascending analysis: building a dendrogram and the clusters of centers

- Distances between each centers are computed

- The closest centers are gathered to form a cluster, and then the closest clusters are gathered to form another cluster.





Results

Flowchart

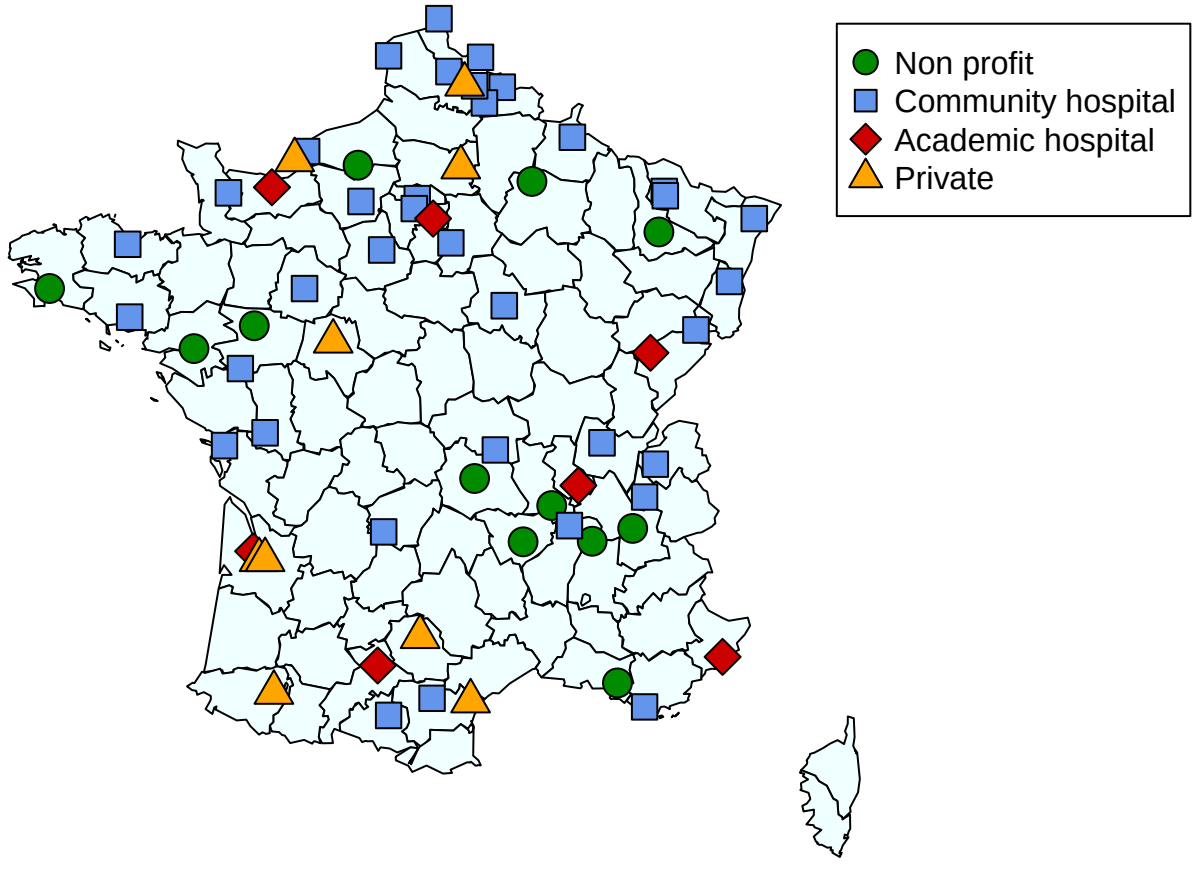
87 French PD-units contributing to the catheter modulus of the RDPLF.
From 2012 to 2016

2795 catheters in
3602 incidents PD patients

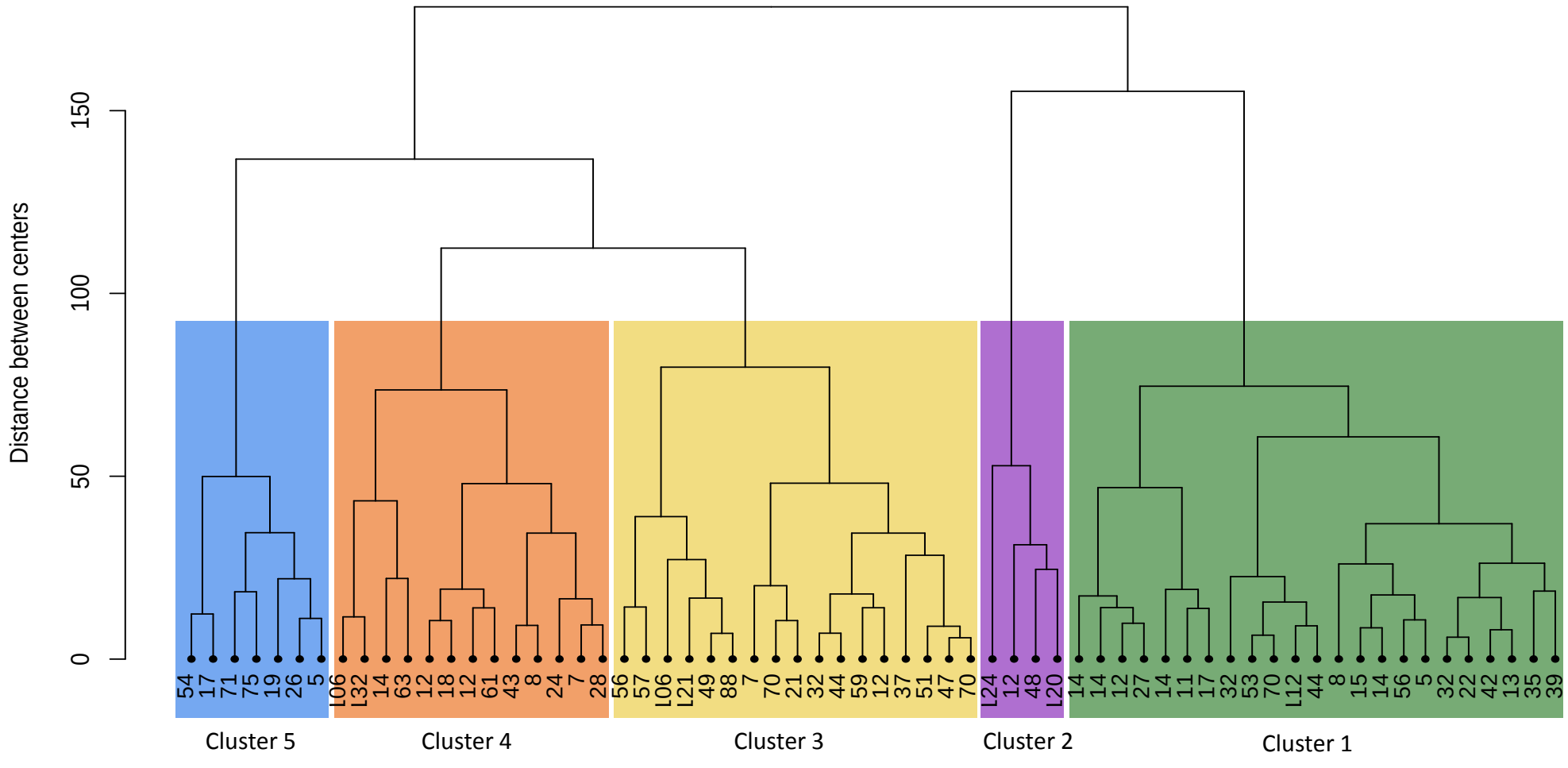
23 PD-units with less than 5 catheters registered

68 (2.5%) patients with missing data

2727 catheters in
2540 incidents PD patients from
64 PD-units

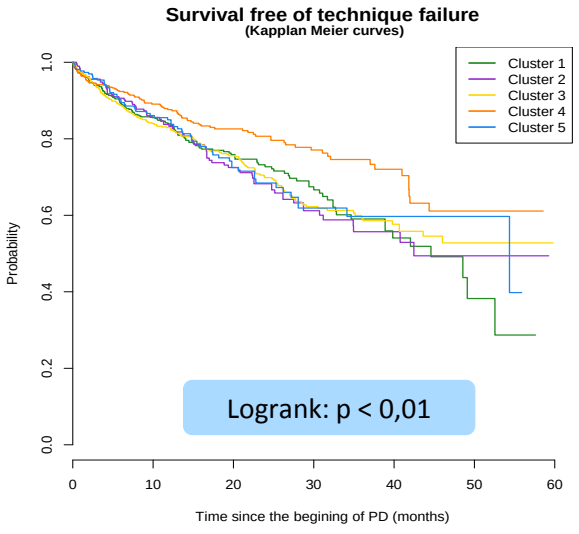


Clusters of centres according to their practices

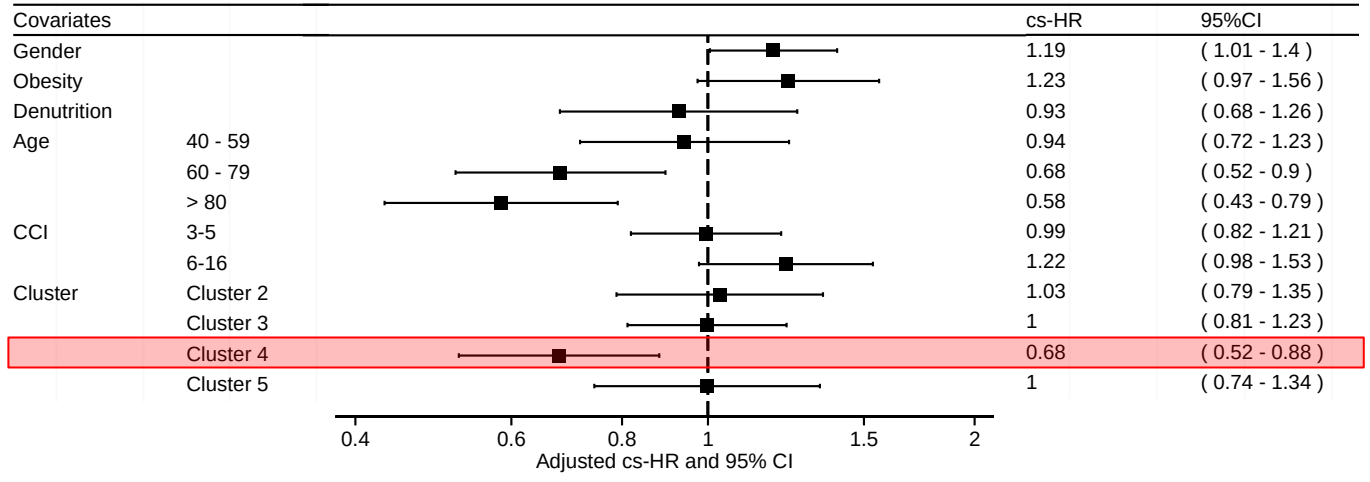


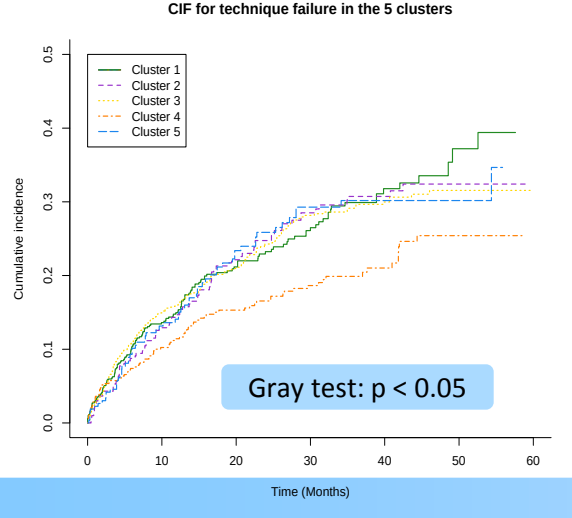
Outcomes associated with the clusters of practices

Primary outcome : **Technique failure**

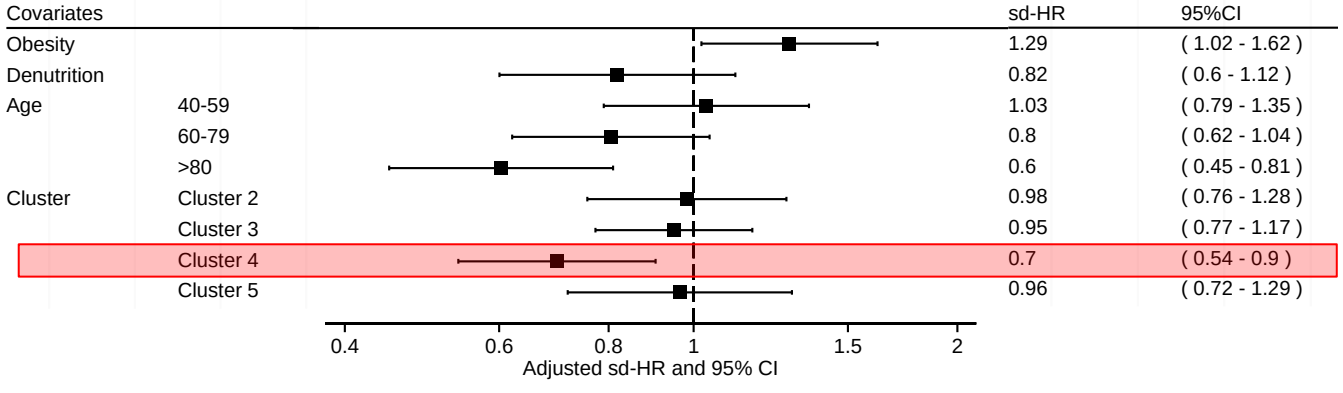


Cox

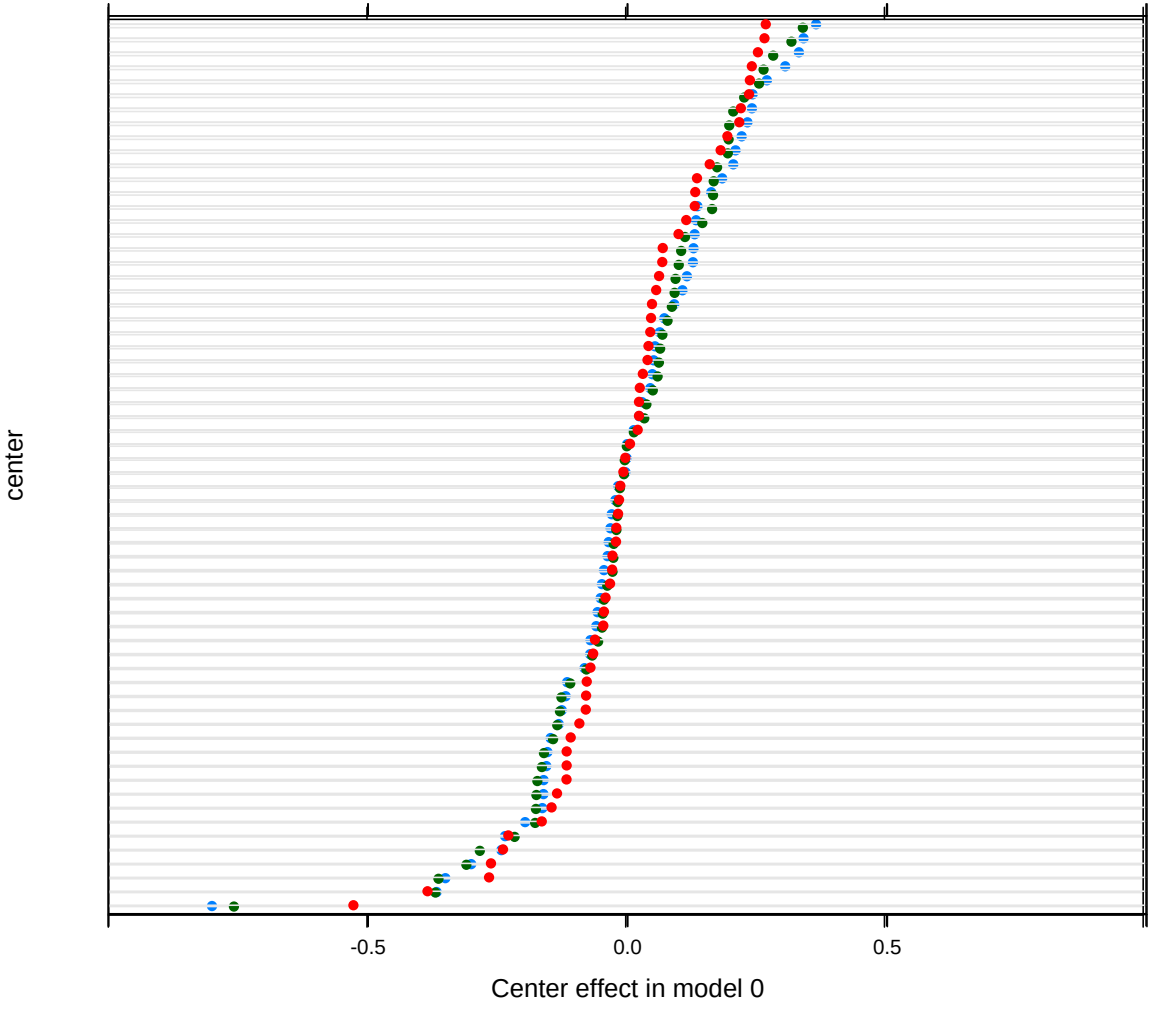




Fine & Gray

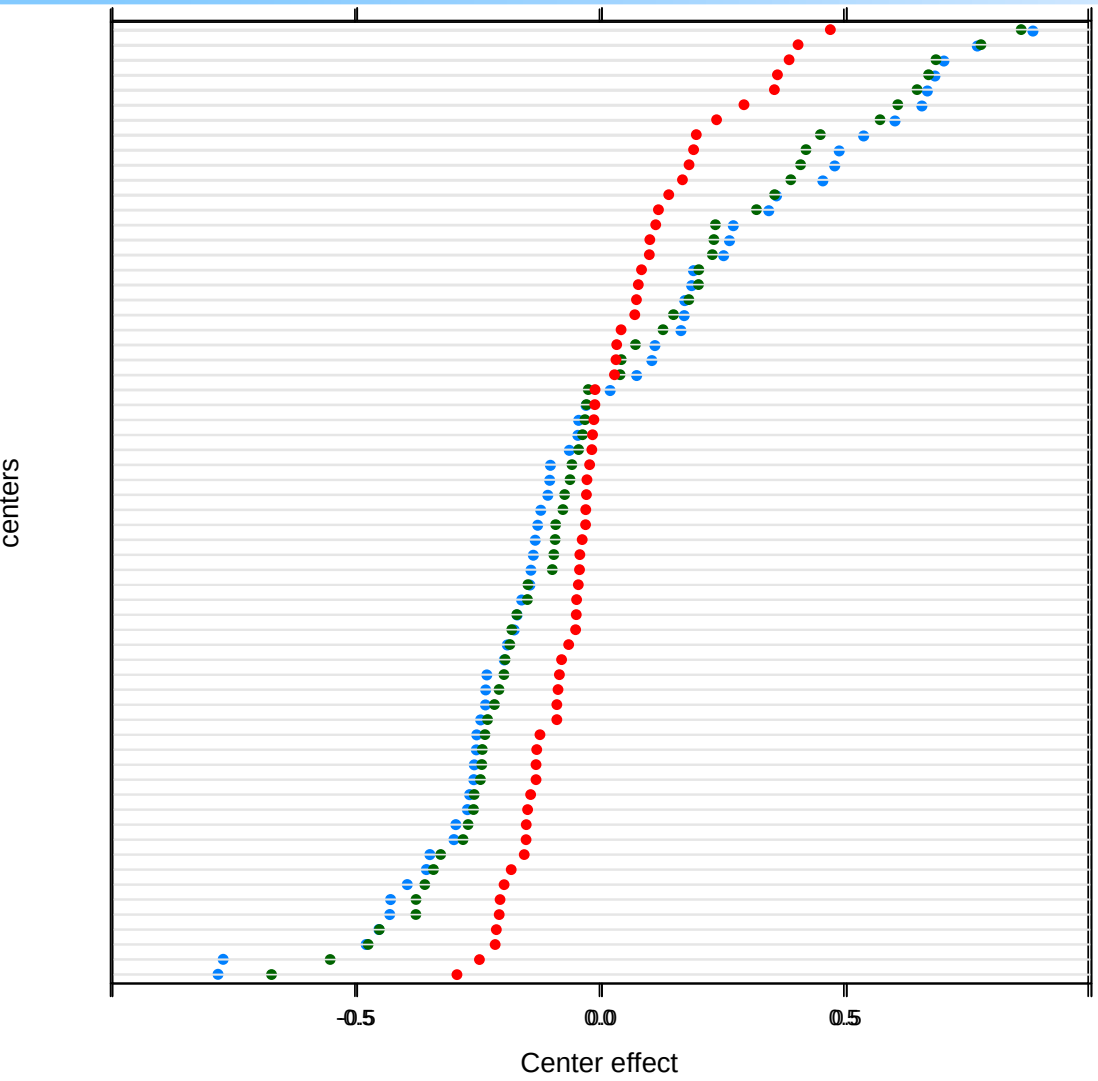


Center effect and technique failure



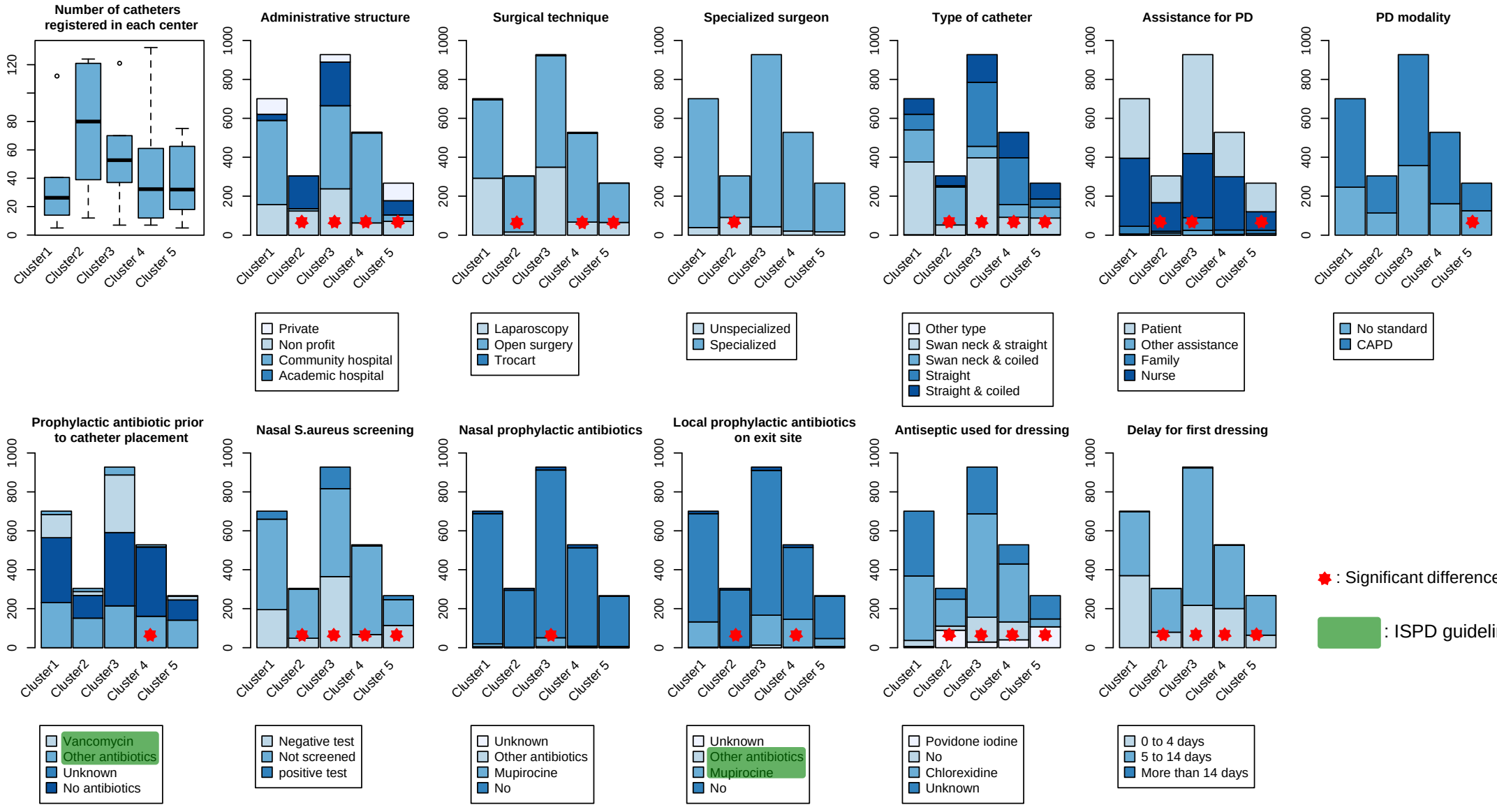
		Patient level	Center level
	Model 0 Empty model	Model 1 cs-HR (95%CI)	Model 2 cs-HR (95%CI)
Random effect			
Standard error (variance)	0.31 (0.1)	0.3 (0.09)	0.27 (0.07)
Standard error of the variance of the random effect	0-0.45	0-0.45	0-0.86
p-value (ANOVA)	-	2.99.10-3*	2.07.10-3*
PCV (%)	-	5.33	25.9

Center effect and technique failure due to peritonitis



	Patient level	Center level
	Model 0 Empty model	Model 1 cs-HR (95%CI)	Model 2 cs-HR (95%CI)
Random effect			
Standard error (variance)	0.69 (0.47)	0.65 (0.42)	0.43 (0.18)
Standard error of the variance of the random effect			
p-value (ANOVA)	-	0.11	3.97.10-2*
PCV (%)	-	10.36	61.4

Distribution of practices among the 5 clusters of centers



: Significant difference with cluster 1

: ISPD guidelines

What's in cluster n° 4 (protective against technique failure)?

Greater proportion of:

- Community hospitals
- Open surgery catheter placements
- Coiled catheters
- Use of local prophylactic antibiotics on exit site
- Antiseptic use for dressing
- First dressing after catheter placement made between 5 and 14 days

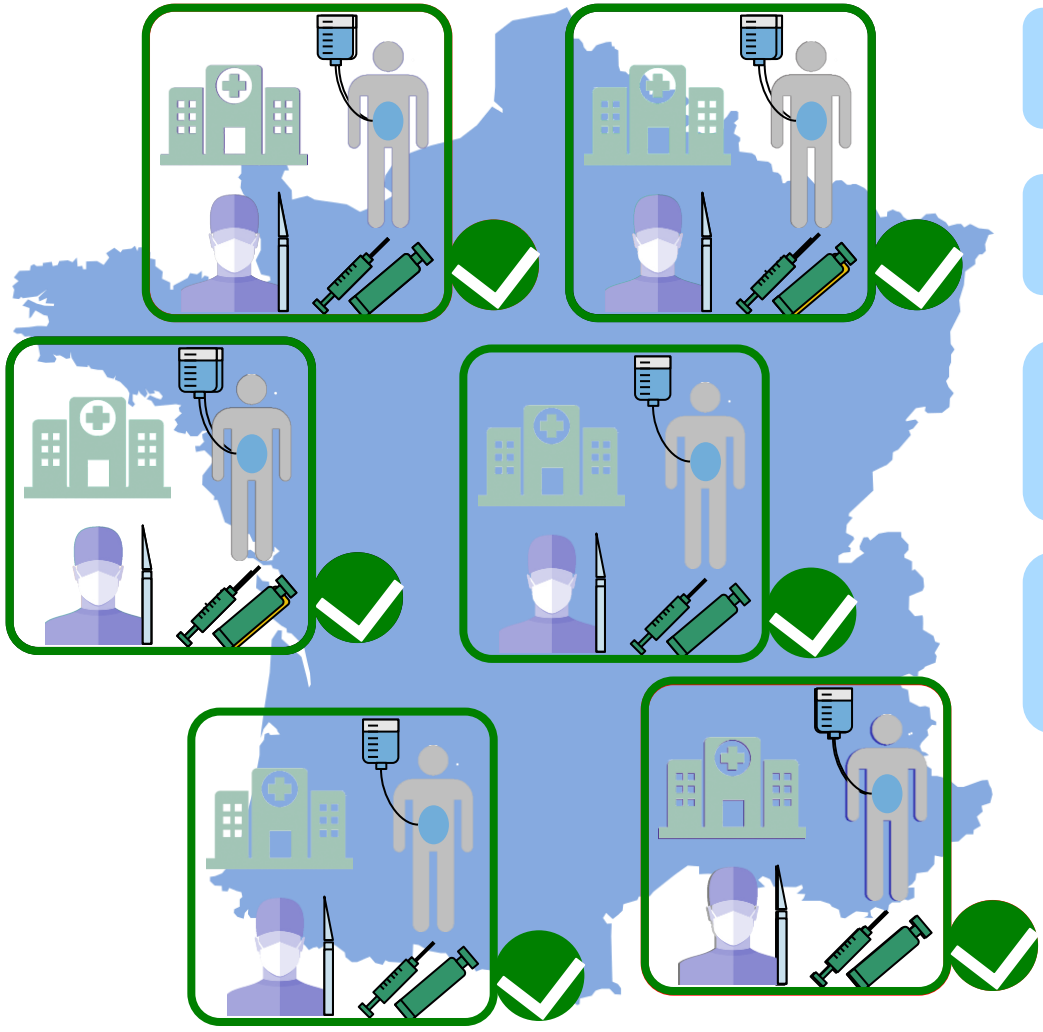
Fewer:

- Use of prophylactic antibiotic prior to catheter placement (?)
- Screening for nasal S. aureus presence

No difference on :

- Use of assistance
- PD modality
- Specialized surgeon for catheter placement

Conclusion



Practices in peritoneal dialysis cares are not uniform in France

Clusters of centers with similar practices can be identified

These patterns of practices are associated with different risks of technique failure

=> identifying centers where poor outcomes would be more prone to improve by evaluating and changing practices

Thank you for your attention

Special thank goes to the nurses, nephrologists and patients from units providing data to the RDPLF

Antoine.lanot@gadz.org
@AntLanot
#NDTCaen

Peritoneal dialysis and center effect

Peritoneal Dialysis International Peritoneal Dialysis International

ESTIMATION OF THE CENTER EFFECT ON EARLY PERITONEAL DIALYSIS FAILURE: A MULTILEVEL MODELLING APPROACH

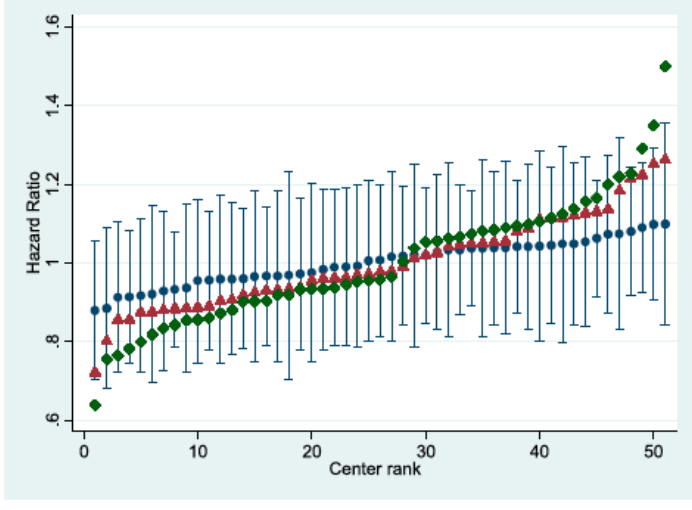
Sonia Guillouët,[1] Ghislaine Veniez,[2] Christian Verger,[2] Clémence Béchade,[1] Maxence Ficheux,[1] Juliette Uteza,[3] and Thierry Lobbedez[1,2]

- ***Conclusion:*** **Center effect on early PD failure is significant. Center experience is associated with a lower risk of transfer to hemodialysis.**

Center effect accounted for 52 % of
The disparities between centers

Multicenter Registry Analysis of Center Characteristics Associated with Technique Failure in Patients on Incident Peritoneal Dialysis

Htay Htay, Yeoungjee Cho, Elaine M. Pascoe, Darsy Darssan, Annie-Claire Nadeau-Fredette, Carmel Hawley, Philip A. Clayton, Monique Borlace, Sunil V. Badve, Kamal Sud, Neil Boudville, Stephen P. McDonald, and David W. Johnson



Sevenfold variation in the technique failure risk
53% of HR due to center-level characteristics

Guillouet S et al. Estimation of the center effect on early peritoneal dialysis failure: a multilevel modelling approach. Perit Dial Int 2016; 36 : 519–525
Htay H et al. Multicenter registry analysis of center characteristics associated with technique failure in patients on incident peritoneal dialysis. Clin J Am Soc Nephrol 2017 ;12 : 1090-1099

Covariates included in the analysis

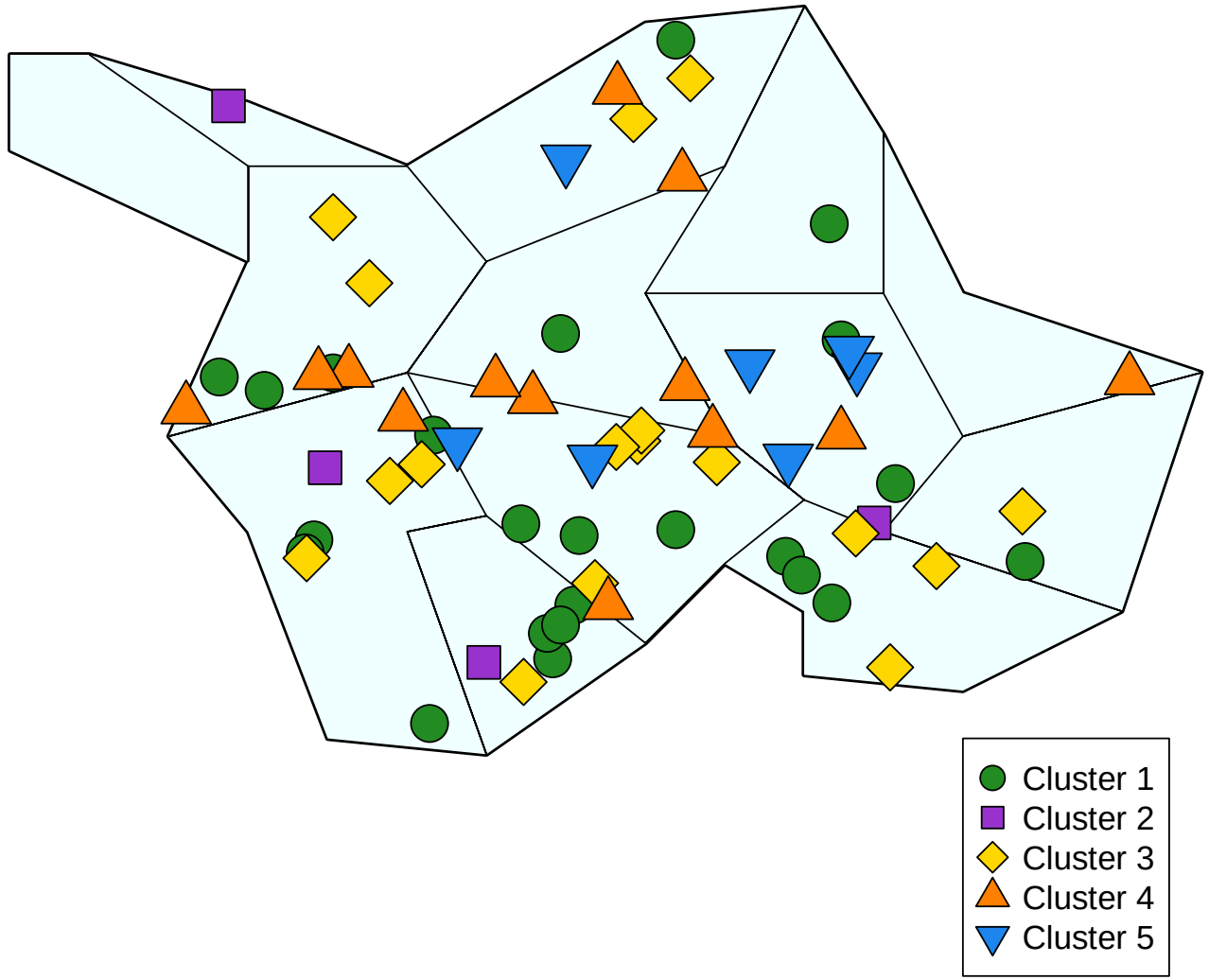
Patient level characteristics

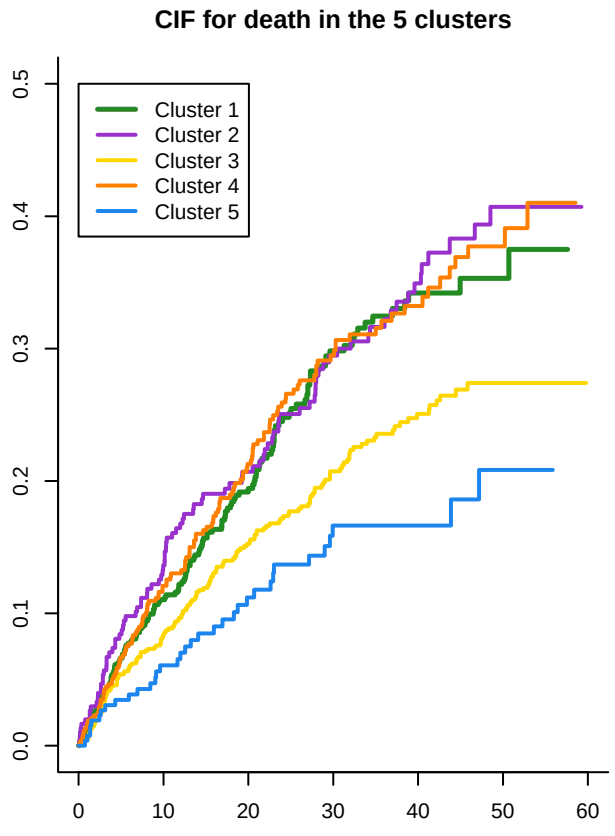
Sex
Age
Obesity
Malnutrition
Diabetes
Nephropathy
Charlson Comorbidity Index

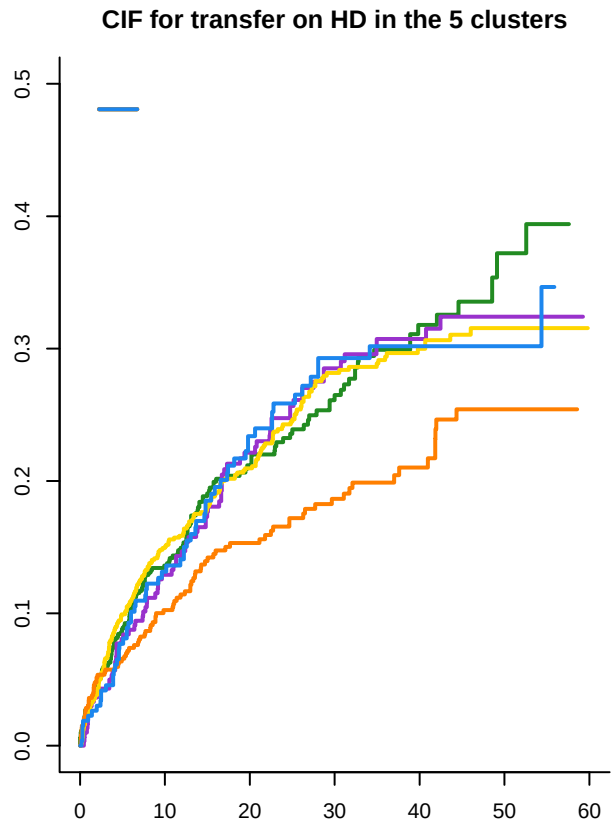
Center level characteristics

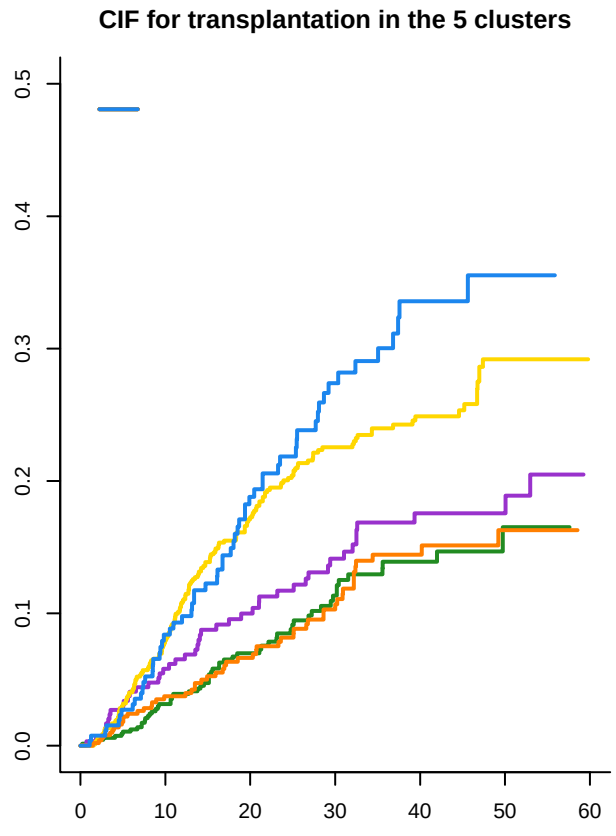
Type of PD catheter
Surgery technique
Administration of antibiotics prophylaxis prior to catheter insertion
Specialized surgeon for the catheter placement
Screening for nasal carriage of *S. aureus*
Use of prophylactic nasal anti-staphylococcal cream
Use of local anti-staphylococcal cream or ointment on the catheter emerging site
Delay after catheter insertion for first dressing
Type of antiseptic for dressing refection
PD modality 3 months after dialysis initiation (APD or CAPD)
Assistance for PD
Type of structure in which the patient was treated
Center size (number of catheters registered)

Centers according to their belonging to a cluster of practice

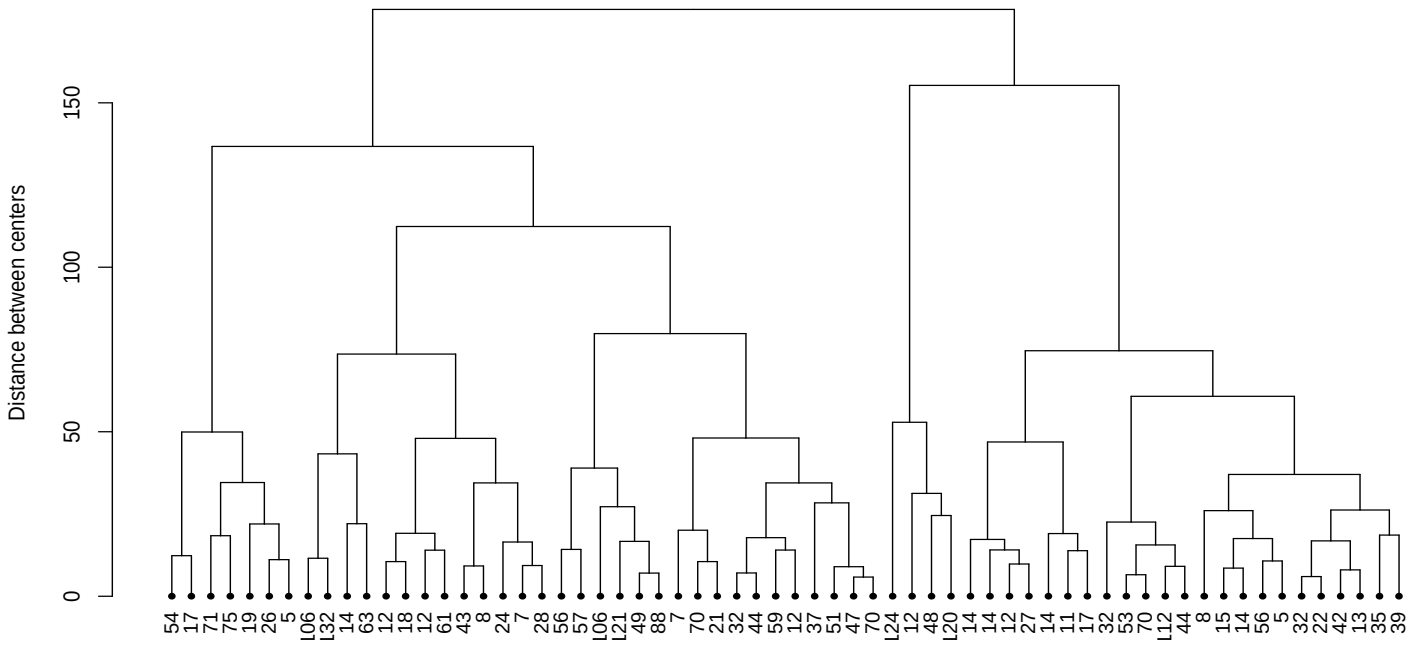


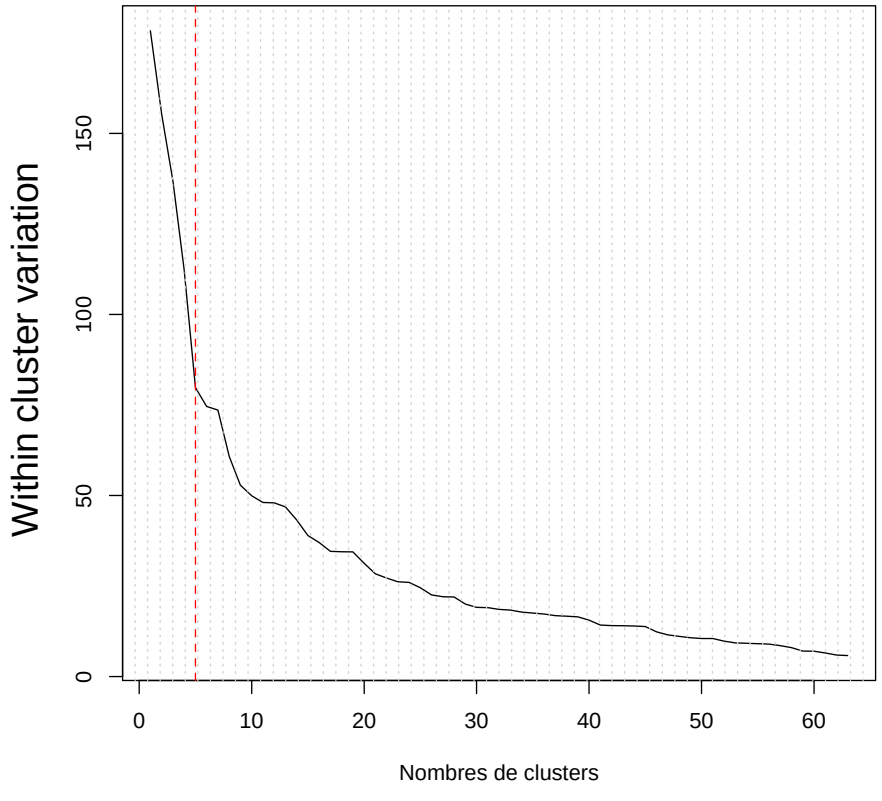

CIF for death in the 5 clusters
Cluster 1
Cluster 2
Cluster 3
Cluster 4
Cluster 5
0.0
0.1
0.2
0.3
0.4
0.5
0
10
20
30
40
50
60


CIF for transfer on HD in the 5 clusters
0.0
0.1
0.2
0.3
0.4
0.5
0
10
20
30
40
50
60

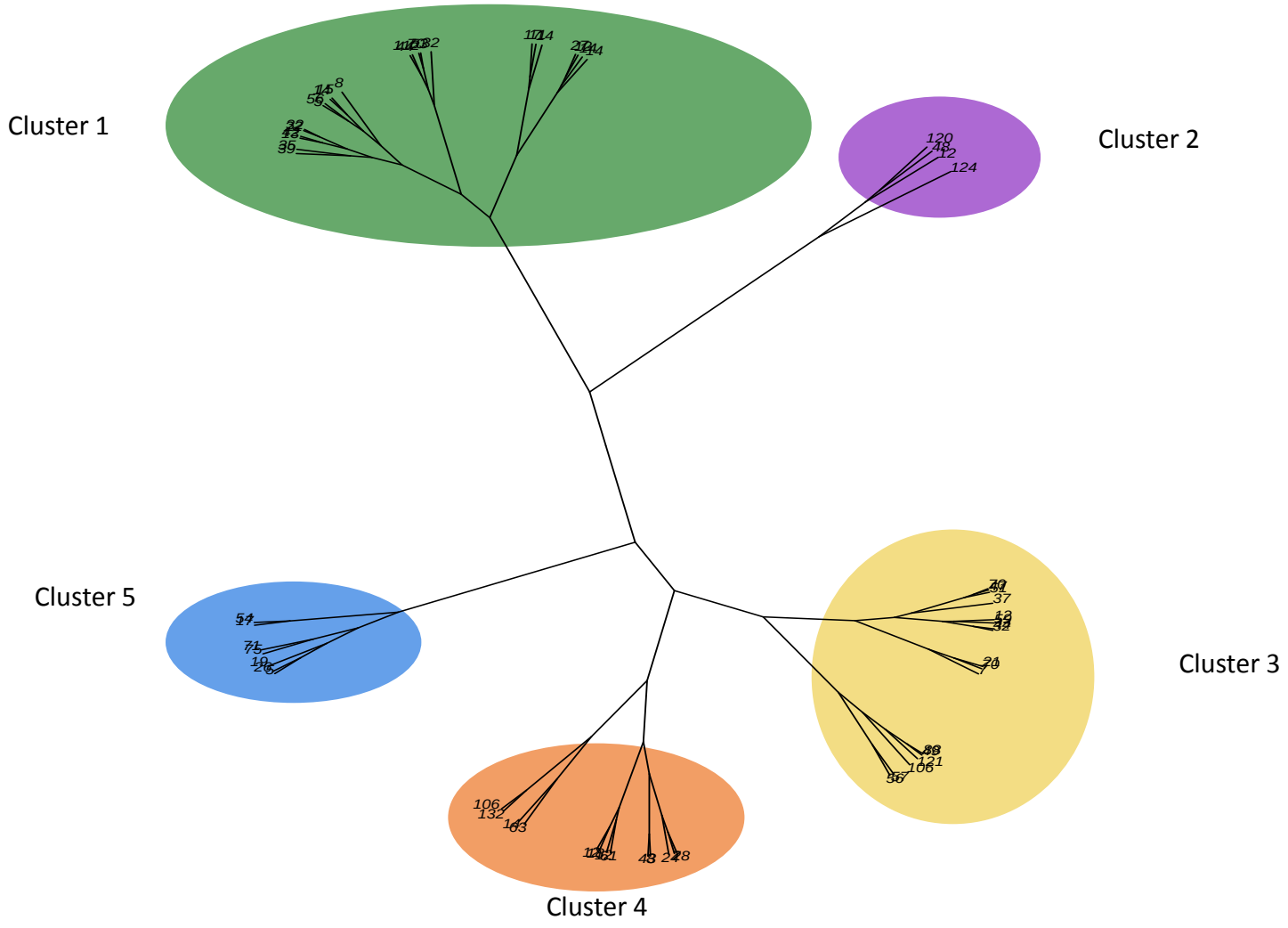

CIF for transplantation in the 5 clusters
0.0
0.1
0.2
0.3
0.4
0.5
0
10
20
30
40
50
60

Choosing the right number of clusters

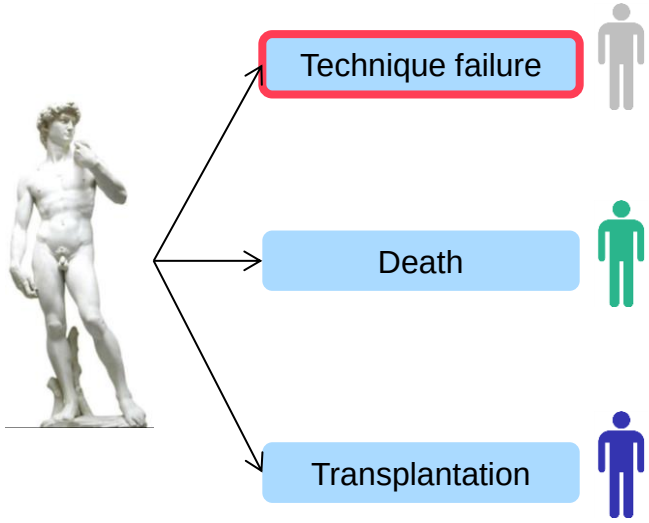


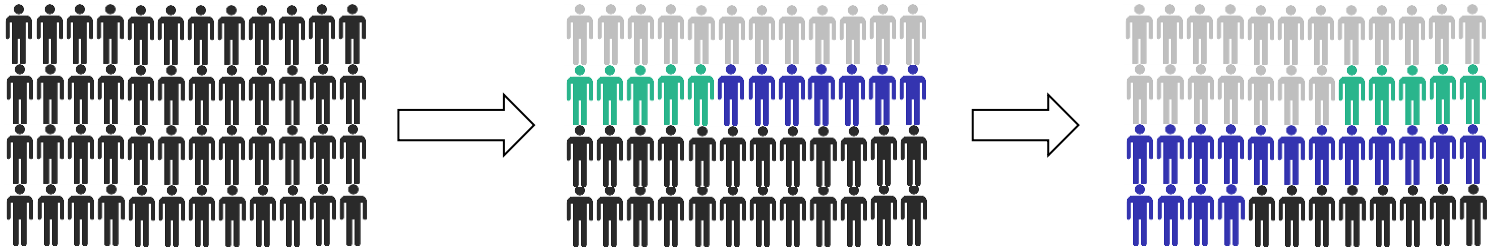


Phylogenic dendrogram



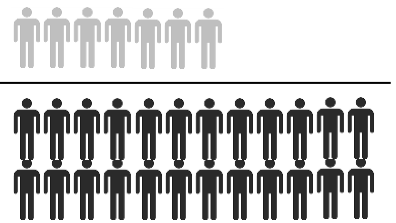
Survival analysis with competing risks : Fine & Gray model





Hazard for technique failure

Cox

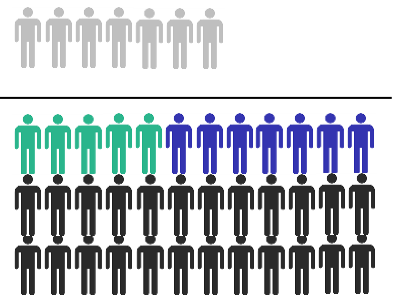
$h(t) =$ 

Competing events censored

Cs-HR

=> for studying the etiology of the disease

Fine & Gray

$h(t) =$ 

Competing events uncensored

sd-HR

=> predicting an individual's risk

Lau B et al. Competing risk regression models for epidemiologic data. Am J Epidemiol 2009;170:244-256

Cox model vs Fine & Gray model

Cox model
Cs-HR => for studying the **<u>etiology of the disease</u>**

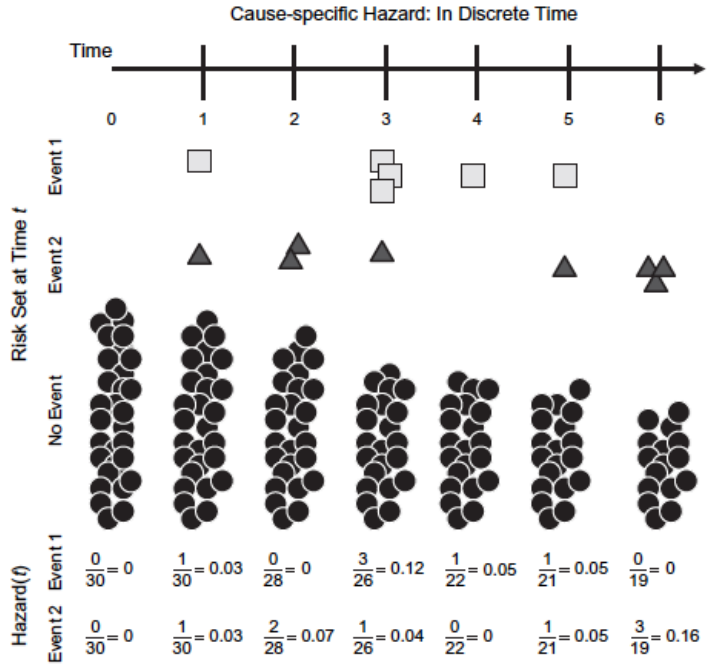


Figure 1. Cause-specific hazard schematic. The risk set starts with 30 individuals (solid circles). Over time, individuals have either event 1 (square) or event 2 (triangle). As individuals have either event, they are removed from the remaining risk sets. The calculation for the cause-specific hazard is given at the bottom of the figure.

Fine & Gray
sd-HR => **<u>predicting an individual's risk</u>**

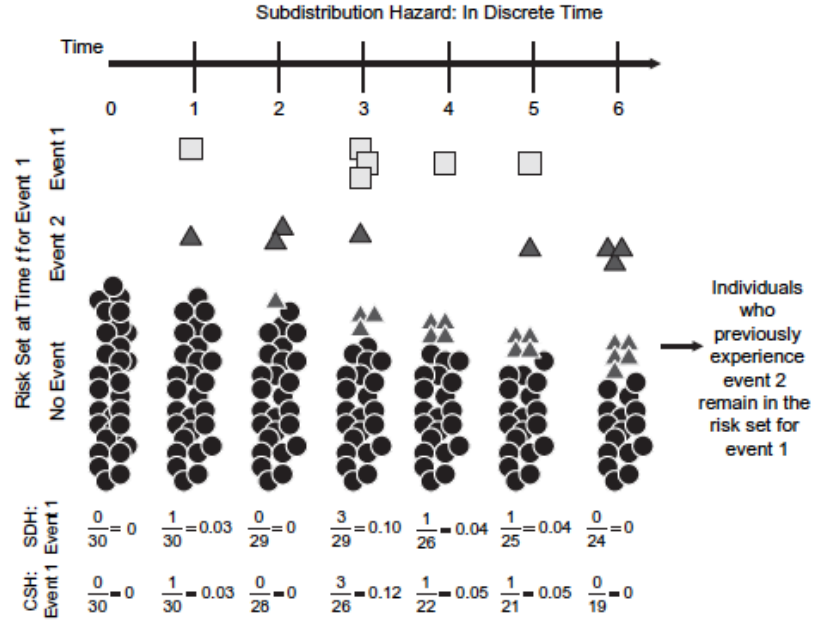


Figure 2. Subdistribution hazard schematic. The risk set starts with 30 individuals (solid circles). Over time, individuals have either event 1 (square) or event 2 (triangle). As individuals have the competing event (event 2, triangle), they are maintained in the risk set as triangles. Thus, over time, a greater proportion of the risk set becomes full of triangles that are individuals who have had the competing event prior to that time. The subdistribution hazard (SDH) for event 1 is given near the bottom of the figure along with the cause-specific hazard (CSH) for event 1 for comparison. Note that, because individuals are maintained in the risk set, the SDH tends to be lower than the CSH.

Lau B et al. Competing risk regression models for epidemiologic data. Am J Epidemiol 2009;170:244-256

Hierarchical analysis: Cox model with Mixed effect

Cluster **Level 2: Center**

Sex
Age
Obesity
Malnutrition
Diabetes
Nephropathy
Charlson Comorbidity Index

Level 1: individual

Level 0: Empty

$$h(t) = \lambda_0 . e^{bX+bZ}$$

Fixed effect

Random effect

$$cs - HR = e^{b(X_i - X_j)+b(Z_i - Z_j)}$$

ISPD guidelines

Peritoneal Dialysis International

CATHETER PLACEMENT

- We recommend that **systemic prophylactic antibiotic** be administered immediatly prior to catheter insertion **(1A)**.

EXIT-SITE CARE

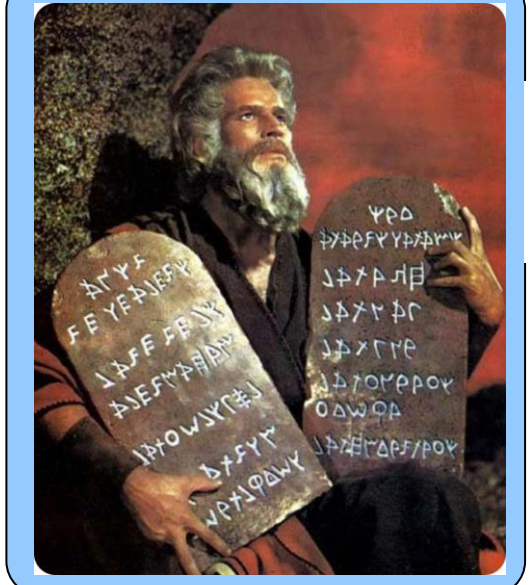
- We recommend **daily topical application of antibiotic** (mupirocin or gentamycin) cream or ointment to the catheter exit site **(1B)**.

TRAINING PROGRAMS

- We recommend that PD training be conducted by nursing staff with the appropriate qualifications and experience **(1C)**.

SECONDARY PREVENTION

- We recommend anti-fungal prophylaxis when PD patients receive antibiotic course to prevent fungal peritonitis **(1B)**.



NEW

ing the local spectrum of antibiotic resistance. No data exist on the effectiveness of routine screening and eradication of *Staphylococcus aureus* nasal carriage before catheter insertion (e.g. by intranasal mupirocin).

DIALYSIS SOLUTION

- The committee has no specific recommendation on the choice of dialysis solution for prevention of peritonitis.

CATHETER DESIGN

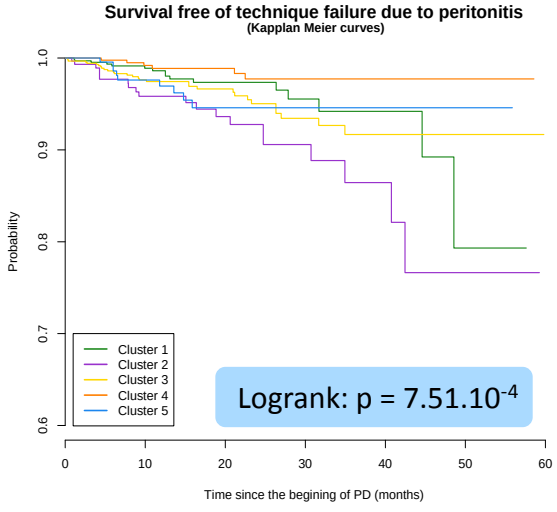
- The committee has no specific recommendation on catheter design for prevention of peritonitis.

BOWEL AND GYNECOLOGICAL SOURCE INFECTIONS

- We suggest antibiotic prophylaxis prior to colonoscopy **(2C)** and invasive gynecologic procedure **(2D)**

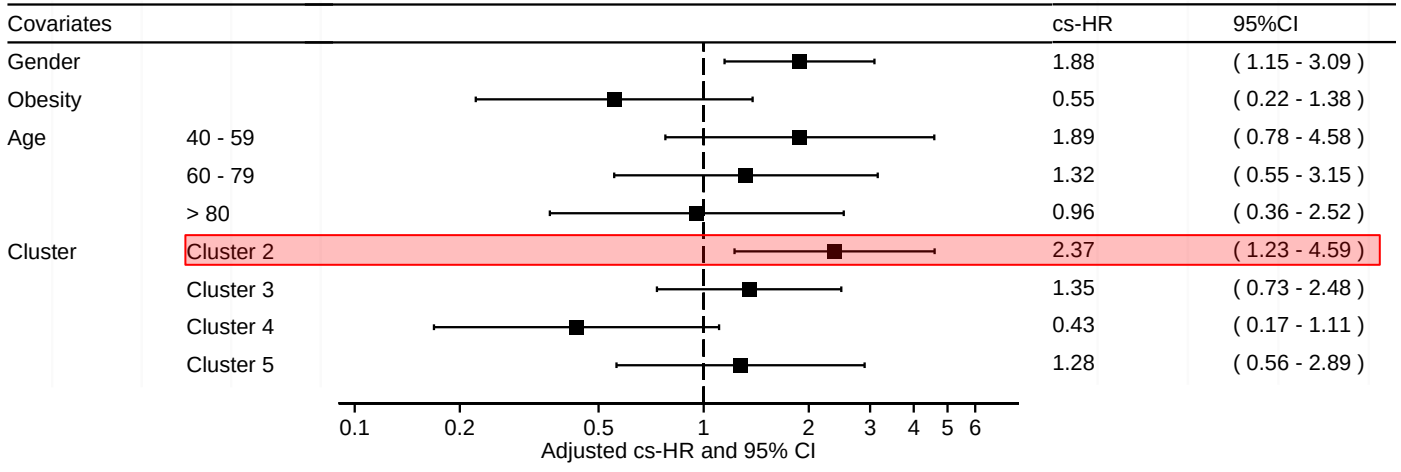
Li et al. ISPD peritonitis recommendations: 2016 update on prevention and treatment. PDI 2016; 36:481-508

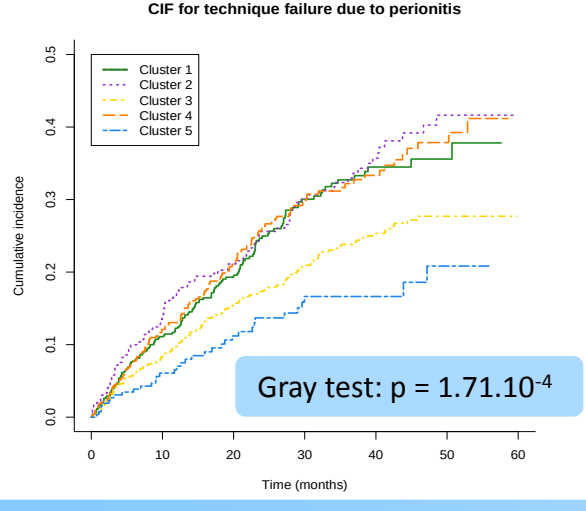
Secondary outcome: **technique failure due to peritonitis**



Logrank: p = $7.51.10^{-4}$

Cox





Gray test: p = $1.71.10^{-4}$

Fine & Gray