self-care dialysis symposium

Survival analysis in PD: is there a center effect?

4ème symposium de dialyse extra-hospitalière

Juin 2018 - Bruxelles

Clémence Béchade

REGISTRE DP HDD de langue française

CHU CAEN NORMANDIE

Anticipe

Methodological aspects

Survival

Concept

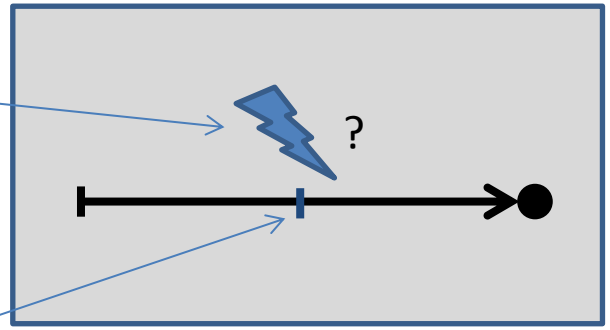
Two questions:

- Did the event of interest occur?

  → yes/no

- When did it occur?

  → date



Survival

Definition

- Time to event:
  - Survival time refers to a variable which measures the time from a particular starting time (e.g., time initiated the treatment) to a particular endpoint of interest

- Events of interest in PD
  - Transfer to HD
  - Peritonitis
  - Transplantation
  - Death
  - …

- Survival function: $S(t)= P(T>t)$

Center effect

Context

- **Patients' characteristics**

Level 1

Age
Sex
Diabetes,
…

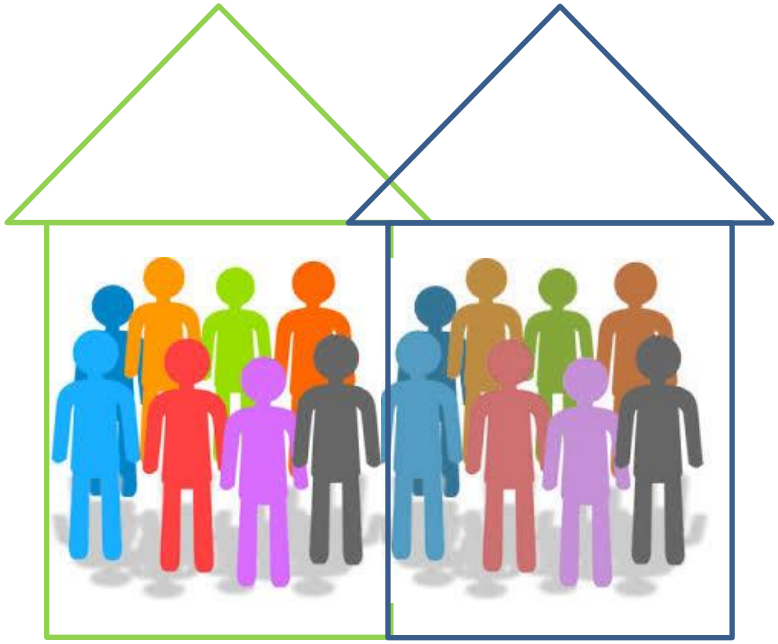
Center effect

Context

- **Center characteristics**

Level 2

Size,
Type,
…

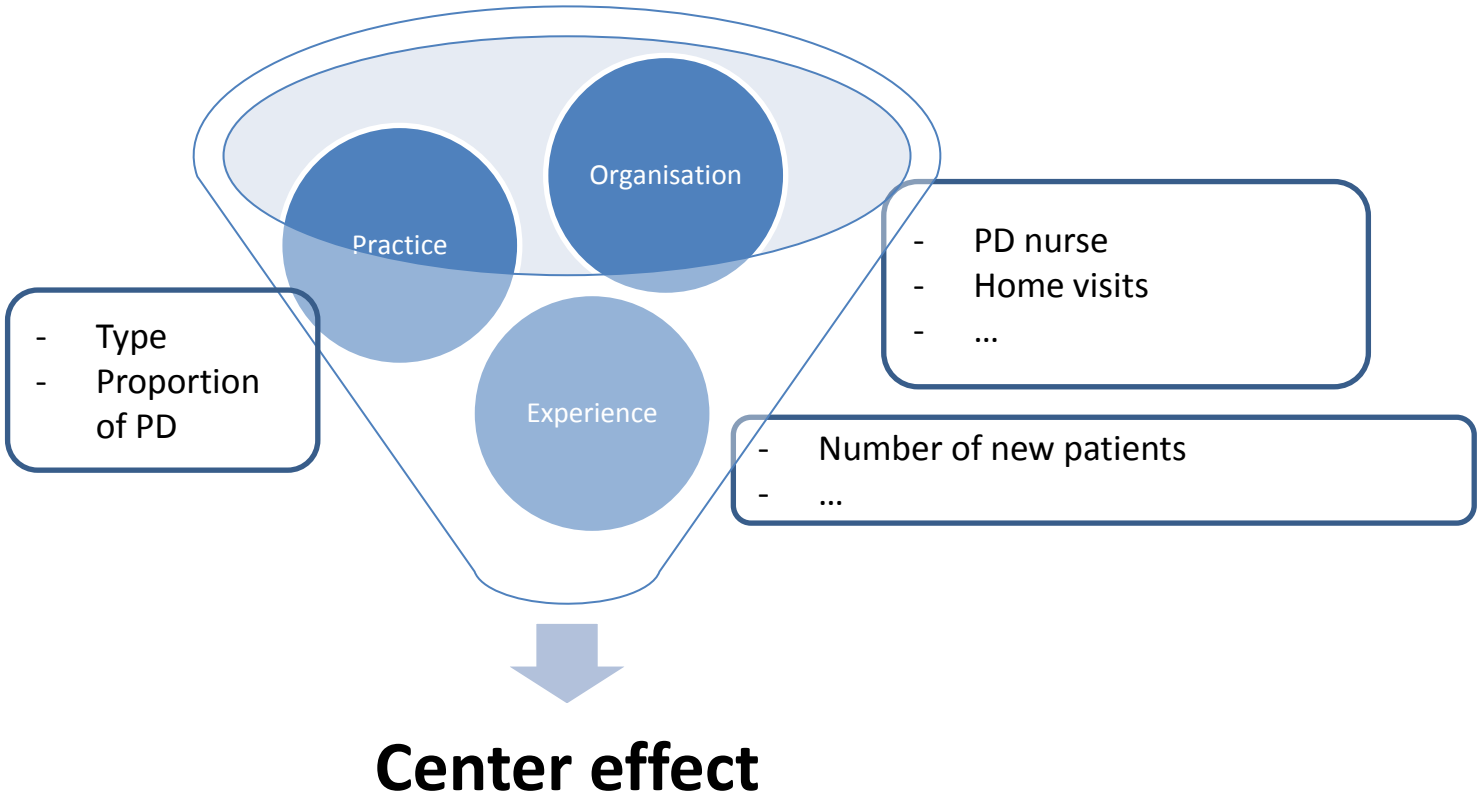


Hospital 1

Hospital 2

Center effect

Definition

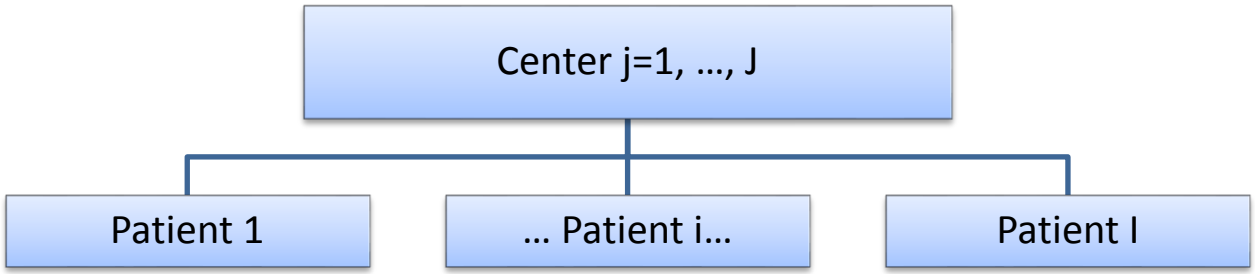


Center effect

Multilevel structure

- **Multilevel structure of the explanatory variables**

« Nested data »



Level 2

Level 1

→ Need for specific models: **Hierarchical models**

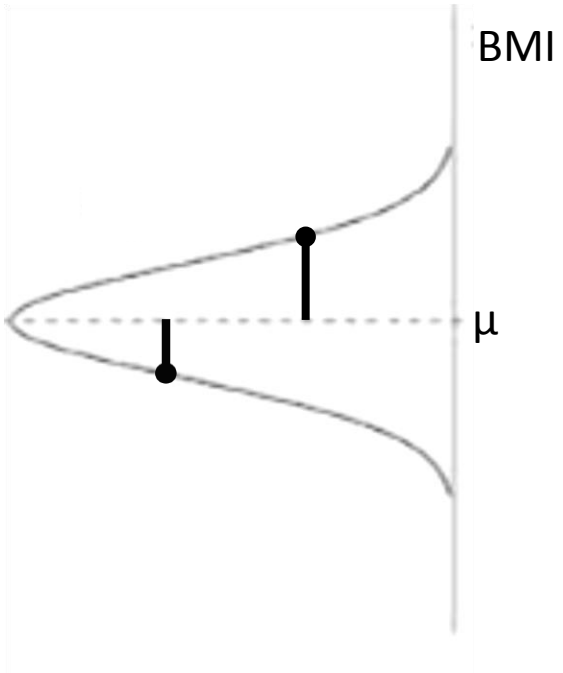
- What does it change compared to «one-level » analysis?
  - Proportion of the center effect
  - Less biased estimates

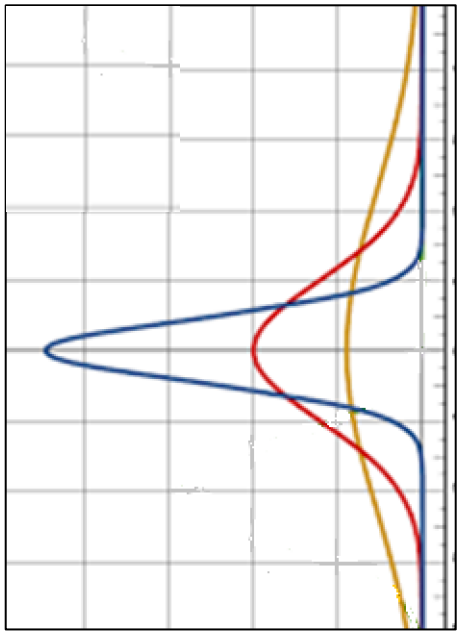
Hierarchical model

Variance

- Variance measures how far a data set is spread out
- Definition : the average of the squared differences from the mean
- Example: BMI of PD patients

$$\sigma^2 = \frac{\Sigma(x-\mu)^2}{N}$$





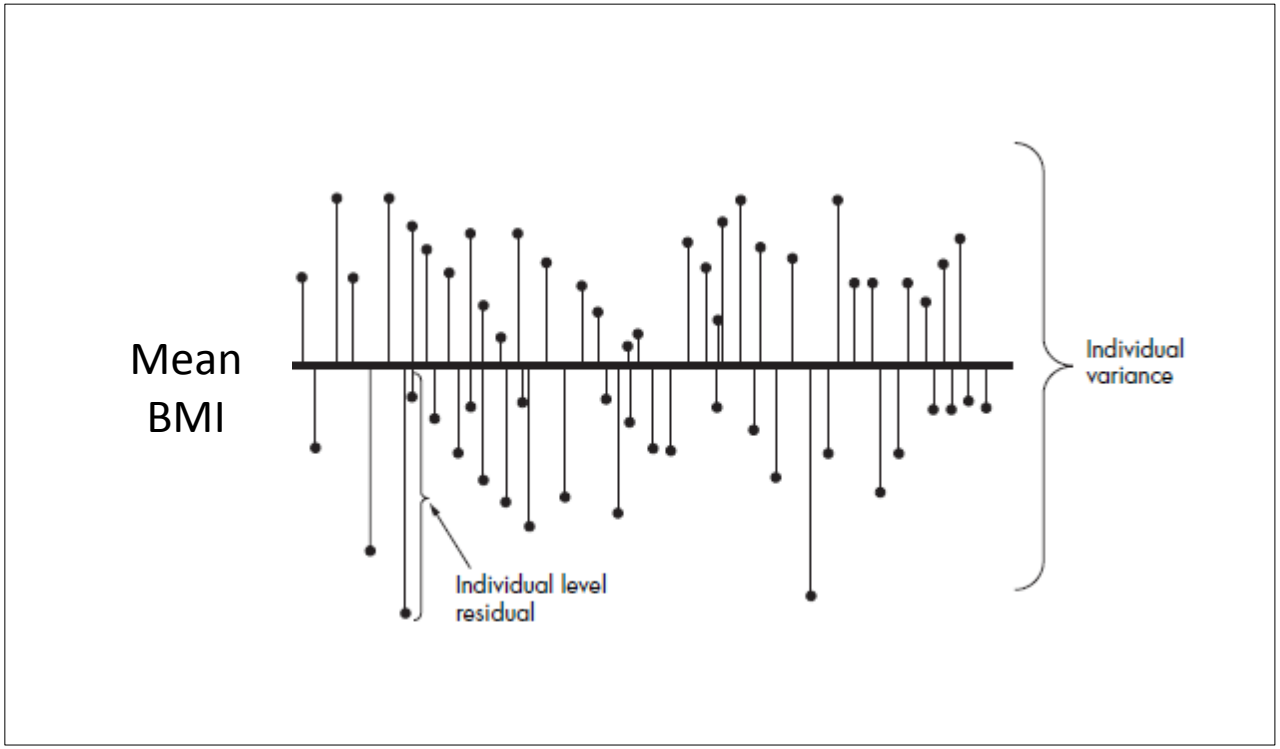
Hierarchical model

Variance

- **Single level individual information**

Distribution of a continuous variable (BMI) between the individuals of a region

Normandy

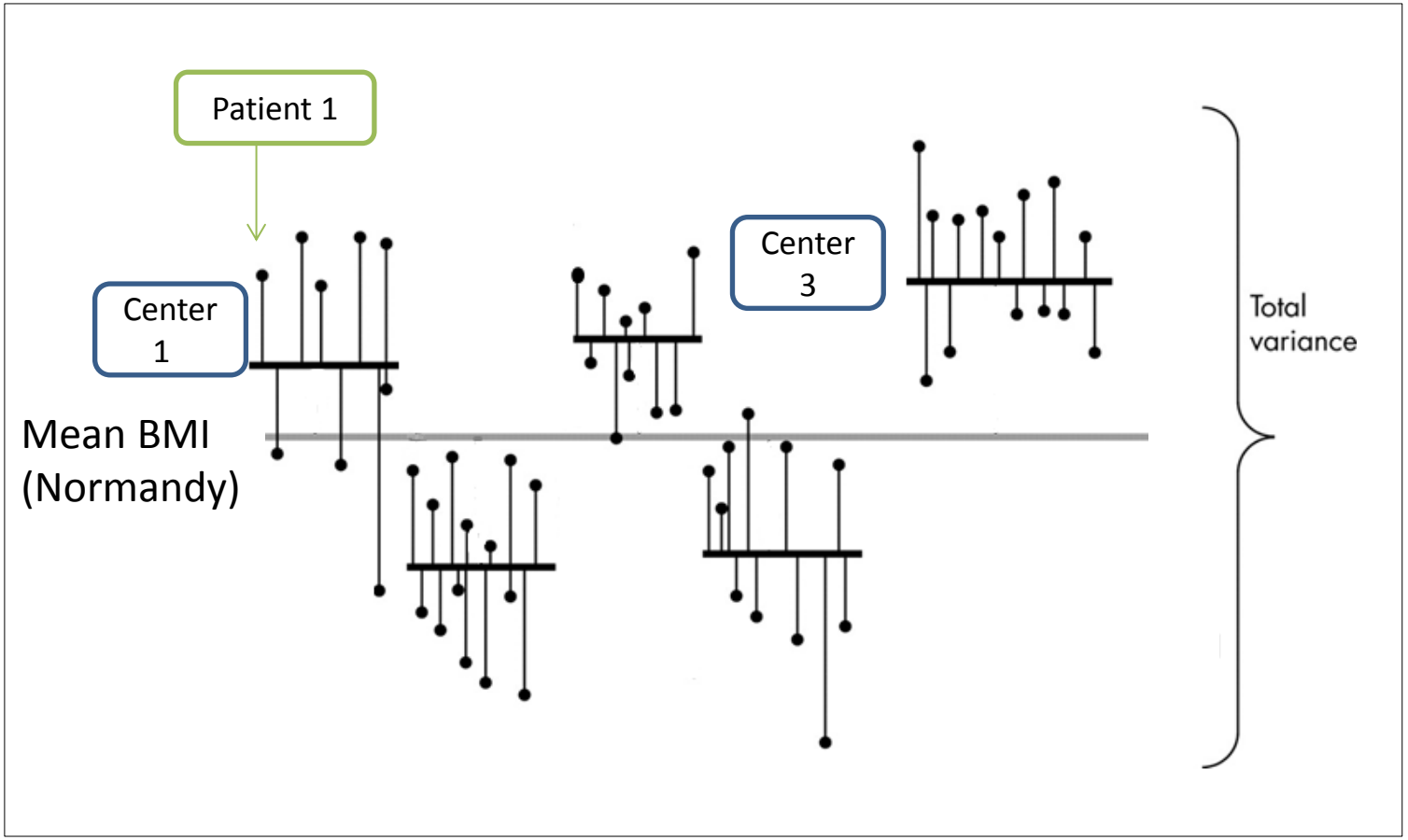


Adapted from Merlo J, J Epidemiol Community Health 2005

Hierarchical model

Variance

- **Multilevel information**

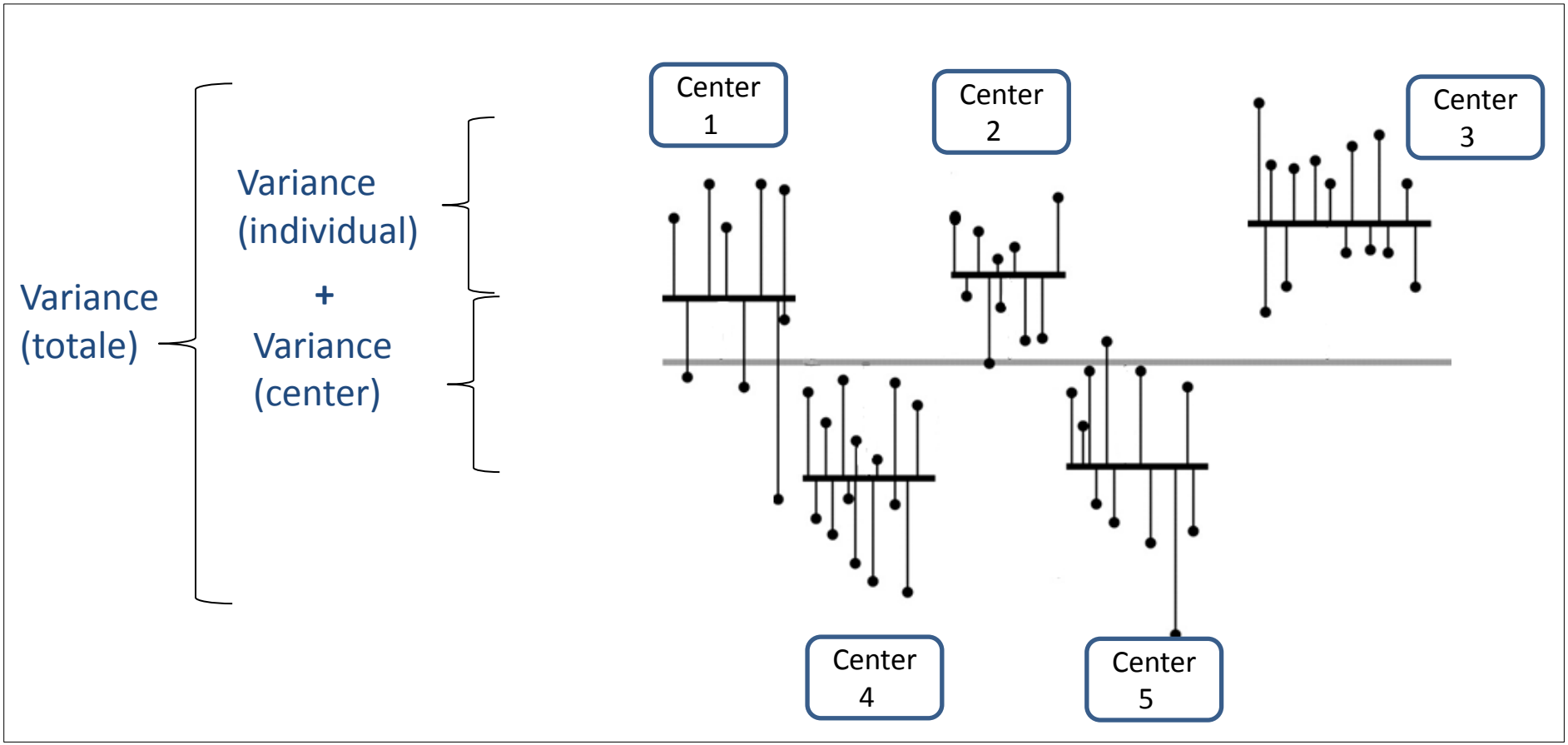


Adapted from Merlo J, J Epidemiol Community Health 2005

Hierarchical model

Variance

- **Multilevel information**



Center effect

Why is it important?

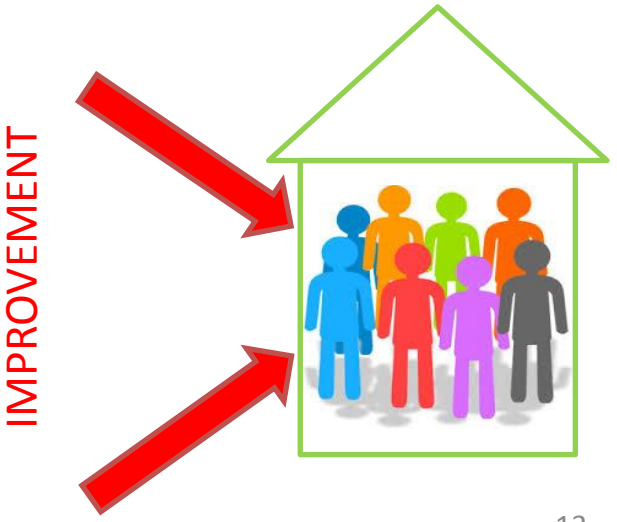
Editorial

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

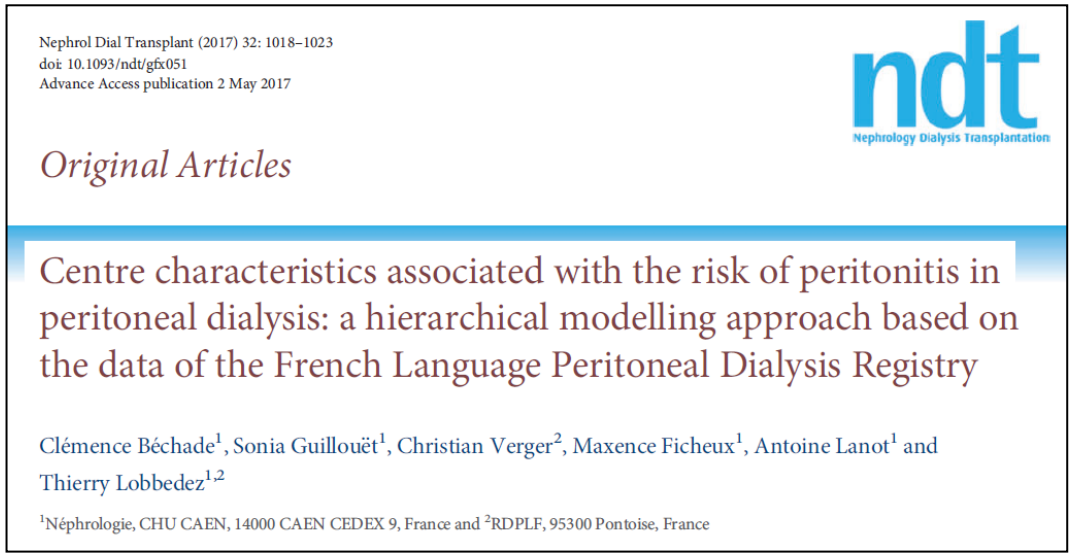
- Modifiable factors
- Targeted strategies



Peritonitis

Center effect and the risk of peritonitis

Peritonitis



Nephrol Dial Transplant (2017) 32: 1018–1023
doi: 10.1093/ndt/gfx051
Advance Access publication 2 May 2017

ndt
Nephrology Dialysis Transplantation

Original Articles

Centre characteristics associated with the risk of peritonitis in peritoneal dialysis: a hierarchical modelling approach based on the data of the French Language Peritoneal Dialysis Registry

Clémence Béchade[1], Sonia Guillouët[1], Christian Verger[2], Maxence Ficheux[1], Antoine Lanot[1] and Thierry Lobbedez[1,2]

[1]Néphrologie, CHU CAEN, 14000 CAEN CEDEX 9, France and [2]RDPLF, 95300 Pontoise, France

Center effect and the risk of peritonitis

Materials and methods

- Objective:

To estimate wether center characteristics could explain the center effects on the peritonitis risk, using hierarchical model

- Incident PD patients between 01/01/2008 and 31/12/2012
- End of the observation period: 01/01/2014

- Exclusion criteria:
  - Age< 18
  - Center with <5 new patients during the study period

- Event of interest: **first peritonitis episode**

Center effect and the risk of peritonitis

Materials and methods

Level 1

Level 2

Patients' characteristics

- Age
- Sex
- Diabetes
- Nephropathy
- PD modality
- Assistance
- Transplantation failure

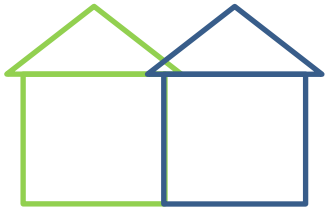
Centers' characteristics

- Type (academic/community/non-profit, private)
- Experience
- Full-time nurse specialized in PD
- Nephrologist specialized in PD
- Home visit by nurse before PD
- Home visit by nurse at PD start
- Home visit by nurse at M3
- Home visit by nurse at M6
- Caregiver ratio

Center effect and the risk of peritonitis

Results

5017 patients



127 centers

3190 episodes of peritonitis

Center effect and the risk of peritonitis

Results

- Patients characteristics

Covariates	N = 5017 patients	
Age at PD initiation (median, IQR)	70 (55-80)	
Modified CCI (median, IQR)	3 (2-5)	
Gender (Male)	2986	59%
Diabetes	1614	32%
Underlying nephropathy		
Unknown	521	11%
Interstitial nephritis	265	5%
Glomerulonephritis	770	15%
Diabetic	929	18%
PKR	343	7%
Miscellaneous	202	4%
Uropathy	177	3 %
Vascular	1685	34%
Systemic disease	125	2%
PD modality at 3 months (CAPD)	3172	76%
Modality of assistance		
Self-care PD	2447	49%
Family assisted PD	443	9%
Nurse-assisted PD	2127	42%
Naive at PD start (not on HD or transplanted)	4249	85%

Center effect and the risk of peritonitis

Results

- Centers characteristics

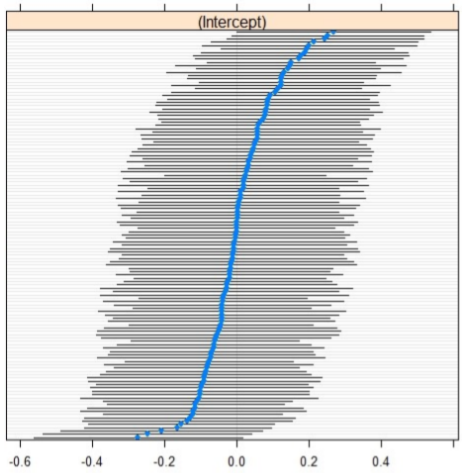
Covariates	N = 127 centers	
Nurse specialized in PD	2185	43%
Nephrologist specialized in PD	3301	66%
Home visit before starting PD	3309	66%
Home visit at PD initiation	4317	86%
Home visit at 3 months	736	14%
Home visit at 6 months	1032	20%

Center effect and the risk of peritonitis

Materials and methods

- Hierarchical model:
  - **Step 1**: empty model
    - Without any adjustment
    - Event=peritonitis
    - random effect=center

=« Is there any difference between centers for the event peritonitis, prior to any adjustment, ie without considering patients/centers characteristics»



Center effect and the risk of peritonitis

Materials and methods

- Hierarchical model:
  - **Step 2**: adjustement on variables from level 1

Level 1

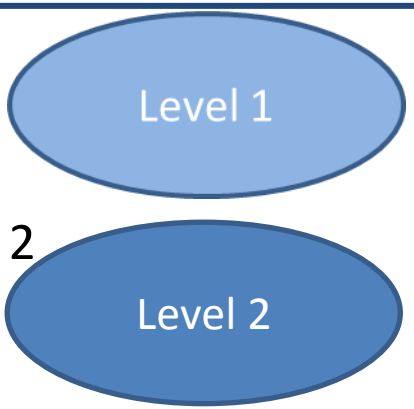
= « Are there any patients' characteristics considered as risk factors for peritonitis »
AND
« Does adjustment on these covariates lead to a reduction in the disparity observed between centers »
?

variance of the center effect decreased by 9%

Center effect and the risk of peritonitis

Materials and methods

- Hierarchical model:
  - **Step 3**: adjustement on variables from level 1 and level 2



= « Are there any patients' and centers' characteristics considered as risk factors for peritonitis »
AND
« Does adjustment on these covariates lead to a reduction in the disparity observed between centers »
?

variance of the center effect decreased by 35%

Center effect and the risk of peritonitis

Materials and methods

	Model 0 Empty model	Model 1 HR [95%CI]	Model 2 HR [95%CI]
LEVEL 1 COVARIATES			
Age	-	0.99 [0.99-1.00]	0.99 [0.99-1.00]
Gender	-	1.05 [0.96-1.17]	1.05 [0.95-1.17]
Diabetes	-	1.34 [1.17-1.59]	1.36 [1.16-1.59]
Modified CCI [unit]	-	1.00 [0.97-1.04]	1.00 [0.98-1.04]
PD modality at 3 months (CAPD)	-	1.10 [0.98-1.24]	1.09 [0.98-1.24]
Modality of assistance			
Self PD	-	Ref	Ref
Family assisted PD		1.02 [0.83-1.22]	1.01 [0.84-1.20]
Nurse assisted PD		0.97 [0.84-1.13]	0.97 [0.85-1.12]
Treatment before PD	-		
Naïve on PD (not on HD or transplanted)		0.99 [0.86-1.16]	0.99 [0.86-1.15]
LEVEL 2 COVARIATES			
Home visits			
Before starting peritoneal dialysis	-	-	0.87 [0.76-0.97]
At peritoneal dialysis initiation			0.90 [0.78-1.07]
Specialization of the peritoneal dialysis team			
Nephrologists specialized on peritoneal dialysis	-	-	0.91 [0.80-1.00]
Nurse specialized on peritoneal dialysis			0.75 [0.67-0.83]

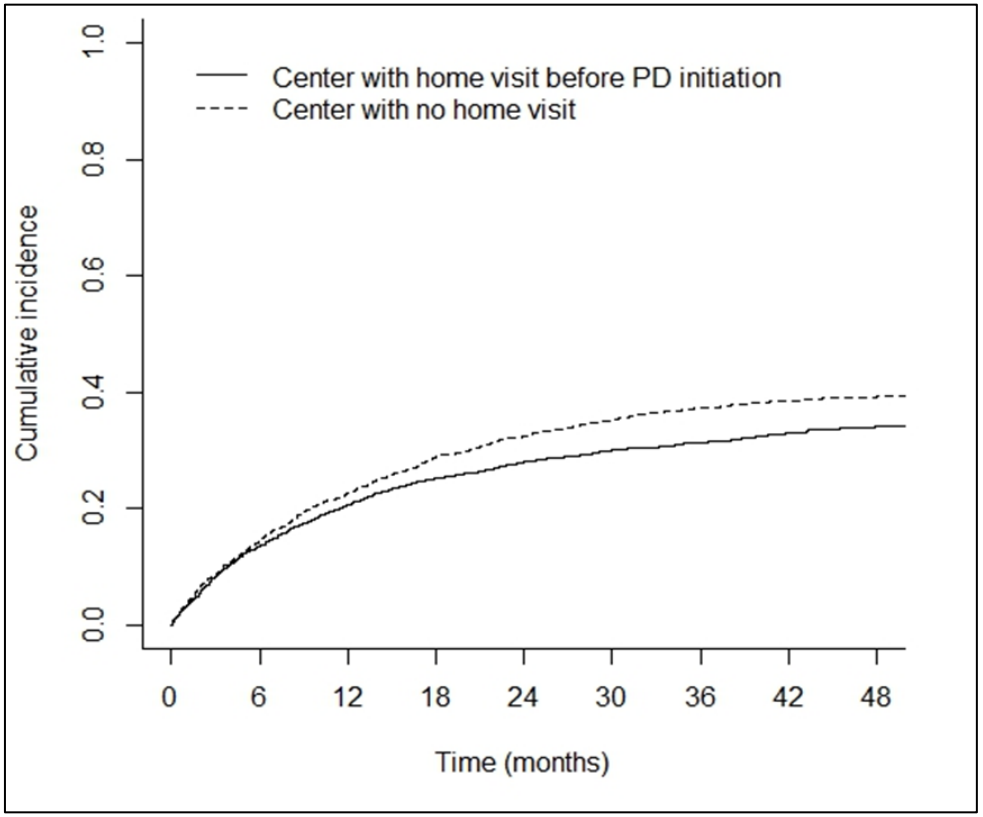
Center effect and the risk of peritonitis

Materials and methods

- Hierarchical model:
  - **Step 3**: adjustement on variables from level 1 and level 2

Level 1

Level 2



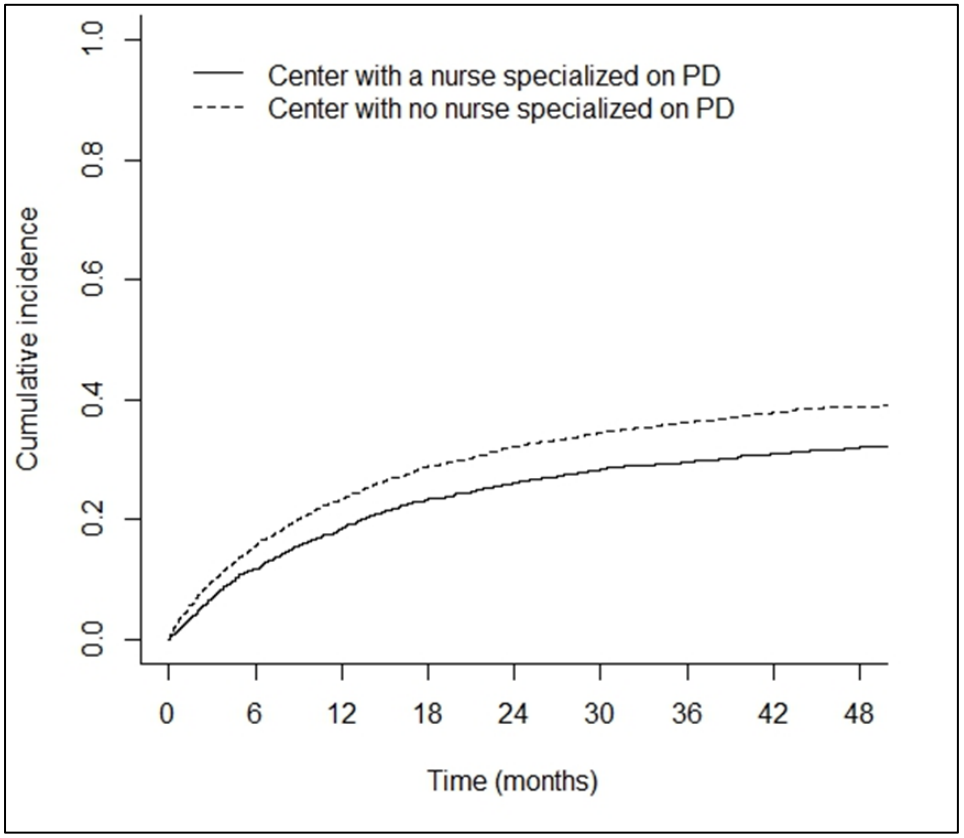
Center effect and the risk of peritonitis

Materials and methods

- Hierarchical model:
  - **Step 3**: adjustement on variables from level 1 and level 2

Level 1

Level 2



Center effect and the risk of peritonitis

Peritonitis

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Original Investigation AJKD

Center Effects and Peritoneal Dialysis Peritonitis Outcomes: Analysis of a National Registry

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

- Event of interest: **cure of peritonitis with antibiotic alone**

  defined as an episode not complicated by relapse, recurrence, catheter removal or transfer to HD >30 days

Center effect and the risk of peritonitis

Materials and methods

Patients' characteristics

- Age
- Sex
- Race
- BMI
- Diabetes
- Cardiovascular disease
- Chronic lung disease
- Nephropathy
- PD modality
- Smoking status
- Initial RRT modality
- Types of causative microorganisms

Centers' characteristics

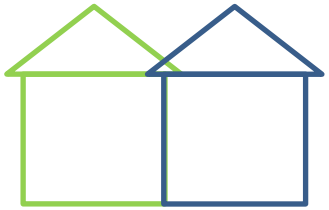
- Transplant center status
- Center size
- PD proportion
- APD exposure
- PET performance
- Icodextrin exposure
- Proportion of culture negative peritonitis
- Proportion of peritonitis episodes requiring hospitalization
- Proportion of peritonitis episodes receiving complete antibiotic therapy
- Proportion of peritonitis treated with antifungal prophylaxis

Htay, Am J Kid Dis 2017

Center effect and the risk of peritonitis

Results

4428 patients



51 centers

9100 episodes of peritonitis

Htay, Am J Kid Dis 2017

Center effect and technique survival

Results

- **Predictors of peritonitis cure**

Level 1

Level 2

Center-level characteristics

Variables	OR (95% CI)	*P*
Center-level characteristics		
PD proportion		0.04
<18%	1.03 (0.90-1.17)	0.7
18-29%	1.00 (reference)	
>29%	1.21 (1.04-1.40)	0.01
Complete antibiotic cover[a]		0.03
<83%	1.07 (0.93-1.23)	0.4
83%-91%	1.00 (reference)	
>91%	1.22 (1.06-1.42)	0.007

Htay, Am J Kid Dis 2017

Technique survival

Center effect and technique survival

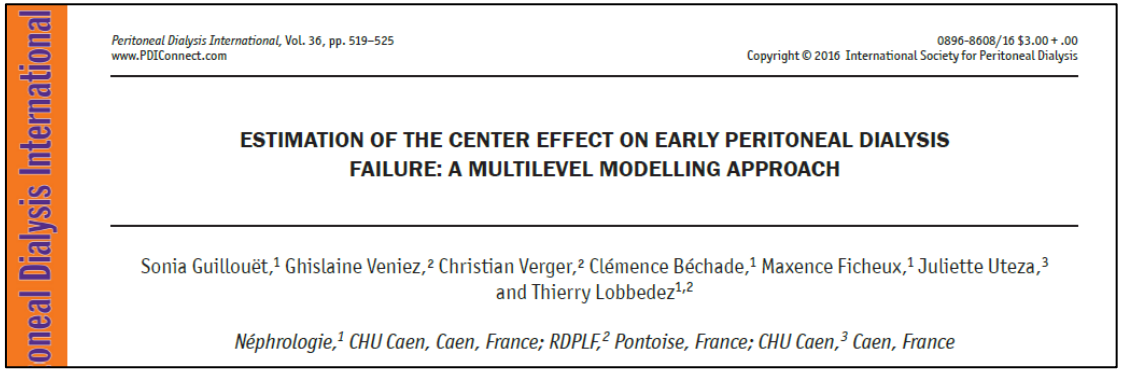
Technique survival

- **What is the definition of technique failure?**
  - Transfer to HD

  or
  - Composite end-point:
    - Transfer to HD
    - Death in DP

Lan, Perit Dial Int 2016

- Our opinion?
  - Not the same event!



oneal Dialysis International

Peritoneal Dialysis International, Vol. 36, pp. 519–525
www.PDIConnect.com

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]

Néphrologie,[1] CHU Caen, Caen, France; RDPLF,[2] Pontoise, France; CHU Caen,[3] Caen, France

Center effect and technique survival

Technique survival

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

Htay, Clin J Am Soc Nephrol 2017

Center effect and technique survival

Materials and methods

- All incident PD patients
- 2004 to 2014

- **Event of interest: technique failure**

  Defined as transfer to HD for >30days or death (including death within 30 days after transfer to HD)

Htay, Clin J Am Soc Nephrol 2017

Center effect and technique survival

Materials and methods

Patients' characteristics

- Age
- Sex
- Race
- BMI
- Diabetes
- Cardiovascular disease
- Chronic lung disease
- Nephropathy
- PD modality
- Smoking status
- Initial RRT modality

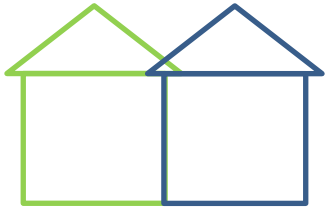
Centers' characteristics

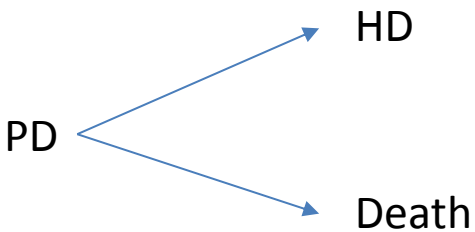
- Transplant center status
- Center size
- PD proportion
- APD exposure
- PET performance
- Icodextrin exposure
- Target serum phosphate
- Target hemoglobin

Htay, Clin J Am Soc Nephrol 2017

Center effect and technique survival

Results





9362 patients

51 centers

5813 episodes of PD failure

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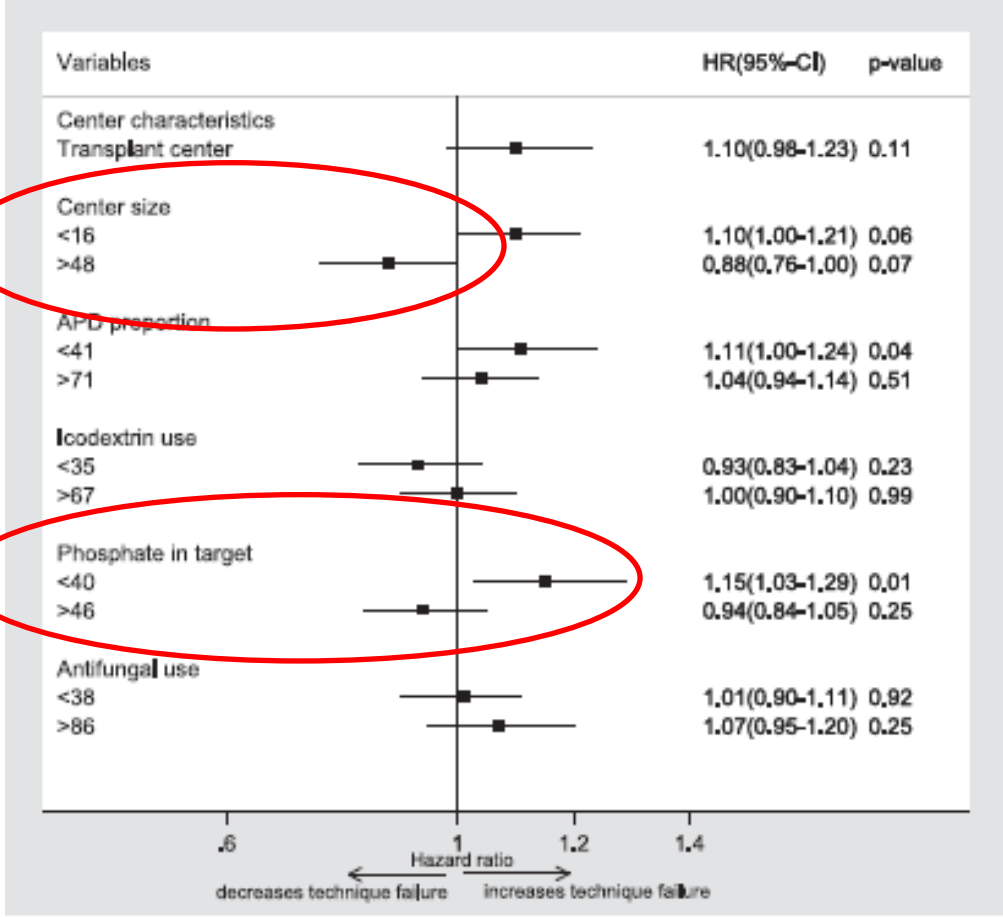
Center effect and technique survival

Results

- Technique failure



Htay, Clin J Am Soc Nephrol 2017

To conclude

Conclusion

Perspective

- Which covariates to describe centers?
  - Studies based on registry data
  - Evolution of the data collected?

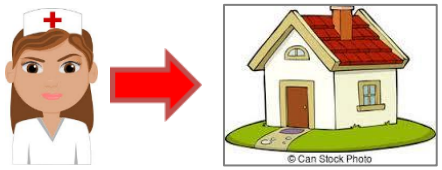
- Causality?
  - Clusters of practice

Dr Lanot!

Conclusion

Take home message

- Multilevel information : Hierarchical model
- Have a look not only to patient characteristics but also to center characteristics
- Modify practices!



Thank you all!

Thierry Lobbedez, Sonia Guillouët, Valérie Châtelet, Antoine Lanot

bechade-c@chu-caen.fr

#NDTCAEN

Center effect and technique survival

Results

Level 1

Level 2

- **Predictors of Peritonitis-Related Catheter Removal**
  - Centers with higher proportions of dialysis patients treated with PD (>29% patients receiving PD)
    (OR, 0.78; 95% CI,0.62-0.97)

- **Predictors of Transfer to HD During Peritonitis**
  - Centers with higher proportions of patients receiving PD (>29% patients receiving PD)
    (OR, 0.78; 95% CI, 0.62-0.97)

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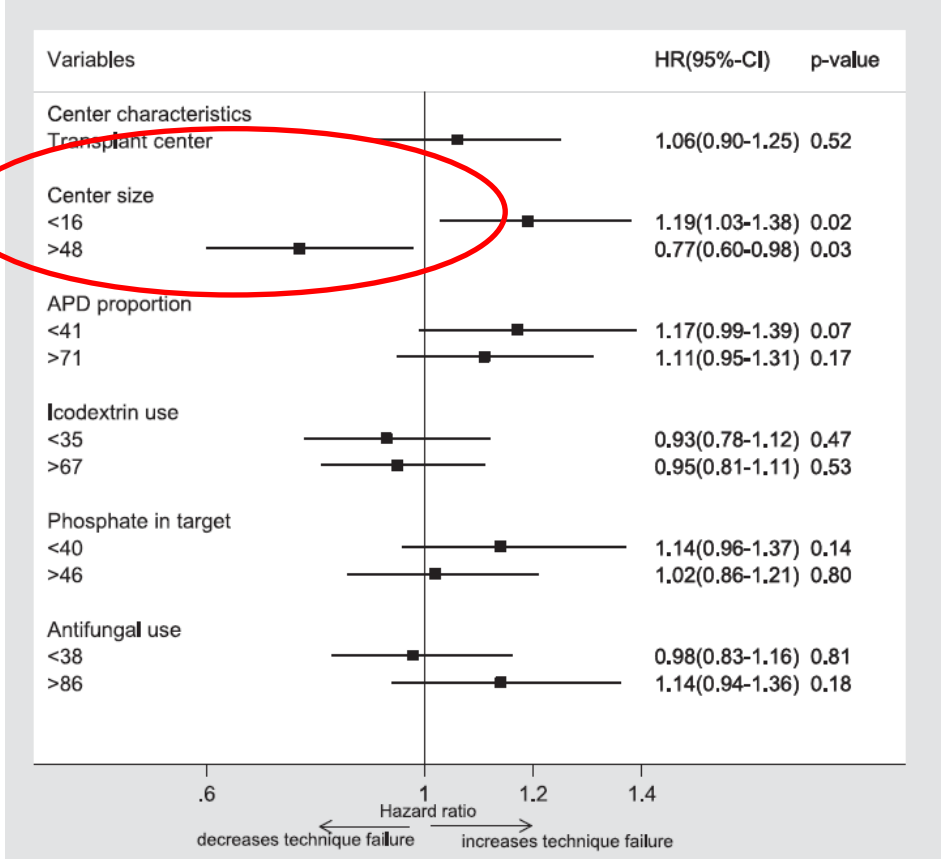
Center effect and technique survival

Results

- Death censored technique failure



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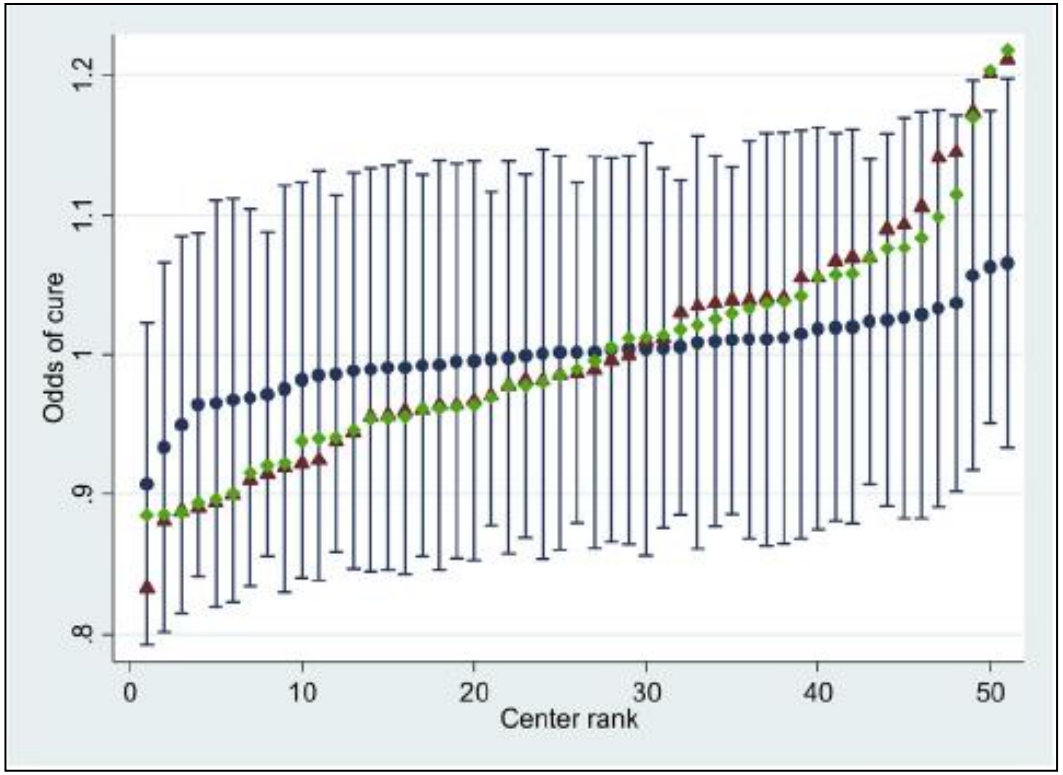
Center effect and technique survival

Results

- **Variations in odds for peritonitis cure accross centers**



No adjustment

-9%

Adj level 1

-66%

Adj level 1+2

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What about death in PD?

Center effect and death-related peritonitis

Peritonitis

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Original Investigation AJKD

Center Effects and Peritoneal Dialysis Peritonitis Outcomes: Analysis of a National Registry

Htay Htay, Yeongjee 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

- Event of interest: cure of peritonitis with antibiotic alone
- Secondary outcomes: **death occurring within 30 days of peritonitis onset**

Htay, Am J Kid Dis 2017

Center effect and death-related peritonitis

Results

- **Predictors of Peritonitis-Related Mortality**
  - No center-level characteristics were associated with the odds of peritonitis-related mortality

Htay, Am J Kid Dis 2017