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# Is hand function associated with assisted peritoneal dialysis? : a cross sectional study

Mathilde Beaumier

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**UNIVERSITÉ de CAEN NORMANDIE**
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**UFR SANTÉ**

**FACULTÉ de MÉDECINE**

Année 2019/2020

# THÈSE POUR L'OBTENTION

# DU GRADE DE DOCTEUR EN MÉDECINE

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par

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Née le 20 février 1991 à Coutances (50)

## TITRE DE LA THÈSE :

## La dextérité manuelle est-elle associée à la dialyse péritonéale assistée ? Une étude transversale

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# Abréviations

APD : Assisted Peritoneal Dialysis

CAPD : Continuous Ambulatory Peritoneal Dialysis

CCI : Charlson Comorbidity Index

DP : Dialyse Péritonéale

HD : Hémodialyse

IQR : InterQuartile Range

MoCA : Montreal Cognitive Assessment

PD : Peritoneal Dialysis

RR : Relative Risk

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# Avant-propos

La dialyse péritonéale (DP) et l'hémodialyse (HD) sont deux modalités thérapeutiques complémentaires de l'insuffisance rénale chronique au stade terminal. Il a été montré que, comparativement au traitement en hémodialyse en centre, le traitement au domicile qui inclue DP et HD au domicile, est associé à une meilleure qualité de vie [1] et à une meilleure satisfaction du traitement [2]. La dialyse à domicile est également moins chère que la dialyse en centre [3]. Cependant, la dialyse à domicile, et notamment la DP, reste peu utilisée. En effet, il existe de nombreux freins à la DP. Ces barrières peuvent être de différentes natures : manque de connaissances de la part du néphrologue et du patient, difficulté pour avoir des infirmières de DP spécialisées, problème d'infrastructure ou de coût, problèmes sociaux [4].

L'incapacité physique qui inclut les troubles de la dextérité manuelle est également une limite à la DP. Or, Les patients dialysés ont un état physique général moins bon que celui de la population générale [5]. De plus, Ostwald et al a montré que l'âge avancé, les troubles cognitifs et les anomalies de la dextérité manuelle étaient associés à la dépendance dans les actes de la vie quotidienne [6]. Chez le patient insuffisant rénal, il existe en plus des troubles du métabolisme phosphocalcique, des comorbidités telles que le diabète, une dénutrition et une sarcopénie qui aggravent la perte de la dextérité manuelle [7]. Il a d'ailleurs été montré une perte de dextérité manuelle chez les patients en hémodialyse [8–10].

Ainsi, des programmes de DP assistée ont été développés pour les patients non autonomes qui souhaitent être traités par DP [11–13]. En France, les patients peuvent être assistés par un membre de leur famille ou une infirmière. L'assistance diminue le risque de péritonite notamment chez le patient diabétique [14] et les sujets âgés [15], et est associée à une diminution du risque de transfert en hémodialyse [16]. En revanche, l'assistance par un membre de la famille peut être source de surmenage. L'assistance par une infirmière peut être à l'origine de contraintes, horaires et temporelles. En outre il existe un coût additionnel

de la dialyse lié à l'assistance par une infirmière [3]. Ainsi, il est important d'identifier les patients qui nécessitent une assistance. Le choix de l'assistance est subjectif et dépend de l'évaluation du néphrologue et de l'infirmière spécialisée en dialyse péritonéale [3]. Il n'y a pas de recommandation pour l'allocation de l'assistance. Ainsi, il existe une hétérogénéité entre les différents centres de traitement dans l'attribution de l'assistance qui n'est pas expliquée par les caractéristiques des patients [17]. Des outils permettant d'évaluer la capacité du patient à réaliser les manipulations en dialyse péritonéale sont donc indispensables.

L'objectif serait donc de pouvoir utiliser des tests de dextérité pour évaluer objectivement les besoins des patients débutants la DP en terme d'assistance ou de rééducation fonctionnelle. Notre étude se définit comme une étude de faisabilité, qui visait au préalable à vérifier que l'évaluation de la dextérité manuelle des patients en dialyse péritonéale pouvait être faite en pratique quotidienne. Les autres objectifs de ce travail préliminaire étaient d'observer les résultats de ces tests dans une population de patients prévalents en DP, de les comparer à ceux observés en population générale, et de rechercher une association entre dextérité et assistance dans cette population.

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# Article

## INTRODUCTION

A free choice of the dialysis modality must be offered to patients starting renal replacement therapy. Home dialysis, that includes peritoneal dialysis (PD) and hemodialysis (HD), is associated with a better quality of life compared with in-centre HD [1] and with a higher treatment satisfaction [2]. In developed countries the rate of PD varies from one country to another [3]. The inability of the patients to manipulate PD devices has been identified as a barrier to peritoneal dialysis [4]. Assisted PD programs have been developed to give access to PD to non-autonomous patients [5–7]. It has been demonstrated that nurse assisted PD patients had a longer technique survival compared with the other patients [8]. Nurse assisted PD was associated with a lower risk of peritonitis in elderly and in diabetic patients [9,10]. In France, whatever the renal replacement modality, home-dialysis is less expensive than in-centre HD [11] but, there is an additional cost due to the assistance since nurse assisted PD is fully covered by the health care insurance. Consequently, a proper allocation of assistance to peritoneal dialysis patients is a matter of concern. One study showed that there was heterogeneity between centres regarding the utilization of assisted peritoneal dialysis [12]. It has been shown that functional impairment, assessed by PD nurses, was strongly associated with assisted PD utilization in incident PD patients but there was no information about the tools used to evaluate patient capability to perform peritoneal dialysis [13]., There are guidelines for patients training and education, but no recommendation is available to identify whose patients need to be assisted [14]. Tools used to evaluate the dexterity could be utilized in peritoneal dialysis to estimate the capability to perform the peritoneal dialysis connection. It can be hypothesized that those instruments may help to identify patients who need to be treated by assisted PD.

The main objective of this study was to evaluate the feasibility of hand function evaluation, using tools that measure the dexterity, in the field of peritoneal dialysis. This study was also carried out to assess the association between hand function evaluation and the assisted peritoneal dialysis utilization.

## MATERIALS AND METHODS

### STUDY POPULATION

This was a cross-sectional study of the patients older than 18 years old treated by PD in our centre in January 2019. Patients had to be in stable condition with no recent medical complication. Patients who did not speak French were excluded.

### HAND FUNCTION ASSESSMENT

Jebsen test (figure 1) evaluates 7 daily life activities (writing, simulating page turning, raising small objects, simulating feeding, stacking, raising big heavy or light cans). Patients are timed for each activity, both dominant and non-dominant hand are tested. The result of each test is expressed in seconds [15].

In the Purdue Pegboard test (figure 2), each evaluation must be done 3 times. Subsequently, the mean of the 3 tests is calculated. Patients are asked to pick pins into holes using dominant hand at first, then non-dominant hand, and finally their two hands simultaneously. The result of each test is expressed as the number of picked pins in 30 seconds. The right plus left plus both hands score is obtained by summering the score of the tests described previously. The last evaluation, that is called the assembly test, consists of piling pins, collars and washers in 1-minute alternating between the two hands [16].

Hand-grip strength is directly correlated with hand function [17]. Hand-grip strength was evaluated with the Jamar dynamometer and pinch gauge [18]. They display grip strength in pounds and kilograms. Values in kilograms for the dominant and non-dominant hands were collected.

These tests were chosen according to the opinion of rehabilitation doctors and therapists from our hospital. They reflect different dimensions of hand function and were validated in the general population and in neurological or rheumatologic diseases [19–22].

All patients were tested by the first author during January 2019 in the outpatient PD clinic during their regular visit.

## COVARIATES

Patient characteristics were extracted from the Registre de Dialyse Péritonéale de Langue Française (RDLPF): age, gender, underlying nephropathy, comorbidities assessed by the Charlson comorbidity index (CCI), diabetes status, time spent in PD, type of PD (assisted PD (APD) or continuous ambulatory PD (CAPD)) and modality of assistance (family or nurse). Patients were asked about their dominant hand, education and occupational status. In addition, they were asked if they were willing to participate in a rehabilitation program. Cognitive function was evaluated with the Montreal Cognitive Assessment test (MoCA) [23]. We also collected the reason for assistance from the patient file (comprehensive disability, manual disability, visual impairment, patient wish or other cause). Haemoglobin and serum albumin were collected the day when the tests were performed. To assess the feasibility of the hand function evaluation, we measured the total duration of the tests in minutes and the number of tests completed by the patients.

## STATISTICAL ANALYSIS

Continuous variables were described by the mean value and standard deviation, the median value and the first and third quartiles in case of skewed distribution. Categorical variables were described by frequencies and percentages. Patients were separated between a self-care PD and assisted PD (family or nurse assisted PD) group. Patients were described by their modality of assistance. To avoid the multiplicity testing issue, no comparison test was performed between the 2 groups. The feasibility of hand function evaluation was assessed by the percentage of completed tests and by the total time spent to perform the tests. The percentage of tests in the normal range according to the results in the general population was provided [15,16,24–26]. The association between the hand function evaluation and assisted PD was estimated with the relative risk [27]. The unadjusted relative risk was calculated for each parameter of each test and subsequently adjusted on the Charlson comorbidity score that includes patient age and comorbidities. Confident interval of the coefficients was used to express the uncertainty. Bootstrap method was used to estimate confident interval of the coefficients.

## ETHICS APPROVAL

The study had the approval of the local ethics committee (Clinical trial Number: NCT03900819).

# RESULTS

## PATIENT CHARACTERISTICS

Of the 45 patients treated by PD in our center in January 2019, 2 did not agree to participate in the study. Among the 43 patients, 16 were on self-care PD, 6 on family-assisted

PD and 21 on nurse-assisted PD. The causes of assistance were comprehensive disability 9/27 (33.3%), manual disability 2/27 (7.4%), visual impairment 2/27 (7.4%), patient wish 8/27 (29.6%) and other 6/27 (22.2%). Median age was 70 years. Sex ratio was 24/19 (M/F). The median CCI was 6 in the total population, 5.5 in the self-care group and 7 in the assisted group. Forty patients (76.7%) were retired and only 3 patients (7%) were active. Nine patients (20.9%) were interested in rehabilitation with an occupational therapist to improve their hand function: 5 in the self-care group and 4 in the assisted group. The MoCA value was lower in the assisted group compared with the self-acre group (19 *vs.* 26.5). Patient characteristics are displayed in Table 1.

## FEASIBILITY OF THE TESTS

Jebsen test and Purdue Pegboard were completed by 41 patients (95.3%). All patients succeeded in performing the Jamar and the pinch test. The median time to complete hand function tests was 22 minutes. There was no significant difference between the 2 groups regarding the median duration of the evaluation.

## RESULTS OF THE TEST OF THE HAND FUNCTION

Results of the tests were different between the 2 groups in several dimensions. Self-care and assisted patients had respectively 19.9 pins *vs.* 12.7 pins with the assembly test of the Purdue Pegboard, 151.8 seconds *vs.* 218 seconds with the total score of the Jebsen test. For the grip strength, results of the Jamar test were respectively for dominant hand 27.5 kg *vs.* 18 kg, and for non-dominant hand 24.5 kg *vs.* 16 kg for self-PD patients and assisted PD patients. Pinch test results were respectively for dominant hand 6.3 kg *vs.* 5 kg, and for non-dominant hand 6 kg *vs.* 5 kg for self-PD patients and assisted PD patients. Detailed results of the tests are displayed in table 2.

For the 4 hand function tests, only few patients had a performance within the range of the general population. Results are provided in table 3.

ASSOCIATION BETWEEN HAND FUNCTION EVALUATION AND ASSISTED PD

In the crude analysis, each dimension of the Purdue Pegboard was associated with assisted PD. After adjustment on the CCI, only the assembly test of the Purdue Pegboard remained associated with assisted PD (RR 0.92 [CI 95% 0.86-0.98]). Total Jebsen score was associated with assisted PD in the crude analysis (RR 1.01 [CI 95% 1.00-1.01]) and after adjustment on the CCI (RR 1.01 [CI 95% 1.00-1.01]). Jamar test (RR 0.94 [CI 95% 0.90-0.99] with dominant hand, RR 0.94 [CI 95% 0.88-0.98] with non-dominant hand) but not the pinch test (RR 0.87 [CI 95% 0.72-1.06] with dominant hand, RR 0.85 [CI 95% 0.68-1.08] with non-dominant hand) was associated with assisted PD. Results are displayed in table 4.

## DISCUSSION

In view of the total duration of the evaluation and on the performance rate of the tests, our study shows that the assessment of the hand function in PD patients was feasible in the outpatient PD clinic. In addition, our work shows that these tests can be used in patients with cognitive dysfunction and comorbidities. The evaluation procedure is not expansive since the cost of the devices for the hand function evaluation was 1500 $.

To the best of our knowledge, this is the first study about the assessment of hand function in PD patients. The subject is of interest as the decision to use assisted PD could affect the patient outcome on PD, furthermore there is an additional cost due to the patient assistance. The assessment is based on the PD nurse evaluation of the patient ability to be on self-care PD that is done before and during the patient education for PD. The nurse

assessment is based on a subjective estimation of the patient capability to be on self-care PD, on the evaluation of the functional impairment and on the measurement of the cognitive dysfunction [28]. One recent study from our team showed that, after the adjustment on the age and on the comorbidities, the nurse estimation of the functional impairment was strongly associated with the utilization of assisted PD [13]. This finding raised the question of the tools used by PD nurses to measure the functional impairment in PD patient. There is no recommendation regarding the tools and the procedure that should be used to evaluate the functional impairment of PD patients [14]. Dexterity could influence the possibility for the patient to do the catheter connection properly. Patient strength may affect the patient capability to handle the PD bags. Consequently, both dexterity and patient strength could reflect the ability to be on self-care PD. In our study the hand function and the strength evaluation were associated with assisted PD utilization. To our knowledge only one Canadian study reported the use of a standardized questionnaire completed by the clinical team to detect strength, hand function, vision and cognitive impairment that could help to guide the allocation of assistance in PD patients [29]. In Australia, the Jo-Pre-training Assessment Tool (JPAT) was created to screen suitable patient for home dialysis. The questionnaire assesses physical stability, nutritional status, communication, ability to maintain self-care, psychological suitability and social support [30]. The lack of standardisation of the nurse evaluation and the subjective assessment of the patient ability to be treated by self-care PD may partly explain the variability between centre in the rate of assisted PD utilization [12]. Our results suggest that the hand function evaluation with dedicated tools could help to identify whose patients need to be treated by assisted PD. One may also argue that the dexterity evaluation could also help PD nurses to personalize the patient training and retraining. The hand function evaluation could also help Nephrologist to identify patient who

should be referred to rehabilitation program in the objective to increase the autonomy of PD patients.

Compared with the general population, hand function was severely impaired in PD patients. This finding is consistent with the results of studies that evaluated hand function in patients on haemodialysis. Limaye *et al.* using the Sollerman score, that assesses activities of daily living, showed that half of the patients under haemodialysis had a score below the normal value [31]. In the study of Tander *et al.*, that assessed hand function with the Sollerman test, 69% of patients on HD had a functional impairment. Abnormal test was associated with age, kidney disease, marital status but neither with gender nor with the haemoglobin level [32]. Sarcopenia, bone mineral disorder that occur in end stage renal disease patient explain the impact of end stage renal disease on dexterity [33,34]. Time spent in hemodialysis and the vascular access also contribute to deterioration of manual dexterity assessed by grip and pinch strength [35]. Moreover, measuring hand grip strength may be helpful as low hand grip strength was associated with a higher rate of all-cause mortality among dialysed patients in a recent meta-analysis [36]. Questionnaires that assess activities of daily living also exist. For example, the Duruöz's Hand Index is a scale with 18 questions that evaluate different component of hand function: force and rotational movements, dexterity and precision, dynamic activities that necessity flexibility. The items are scored from 0 (able to do the activity) to 5 (enable). The Duruöz's Hand Index was correlated with the Purdue Pegboard and grip strength. With this index, among 60 patients in HD, 51.7% had impaired hand function [37].

Our study has limitation due to the nature of the design, as it was a single centre cross sectional study that included a limited number of patients.

## CONCLUSION

The evaluation of hand function of PD patients appeared to be feasible in the daily practice. The Jebsen test the Purdue Pegboard and the Jamar test were associated with assisted PD. Further studies are needed to evaluate the association between the hand function evaluation and the outcomes on peritoneal dialysis.

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## TABLES

**Table 1**. Baseline characteristics of patients according to assistance

| | Total<br>N=43 | Self-PD<br>N=16 | Assisted-PD<br>N=27 |
|---|---|---|---|
| Age, median (IQR) | 70 (65-81) | 66 (59-69.3) | 78 (68-83) |
| Sex, number of male (%) | 24 (55.8%) | 9 (56.2%) | 15 (55.6%) |
| Dominant hand, n (%) | | | |
| Right-handed | 42 (97.7%) | 16 (100%) | 26 (96.3%) |
| Left-handed | 1 (2.3%) | 0 | 1 (2.3%) |
| Occupational status, n (%) | | | |
| Working | 3 (7%) | 2 (12.5%) | 1 (3.7%) |
| Unemployed | 7 (16.3%) | 5 (31.2%) | 2 (7.4%) |
| Retired | 33 (76.7%) | 9 (56.2%) | 24 (88.9%) |
| Education, n (%) | | | |
| Unqualified | 10 (23.3%) | 0 | 10 (37%) |
| Diploma before high school | 25 (58.1%) | 12 (75%) | 13 (48.2%) |
| High school diploma or higher | 8 (18.6%) | 4 (25%) | 4 (14.8%) |
| CCI, median (IQR) | 6 (5-8) | 5.5 (3.8-7) | 7 (5.5-8.5) |
| Diabetes, n (%) | 20 (46.5%) | 6 (37.5%) | 14 (51.9%) |
| Underlying nephropathy, n (%) | | | |
| Diabetic | 14 (32.6%) | 3 (18.8%) | 11 (40.7%) |
| Polycystic kidneys | 3 (7%) | 2 (12.5%) | 1 (3.7%) |
| Glomerulonephritis | 5 (11.6%) | 3 (18.8%) | 2 (7.4%) |
| Vascular or hypertensive | 5 (11.6%) | 2 (12.5%) | 3 (11.1%) |
| Other or unknown | 16 (37.2%) | 6 (37.5%) | 10 (37%) |
| PD modality, n (%) | | | |
| APD | 11 (25.6%) | 6 (37.5%) | 5 (18.5%) |
| CAPD | 32 (74.4%) | 10 (62.5%) | 22 (81.5%) |
| MoCA value, median (IQR) | 23 (18-27) | 26.5 (24-30) | 19 (15-24) |
| Time spent in PD, median (IQR) | 289 (141.5-919) | 625 (265.8-898.8) | 280 (112-998) |
| Hemoglobin (g/dL), median (IQR) | 11.7 (10-12.4) | 11.5 (9.7-12.3) | 11.8 (10-12.4) |
| Serum albumin (g/L), median (IQR) | 35 (31.5-37) | 34.5 (32-37.3) | 35 (31-37) |

APD = automated peritoneal dialysis; CAPD = continuous ambulatory peritoneal dialysis; CCI = Charlson comorbidity index; IQR = interquartile range; MoCA = Montreal cognitive assessment; PD = peritoneal dialysis.

**Table 2**. Hand function according to assistance

| | Total N=43 | Self-PD N=16 | Assisted-PD N=27 |
|---|---|---|---|
| | Median (IQR) | Medan (IQR) | Median (IQR) |
| Purdue Pegboard (number of pins) | | | |
| Completed test, n (%) | 41 (95.3%) | 16 (100%) | 25 (92.6%) |
| Dominant hand (D) | 10 (8.3-12) | 11 (10.2-12.8) | 8.7 (7.7-10.3) |
| Non dominant hand (ND) | 9.7 (7.3-11.7) | 11.3 (9.3-12.5) | 9 (7-10.3) |
| Both hands (B) | 7.3 (5.7-9) | 8.9 (7.5-10.4) | 6.7 (5.3-8) |
| Sum (D+ND+B) | 26.7 (21.6-32.7) | 31 (27-35.9) | 24 (21.3-27.6) |
| Assembly test | 14 (11.7-19.7) | 19.9 (15-24.1) | 12.7 (10-15.7) |
| Jebsen test (time in sec) | | | |
| Completed test, n (%) | 41 (95.3%) | 16 (100%) | 25 (92.6%) |
| Dominant hand | | | |
| Writing | 21.3 (17.9-29) | 17.2 (14-20.1) | 27.3 (21.3-45.8) |
| Cards | 7.2 (5.8-9.4) | 7 (5.5-7.7) | 8.2 (6-10.8) |
| Small objects | 11.2 (8.6-13.9) | 9.2 (7.9-11.9) | 12 (10.2-15.1) |
| Simulated feeding | 12 (10-14.3) | 11.8 (9.9-13.5) | 13.1 (10.7-14.8) |
| Checkers | 6.5 (4.9-8.3) | 5.4 (4.7-6.1) | 7 (5.3-9) |
| Large light objects | 5 (4-6.2) | 4.3 (3.7-4.8) | 5.5 (4.7-6.6) |
| Large heavy objects | 5 (4.2-6.2) | 4.4 (4-5.1) | 5.5 (4.8-6.8) |
| Non dominant hand | | | |
| Writing | 47.9 (36.5-66.9) | 36.1 (34.7-48.4) | 58.9 (42.5-91.9) |
| Cards | 7.1 (5.9-9.5) | 6.2 (5.7-7.3) | 8.8 (6-11.9) |
| Small objects | 12.1 (9.3-14.8) | 9.9 (8.8-11.6) | 14.3 (10.9-16.9) |
| Simulated feeding | 13.8 (11.8-18.1) | 13.2 (11.6-14.8) | 14.3 (12.8-19.8) |
| Checkers | 7.2 (6.2-9.9) | 6.3 (5.8-6.8) | 8.8 (6.8-11.7) |
| Large light objects | 5.5 (4.5-6.2) | 4.8 (4.2-5.8) | 5.7 (4.9-7.4) |
| Large heavy objects | 5.4 (4.5-6.9) | 4.9 (4.2-5.5) | 6.3 (5.3-7.9) |
| Total Jebsen score | 168.8 (147.9-229.3) | 151.8 (121.1-166.7) | 218 (164.2-247.9) |
| Jamar test (kg) | | | |
| Completed test, n (%) | 43 (100%) | 16 (100%) | 27 (100%) |
| Dominant hand | 22 (14-28.5) | 27.5 (22.5-32) | 18 (12-24.5) |
| Non dominant hand | 19 (13.5-25) | 24.5 (18-27) | 16 (11.5-20.5) |
| Pinch test (kg) | | | |
| Completed test, n (%) | 43 (100%) | 16 (100%) | 27 (100%) |
| Dominant hand | 5.5 (4-7.5) | 6.3 (4.9-8) | 5 (3.5-7) |
| Non dominant hand | 5.5 (4.5-6.75) | 6 (4.9-7) | 5 (3.5-6.4) |

B = both; D = dominant; kg = kilograms; ND = non dominant; sec = seconds; PD = peritoneal dialysis.

**Table 3**. Proportion of patients with results within the normal range of the general population, n (%)

| | Total | Self-PD | Assisted-PD |
|---|---|---|---|
| Purdue Pegboard | | | |
| Dominant hand | 2 (4.7%) | 1 (6.3%) | 1 (3.7%) |
| Non dominant hand | 5 (11.6%) | 1 (6.3%) | 4 (14.8%) |
| Both hands | 3 (7%) | 1 (6.3%) | 2 (7.4%) |
| Sum | 4 (9.3%) | 1 (6.3%) | 3 (11.1%) |
| Assembly test | 0 | 0 | 0 |
| Jebsen test | | | |
| Dominant hand | | | |
| Writing | 8 (18.6%) | 7 (43.8%) | 1 (3.7%) |
| Cards | 5 (11.6%) | 3 (18.8%) | 2 (7.4%) |
| Small objects | 0 | 0 | 0 |
| Simulated feeding | 0 | 0 | 0 |
| Checkers | 0 | 0 | 0 |
| Large light objects | 2 (4.7%) | 2 (12.5%) | 0 |
| Large heavy objects | 3 (7%) | 3 (18.8%) | 0 |
| Non dominant hand | | | |
| Writing | 13 (30.2%) | 8 (50%) | 5 (18.5%) |
| Cards | 4 (9.3%) | 2 (12.5%) | 2 (7.4%) |
| Small objects | 0 | 0 | 0 |
| Simulated feeding | 0 | 0 | 0 |
| Checkers | 0 | 0 | 0 |
| Large light objects | 0 | 0 | 0 |
| Large heavy objects | 1 (2.3%) | 1 (6.3%) | 0 |
| Jamar test | | | |
| Dominant hand | 4 (9.3%) | 3 (18.8%) | 1 (3.7%) |
| Non dominant hand | 3 (7%) | 2 (12.5%) | 1 (3.7%) |
| Pinch test | | | |
| Dominant hand | 1 (2.3%) | 0 | 1 (3.7%) |
| Non dominant hand | 1 (2.3%) | 0 | 1 (3.7%) |
| MoCA | 14 (32.6%) | 10 (62.5%) | 4 (14.8%) |

PD = perioneal dialysis; MoCA = Montreal Cognitive Assessment.

**Table 4.** Association between hand function and assisted peritoneal dialysis (Cox models)

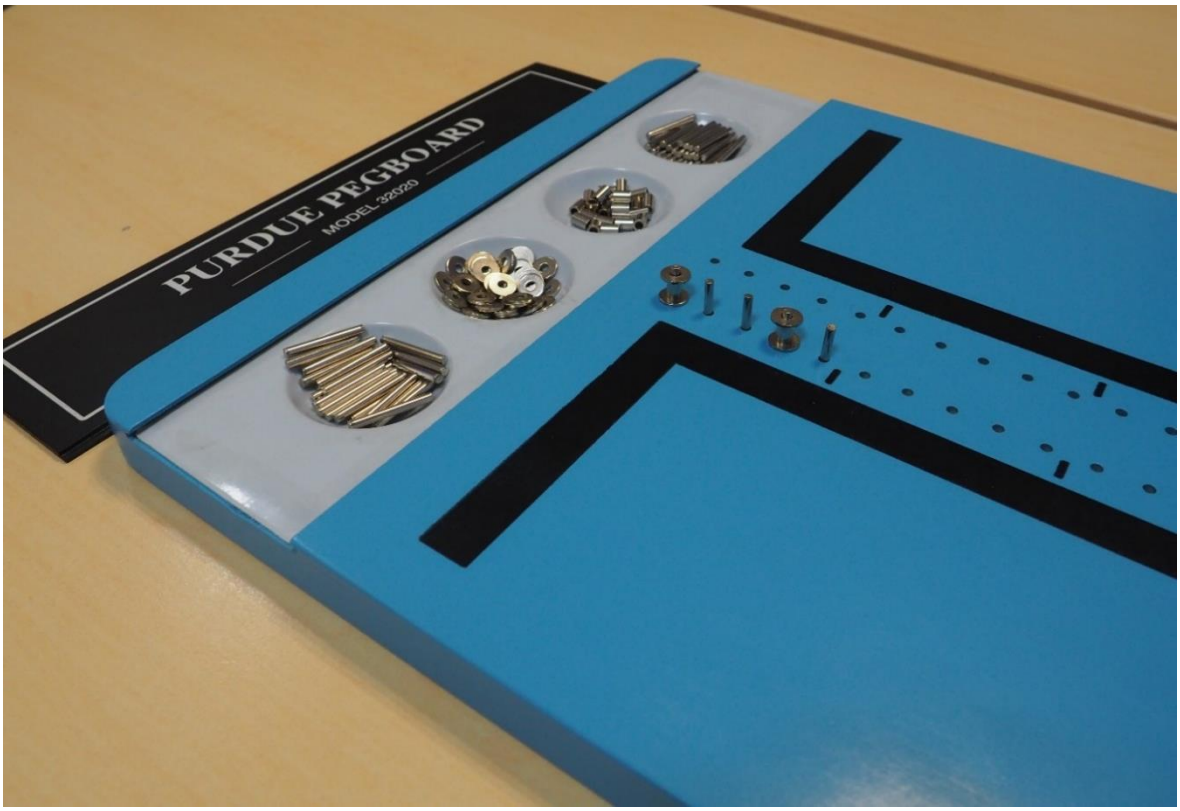
| | Unadjusted | | Adjusted on Charlson | |
|---|---|---|---|---|
| | RR (95% CI) | p value | RR (95% CI) | p value |
| Purdue Pegboard | | | | |
| Dominant hand | 0.87 (0.77-0.96) | 0.018 | 0.90 (0.76-1.03) | 0.137 |
| Non dominant hand | 0.87 (0.79-0.96) | 0.027 | 0.91 (0.79-1.05) | 0.236 |
| Both hands | 0.83 (0.74-0.92) | 0.007 | 0.86 (0.73-0.98) | 0.072 |
| Sum | 0.95 (0.91-0.98) | 0.013 | 0.96 (0.91-1.01) | 0.123 |
| Assembly test | 0.91 (0.85-0.95) | 0.004 | 0.92 (0.86-0.98) | 0.020 |
| Jebsen test | | | | |
| Dominant hand | | | | |
| Writing | 1.02 (1.01-1.04) | 0.005 | 1.01 (1.01-1.04) | 0.030 |
| Cards | 1.13 (1.07-1.27) | 0.014 | 1.13 (1.04-1.26) | 0.031 |
| Small objects | 1.08 (1.03-1.18) | 0.037 | 1.05 (0.98-1.17) | 0.266 |
| Simulated feeding | 1.07 (0.99-1.14) | 0.116 | 1.04 (0.95-1.13) | 0.478 |
| Checkers | 1.13 (1.05-1.35) | 0.028 | 1.12 (0.99-1.31) | 0.057 |
| Large light objects | 1.07 (1.04-1.67) | 0.060 | 1.09 (1.05-1.59) | 0.032 |
| Large heavy objects | 1.06 (1.04-1.54) | 0.070 | 1.09 (1.04-1.45) | 0.031 |
| Non dominant hand | | | | |
| Writing | 1.01 (1.01-1.02) | 0.005 | 1.01 (1.00-1.02) | 0.028 |
| Cards | 1.09 (1.05-1.22) | 0.011 | 1.10 (1.05-1.21) | 0.018 |
| Small objects | 1.13 (1.08-1.25) | 0.001 | 1.12 (1.07-1.26) | 0.006 |
| Simulated feeding | 1.03 (0.97-1.10) | 0.240 | 1.01 (0.94-1.08) | 0.777 |
| Checkers | 1.09 (1.06-1.35) | 0.009 | 1.08 (1.03-1.33) | 0.039 |
| Large light objects | 1.13 (1.08-1.64) | 0.018 | 1.17 (1.09-1.59) | 0.014 |
| Large heavy objects | 1.15 (1.10-1.48) | 0.012 | 1.19 (1.09-1.44) | 0.009 |
| Total Jebsen score | 1.01 (1.00-1.01) | 0.002 | 1.01 (1.00-1.01) | 0.011 |
| Jamar test | | | | |
| Dominant hand | 0.94 (0.90-0.97) | 0.008 | 0.94 (0.90-0.99) | 0.022 |
| Non dominant hand | 0.93 (0.88-0.98) | 0.010 | 0.94 (0.88-0.98) | 0.023 |
| Pinch test | | | | |
| Dominant hand | 0.85 (0.72-1.03) | 0.102 | 0.87 (0.72-1.06) | 0.182 |
| Non dominant hand | 0.86 (0.69-1.08) | 0.186 | 0.85 (0.68-1.08) | 0.186 |

CI = confident interval; RR = relative risk.

## FIGURES

**Figure 1**. The Jebsen test

**Figure 2**. The Purdue Pegboard test



# Annexes

# PROTOCOLE D'ETUDE

## Objectif de l'étude

L'objectif principal de ce travail est d'estimer la faisabilité de l'évaluation de la dextérité manuelle des patients prévalents en dialyse péritonéale à l'aide de tests validés et de rechercher une association entre la dextérité manuelle et l'assistance en dialyse.

## Matériels et méthode

### Population étudiée

Critères d'inclusion : patients prévalents en dialyse péritonéale du CHU de Caen, âge > 18 ans

Critères d'exclusion : mineur, patient ne parlant pas français, refus de consentement

### Variables extraites

- Démographiques : âge, sexe, niveau d'éducation, statut socio-professionnel, le côté dominant (droitier ou gaucher)
- Comorbidités : score de Charlson, score de Charlson modifié, diabète, néphropathie initiale
- Dialyse péritonéale : modalité de dialyse péritonéale (DPCA ou DPA), assistance, durée en dialyse péritonéale
- Troubles cognitifs : MOCA
- Biologie : hémoglobine, Albumine
- Impossibilité de réaliser le test et raison

- Motif de la présence d'une assistance d'après les infirmières référentes de dialyse péritonéale
- Intérêt pour un programme de rééducation manuelle avec des ergothérapeutes

**Tests d'évaluation de la dextérité manuelle utilisés**

- Purdue Pegboard
- Jebsen Test
- Jamar
- Pinch

**Statistiques**

Les variables continues seront décrites par leur moyenne et écart type, la médiane et les 1 et 3 quartiles dans le cas d'une distribution asymétrique. Les variables catégorielles seront décrites par la proportion et pourcentage. Une description de la distribution des variables dans les deux groupes (assistés et non assistés) sera réalisée. Pour éviter le problème de multiplicité des tests, aucun test de comparaison des 2 groupes ne sera effectué. La faisabilité de l'évaluation de la dextérité manuelle sera estimée par le pourcentage de tests complétés et par la durée pour les effectuer. Le pourcentage de tests avec des valeurs normales selon la population générale sera décrit. L'association entre la dextérité manuelle et la DP assistée sera évaluée par un modèle de Cox, qui mesure les risques relatifs. Les risques relatifs seront calculés individuellement pour chaque paramètre de chaque test. Le résultat de chaque test sera ajusté sur le score de Charlson qui inclue l'âge et les comorbidités. L'intervalle de confiance des coefficients sera utilisé pour exprimer l'incertitude des résultats. La méthode du boostrap sera utilisée pour estimer l'intervalle de confiance des coefficients du modèle.

**Déroulement de l'étude**

Tous les patients prévalents en dialyse péritonéale au CHU de Caen, majeurs et ayant donné leur accord seront inclus dans l'étude. Le jour d'une consultation de suivi habituel de dialyse péritonéale, les patients seront inclus dans l'étude après obtention d'un consentement oral. Le même jour, un bilan biologique sera prélevé parmi lequel les valeurs d'hémoglobine et d'albumine seront relevées. Le dossier médical et le Registre de Dialyse Péritonéale de Langue Française seront consultés pour évaluer les comorbidités (score de Charlson, score de Charlson modifié, diabète, néphropathie initiale), la modalité et la durée de dialyse, la présence d'une assistance. Les infirmières référentes de dialyse péritonéale seront interrogées sur la raison de la présence d'une assistance le cas échéant. Les patients bénéficieront ensuite d'une seconde consultation par l'interne en charge de l'étude, au cours de laquelle ils passeront les tests de dextérité manuelle (Purdue Pegboard, Jebsen test, Jamar, pinch test) et une évaluation cognitive par le Montreal Cognitive Assessment (MoCA). En cas d'impossibilité pour réaliser l'un des tests, la cause sera notée. Ils seront également interrogés sur leur niveau d'éducation et leur statut socio-économique. La durée de cette seconde consultation est estimée à 1 heure environ. Le matériel pour les tests sera emprunté au service de Médecine Physique et Réadaptation.

# ACCORD DU COMITE DE PROTECTION DES PERSONNES (CPP)

**COMITE DE PROTECTION DES PERSONNES**
**ILE-DE-FRANCE V**

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Avenue de la Côte de Nacre
14033 CAEN

Paris, le 13 juin 2018

Le Comité avait été saisi, **par courriel du 29 mai 2018,** d'une demande d'avis initial concernant le projet de recherche biomédicale ci-dessous référencé.

**18035: RIPH Cat 3** Autres recherches biomédicales
**N° IDRCB :** 2018-A01523-52
**Titre :** « Faisabilité de l'évaluation de la dextérité manuelle en pratique courante chez des patients traités par dialyse péritonéale »
Promoteur **: CHU DE CAEN**
**Investigateur principal: Docteur Béchade Clémence Service de Néphrologie-Dialyse-Transplantation**
Centre Universitaire des Maladies Rénales -CHU de Caen
**Rapporteurs CPP : Pr BOFFA – Mr BESSIERE**

Le Comité avait examiné les informations relatives à cette demande lors de la séance du **mardi 5 juin 2018 et demandé d'apporter des modifications.**

Le Comité a examiné les documents modifiés envoyés par mail **le 14 juin 2018** et adopté la décision suivante : **AVIS FAVORABLE les modifications demandées ayant été faites.**

La Présidente
Annie KURTZ

Le Vice-président
Jean-Jacques BOFFA

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« Par délibération de son Conseil en date du 10 Novembre 1972, l'Université n'entend donner aucune approbation ni improbation aux opinions émises dans les thèses ou mémoires. Ces opinions doivent être considérées comme propres à leurs auteurs ».

VU, le Président de Thèse

VU, le Doyen de la Faculté

VU et permis d'imprimer
en référence à la délibération
du Conseil d'Université
en date du 14 Décembre 1973

Pour le Président
de l'Université de CAEN et P.O

Le Doyen

ANNEE DE SOUTENANCE : 2019

NOM ET PRENOM DE L'AUTEUR : BEAUMIER Mathilde

TITRE DE LA THESE **: La dextérité manuelle est-elle associée à la dialyse péritonéale assistée ? Une étude transversale**

RESUME DE LA THESE EN FRANÇAIS :
**Introduction** : Il existe une hétérogénéité en ce qui concerne l'utilisation de la dialyse péritonéale (DP) assistée entre les centres. Le handicap fonctionnel est l'une des causes de DP assistée. Des outils évaluant la capacité du patient à manipuler le matériel de DP sont nécessaires. L'objectif de cette étude était d'estimer la faisabilité de ces tests en pratique quotidienne et de tester l'association entre dextérité et assistance en DP.
**Matériels et méthode** : Tous les adultes majeurs traités par DP dans notre centre en janvier 2019 ont été inclus. La dextérité manuelle était évaluée par le Purdue Pegboard, le Jebsen, le Jamar et le pinch. Les risques relatifs ont été calculés avec un modèle de Cox en estimant l'association entre la DP assistée et chacun des tests.
**Résultats** : Parmi les 43 patients en DP inclus, 16 étaient autonomes et 27 étaient assistés. Le Jebsen et le Purdue Pegboard ont été complétés par 41 patients (95.3%). Tous les patients ont effectué le Jamar et le pinch. Le temps médian pour compléter tous les tests était de 22 minutes. Après ajustement sur le score de Charlson, le test d'assemblage du Purdue Pegboard (RR 0.92 [CI 95% 0.86-0.98]), le score total du Jebsen (RR 1.01 [CI 95% 1.00-1.01]) et le Jamar (RR 0.94 [CI 95% 0.90-0.99] avec la main dominante, RR 0.94 [CI 95% 0.88-0.98] avec la main non dominante) étaient associées à l'utilisation de la DP assistée.
**Conclusion** : L'évaluation de la dextérité manuelle des patients en DP est faisable en pratique quotidienne en utilisant le Jebsen, le Purdue Pegboard, le pinch et le Jamar. L'évaluation de la dextérité est associée à l'utilisation de la DP assistée. Des études sont nécessaires pour déterminer si l'évaluation de la dextérité est associée au devenir en dialyse péritonéale.

MOTS CLES : Dextérité manuelle ; dialyse péritonéale ; assistance ; Jamar ; pinch ; Purdue Pegboard ; Jebsen

TITRE DE LA THESE EN ANGLAIS**: Is hand function associated with assisted peritoneal dialysis? A cross sectional study**

RESUME DE LA THESE EN ANGLAIS :
**Background**: There is a heterogeneity between centres regarding the utilization of assisted peritoneal dialysis (PD). Functional impairment is one of the leading causes of assisted PD. Tools to assess the patient ability to manipulate PD devices are required. The objective of this study was to evaluate the feasibility of hand function evaluation in PD patient and to test the association between hand function estimation and assisted PD.
**Methods**: This was a cross sectional study of adults treated by PD in our centre in January 2019. Hand function was evaluated by Purdue Pegboard, Jebsen, Jamar and pinch tests. Relative risks were calculated with a Cox model to evaluate the association between each test and assisted PD.
**Results**: Among the 43 PD patients included, 16 were autonomous and 27 were assisted. Jebsen test and Purdue Pegboard were completed by 41 patients (95.3%). All patients succeeded in performing Jamar and pinch test. Median time to complete all tests was 22 minutes. After adjustment on the Charlson comorbidity index, assembly test of the Purdue Pegboard (RR 0.92 [CI 95% 0.86-0.98]), total Jebsen score (RR 1.01 [CI 95% 1.00-1.01]) and Jamar test (RR 0.94 [CI 95% 0.90-0.99] with dominant hand, OR 0.94 [CI 95% 0.88-0.98] with non-dominant hand) were associated with assisted PD.
**Conclusion**: Evaluation of hand function of PD patients is feasible in daily practice using Jebsen test, Purdue Pegboard, pinch and Jamar test and associated with the utilization of assisted PD. Further studies are needed to assess whether dexterity tests are associated with the outcome on PD.

KEY WORDS: Hand function; peritoneal dialysis; assistance; Jamar; pinch; Purdue Pegboard; Jebsen test