

Article details: 2013-0050	
Title	Geographical and regional variation in the use of peritoneal dialysis in Canada: a cohort study
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Reviewer 1	Brendan Barrett
Institution	Health Sciences Centre, Patient Research Centre, St. John's, NL
General comments	<p>Dr. Sood et al analyzed data from the Canadian dialysis registry (CORR) over a ten year period to examine the variability in use of Peritoneal Dialysis. In multilevel analyses they examine the relative contribution of patient, facility and regional factors to the variability in use. The results show variability attributable to facility and region (almost 13% combined) and the authors suggest that health policy interventions might be effective in reducing variability, presumably by increasing the use of PD in currently low use facilities and regions.</p> <p>The authors comment on the two fold difference in PD proportion comparing Toronto and Vancouver (high use) to low use regions. It is noteworthy that these are the biggest cities in the country as Quebec was left out of this study.</p> <p>One weakness lies in the registry nature of the data which may miss factors relevant to the decision making process in choice of dialysis modality. The nature of the study makes it hard to assess which policy interventions might be appropriate here. Nevertheless this study noting variability does provide an incentive to continue to work on factors associated with choice of dialysis modality. It seems inherent to the authors argument that there should be greater utilization of PD relative to hemodialysis, but the rationale for this contention needs to be more explicit. The nature of the study does not permit an assessment of what role assisted PD might play and there is no consideration of the relative costs associated with that option, especially if the population treated is dispersed as opposed to concentrated in an urban setting such as Toronto or Vancouver.</p>
Reviewer 2	Alice Dragomir
Institution	Surgery/Urology, McGill University and the Research Institute of the McGill University Health Centre, Montréal, Que.
General comments	<p>General comments:</p> <p>The manuscript 'Geographical and regional variation in the use of peritoneal dialysis in Canada: A cohort study' is a study of a cohort of 31,778 incident dialysis patients identified over 56 dialysis facilities and 14 geographic regions from the Canadian Organ Replacement Registry between January 2001 and December 2010.</p> <p>The primary objective of this study was to examine the degree of variation in peritoneal dialysis (PD) utilization across regions in Canada, and to estimate the influence of facility and regional level characteristics on variation. The topic is of contemporary interest and the cohort constituted from the Canadian Organ Replacement Registry which includes all end-stage renal disease (ESRD) cases in Canada is a distinct strength of this investigation. In contrast, Quebec's cases were not included in the study cohort.</p> <p>The main finding of this paper is that there is significant variation in the use of peritoneal dialysis based on the treating facility and geographic region, among end-stage renal disease patients in Canada. This variation was persistent after adjustment for known patient- and facility- related factors that influence peritoneal dialysis use. My specific comments about this manuscript include the following:</p> <p>Major concerns</p> <ol style="list-style-type: none"> 1. Statistical analysis: For each variable in Table 1 please specify the test that was used. 2. Page 8, para 2. Despite the fact that the multilevel modeling seems to be the most appropriate approach to answer to this research question, I was confused on interpreting the results shown in table 2. I suggest to the authors to give more details on this method. 3. In page 8, line 34-37, it was specified "Facility and geographic variation were determined by intra-class correlation" without any further details. I suggest to the authors to give more details on this method as well. 4. In addition, the Table 2 is entitled "Multi-level model analysis of the unadjusted and adjusted variation (percentage) at the facility and geographic level for peritoneal dialysis utilization" but the results are presented as "percentage variation determined by the interclass correlation coefficient". Please provide details on how these two methods (multi-level model analysis and interclass correlation coefficient) are working together. 5. There are two different terminologies used in the text which referred the same method (intra-class correlation on page 8, line 37, versus interclass correlation, page 17, line 34). Please specify which one is the exact terminology. <p>Minor comments</p> <ol style="list-style-type: none"> 1. ESRD abbreviation was used for the first time in page 6, line 32, but was not previously defined. <p>Reviewed by: Alice Dragomir, MSc, PhD Assistant Professor, McGill University Scientist, The Research Institute of the McGill University Health Center</p> <p>Please note that I have no conflict of interest in reviewing this manuscript.</p>
Reviewer 3	Frederick Finkelstein
Institution	Medicine, Yale University, New Haven, CT
General comments	<p>This paper is well written and the data is analyzed properly -- including the important distinction between utilization at dialysis initiation and day 90.</p> <p>The authors seem to suggest that more folks could be placed on PD through policy changes and standardization of PD initiation criteria -- and this is something the government and nephrology community should strive for. But is this really the correct conclusion? Patient selection of treatment modality is what we should be focusing on --</p>

	<p>leaving cost issues aside for the moment. What would patients really choose if treatment options were presented equitably and fairly? Would this vary in different regions? Would the true percentage of patients opting for PD be 50% or 30% or 15%? Would it be the same in different regions of Canada? Are there not cultural differences amongst northern Alberta, northern Quebec and southern Ontario? In Hong Kong, 85% of patients who initiate dialysis start on PD -- this is mandated by the government (via the reimbursement policy). But, is that the approach the authors think the nephrology community should endorse? Isn't the more appropriate approach to permit patients to select their treatment once appropriate education is provided? The financial issues can be dealt with once you know what patients will select (in the U.S., dialysis facilities get the same reimbursement for PD and HD even though the cost of PD is less). Do you really want the government to dictate patient treatment selection? Would the Hong Kong model (or some variation of this model) be accepted in Canada?</p>
Reviewer 4	Arsh Jain
Institution	Medicine, Nephrology, London Health Sciences Centre, The University of Western Ontario, London, Ont.
General comments	<p>This is a very interesting study aiming to determine the impact of facility and geographic variation on the use of PD in Canada. The authors reviewed data on 31, 778 incident dialysis patients from 56 dialysis facilities, in 14 geographic regions, using data from CORR. Multilevel models were used to evaluate the variation in use of PD by facility- and geographic-level.</p> <p>The main finding was that 9.3 and 3.4% of the variability in PD use was attributable to facility and geographic factors.</p> <p>This is an important and interesting finding. It highlights the disparities in care and differences in approaches to management at different facilities and in different regions. It serves as a call to action for laggard facilities/areas to improve access to this form of therapy.</p> <p>I have a few comments.</p> <p>METHODS:</p> <p>"Distance to center was calculated as the direct linear distance in kilometers between a patients postal code from their primary residence at dialysis initiation to the nearest dialysis provider using Vincenty's formula (23)."</p> <p>What about satellite dialysis centres (where the primary nephrologist may be located remotely from the nearest dialyzing centre), how was this captured or adjusted for?</p> <p>"Models were adjusted for facility level factors (percentage central venous catheter use, transplantation facility, average hemoglobin and phosphate, number of patients) and patient case mix (age, sex, BMI, race, co-morbidities, distance to facility, length of pre-dialysis care, serum phosphate, albumin and hemoglobin)."</p> <p>CORR, in the past, has demonstrated that facility level size and percent of dialysis patients doing PD impact technique failure and morality of PD patients. ("Effect of renal center characteristics on mortality and technique failure on peritoneal dialysis." SCHAUBEL et al. KI 2001) Does your metric of "number of patients" reflect a similar concept? What impact would adjusting for the percent of prevalent patients doing PD have on the likelihood of starting PD vs HD?</p> <p>Also, as a discussion point this study demonstrated that as the percent starting increased there was a decrease in technique failure. Thus, centres with low use might simply see PD as a second rate therapy.</p> <p>"Unadjusted, fully adjusted and reduced models were created. Variables in the reduced models were included based on statistical significance in fully adjusted models."</p> <p>Forwards or Backwards stepwise regression? OR univariate analyses which were significant were included?</p> <p>How were the distance cutoffs chosen (see table 3)?</p> <p>"The study included 31,778 patients who initiated dialysis in 56 facilities across 14 regions. Patients on PD by 90 days were younger, more likely to be female, more likely to receive pre-dialysis care and have fewer co-morbid conditions (Table 1)."</p> <p>What about the distances from the facilities as a baseline characteristic? Should this be listed to allow the reader compare HD to PD overall? Also, would be nice to know how many patients fell into each of the distance group.</p> <p>DISCUSSION</p> <p>Relative to other factors, how significant is the variation due to facility and geographic region? ie are there factors (e.g. patient-level) that are this impactful? Although you cannot describe explicitly (due to limitations of the data set) is patient choice the biggest driver of the discrepancy here?</p> <p>Table 3:</p> <p>Was the 'age' variable measure in per year? (or something else per decade)</p>
Author response	<p>Reviewer 1: Brendan Barrett</p> <p>1. One weakness lies in the registry nature of the data which may miss factors relevant to the decision-making process in choice of dialysis modality.</p> <p>Response: Agree and added a statement to reflect this weakness in the discussion</p> <p>"Our study had limitations. As our study examined registry data, we lacked information on why patients were deemed ineligible for peritoneal dialysis such as poor functional status, patient preference, cognitive capacity, and socioeconomic factors."</p> <p>3. It seems inherent to the authors' argument that there should be greater utilization of PD relative to hemodialysis, but the rationale for this contention needs to be more explicit. The nature of the study does not permit an assessment of what role assisted PD might play and there is no consideration of the relative costs</p>

associated with that option, especially if the population treated is dispersed as opposed to concentrated in an urban setting such as Toronto or Vancouver.

Response: Agree and we softened the language throughout the manuscript to better reflect the uncertainty regarding optimal PD usage.

Introduction:

"Considering the multitude of factors that may influence use plus the lack of standardized, evidence-based criteria for peritoneal dialysis suitability, it follows that there may be considerable variation in its use across facilities and regions and the optimal usage of peritoneal dialysis remains unknown"

We added a statement in the limitations acknowledging our lack of information on assisted PD programs.

"We were unable to account for assisted peritoneal dialysis programs that may facilitate easier peritoneal dialysis usage, especially in urban areas."

Reviewer 2: Alice Dragomir

Major concerns

1. Statistical analysis: For each variable in Table 1 please specify the test that was used.

Response: Added as a footnote to the table

"Significance testing for all continuous variables was by the student's t-test except the median distance to facility where the Mann-Whitney test was used. Categorical variables were examined by the chi-square test."

2. Page 8, para 2. Despite the fact that the multilevel modeling seems to be the most appropriate approach to answer to this research question, I was confused on interpreting the results shown in table 2. I suggest to the authors to give more details on this method.

3. In page 8, line 34-37, it was specified "Facility and geographic variation were determined by intra-class correlation" without any further details. I suggest to the authors to give more details on this method as well.

4. In addition, the Table 2 is entitled "Multi-level model analysis of the unadjusted and adjusted variation (percentage) at the facility and geographic level for peritoneal dialysis utilization" but the results are presented as "percentage variation determined by the interclass correlation coefficient". Please provide details on how these two methods (multi-level model analysis and interclass correlation coefficient) are working together.

Response to 2-4. Agree and sorry for not being clear earlier. We added more detail and rationale for our methods used as follows:

"Variation in the multi-level model was determined by intra-class correlation (%) (29, 30). The intra-class correlation coefficient is the ratio of variance between levels in a multi-level model to variance within each level. In our study the intra-class correlation coefficient determines the proportion of variation in peritoneal dialysis use that is due to being a member of a particular group such as patient, facility and geographic region and is reported as a percentage(31, 32)"

5. There are two different terminologies used in the text which referred the same method (intra-class correlation on page 8, line 37, versus interclass correlation, page 17, line 34). Please specify which one is the exact terminology.

Response: Corrected throughout.

Minor comments

1. ESRD abbreviation was used for the first time in page 6, line 32, but was not previously defined.

Response: Corrected.

Reviewer 3: Frederick Finkelstein

This paper is well written and the data are analyzed properly -- including the important distinction between utilization at dialysis initiation and day 90.

1. The authors seem to suggest that more folks could be placed on PD through policy changes and standardization of PD initiation criteria -- and this is something the government and nephrology community should strive for. But is this really the correct conclusion? Patient selection of treatment modality is what we should be focusing on -- leaving cost issues aside for the moment. What would patients really choose if treatment options were presented equitably and fairly? Would this vary in different regions? Would the true percentage of patients opting for PD be 50% or 30% or 15%? Would it be the same in different regions of Canada? Are there not cultural differences amongst northern Alberta, northern Quebec and southern Ontario? In Hong Kong, 85% of patients who initiate dialysis start on PD -- this is mandated by the government (via the reimbursement policy). But, is that the approach the authors think the nephrology community should endorse? Isn't the more appropriate approach to permit patients to select their treatment once appropriate education is provided? The financial issues can be dealt with once you know what patients will select (in the U.S., dialysis facilities get the same reimbursement for PD and HD even though the cost of PD is less). Do you really want the government to dictate patient treatment selection? Would the Hong Kong model (or some variation of this model) be accepted in Canada?

Response: We agree with the reviewer that patient choice regarding modality is paramount. We have added statements to highlight the importance that the optimal percentage of PD use is unclear.

"Considering the multitude of factors that may influence use plus the lack of standardized, evidence-based criteria for peritoneal dialysis suitability, it follows that there may be considerable variation in its use across facilities and regions and the optimal usage of peritoneal dialysis remains unknown"

And the importance of patient choice and the Hong Kong model.

"Another important contributor to the variation in modality use is patient choice. Canada still allows for patients who are medically suitable to freely decide their dialysis modality. Other countries such as Hong Kong have implemented a peritoneal dialysis first strategy that limits choice as the government will only cover the costs of dialysis therapy if patients choose peritoneal dialysis. This strategy has been successfully applied, resulting in a PD prevalence of over 80% whereas in jurisdictions without this policy and the inclusion of patient preferences, such as Canada and Europe, the historical PD prevalence is roughly 20-25%(37)."

After patient choice and differences in patient characteristics, we do feel practice variability is occurring due to differences in individual physicians and programs. We counter with the concern that patients may not receive or be offered PD simply based on where in the country they present or based on how modality education is performed. Quantitative means of measuring PD use (as we attempted to do in this study) allow for programs to create local quality control initiatives to attempt to improve PD use if they choose to do so. Also it serves as feedback and allows for internal reflection among programs/geographic regions as whether they believe PD use could be improved in their distinct program/region. We would not advocate that the government dictate patient choice rather it's up to individual facilities/regions to insure PD as an option is well represented.

Reviewer 4: Arsh Jain

METHODS:

1. "Distance to center was calculated as the direct linear distance in kilometers between a patients postal code from their primary residence at dialysis initiation to the nearest dialysis provider using Vincenty's formula (23)."

a. What about satellite dialysis centres (where the primary nephrologist may be located remotely from the nearest dialyzing centre)? How was this captured or adjusted for?

Response: Unfortunately satellite unit information was not captured. We added this to the limitations as follows: "Information on satellite hemodialysis units was not captured."

Anecdotally, we feel this may be contributing to PD use as areas that were more geographically dispersed with a high number of satellite units did some of the lower PD use (east and west Ontario and northern Alberta) however because we did not have direct satellite unit data, we refraining from commenting on this.

2. "Models were adjusted for facility level factors (percentage central venous catheter use, transplantation facility, average hemoglobin and phosphate, number of patients) and patient case mix (age, sex, BMI, race, co-morbidities, distance to facility, length of pre-dialysis care, serum phosphate, albumin and hemoglobin). "

a. CORR, in the past, has demonstrated that facility level size and percent of dialysis patients doing PD impact technique failure and morality of PD patients. ("Effect of renal center characteristics on mortality and technique failure on peritoneal dialysis." SCHAUBEL et al. KI 2001) Does your metric of "number of patients" reflect a similar concept? What impact would adjusting for the percent of prevalent patients doing PD have on the likelihood of starting PD vs. HD?

b. Also, as a discussion point, this study demonstrated that as the percent starting increased there was a decrease in technique failure. Thus, centres with low use might simply see PD as a second rate therapy.

Response for a and b: Dr Jain brings up an excellent point. We attempted to adjust for facility level factors what may influence PD use or reflect the quality of care however they were all indirect measures. We did not add % prevalent PD use at a site and simply limited our study to sites offering PD only. Adding historical PD prevalence data, for example from the 1990s, would be difficult as our study covered a decade worth of data and many centres/geographic regions underwent considerable changes over that time period that may not be reflected by historical PD use. We added the following to the discussion:

"Previous studies have reported the number of peritoneal dialysis patients treated at a facility to be associated with increases in technique failure and mortality(49). In our study, facility size was not significantly associated with peritoneal dialysis utilization."

As an aside, we did examine the variation in technique failure across Canada and found very little facility and geographic variability although we felt that was outside of the scope of this manuscript.

3. "Unadjusted, fully adjusted and reduced models were created. Variables in the reduced models were included based on statistical significance in fully adjusted models."

a. Forwards or Backwards stepwise regression? OR univariate analyses which were significant were included?

Response: We added the following to the methods to clarify:

Unadjusted, fully adjusted and reduced models were created. Variables in the reduced models were included if the p value was <0.01 in the full model and retained if p value remained < 0.05 in the reduced model.

b. How were the distance cutoffs chosen (Table 3)?

Response: Distance cut-offs were based on a previous Canadian publication that demonstrated an increase in infection-related mortality based on distance.

Tonelli M, Manns B, Culleton B, Klarenbach S, Hemmelgarn B, Wiebe N, et al. Association between proximity to the attending nephrologist and mortality among patients receiving hemodialysis. CMAJ. 2007 October 23, 2007;177(9):1039-44.

We added the following to the methods

"Distance to center was calculated as the direct linear distance in kilometers between a patients postal code from their primary residence at dialysis initiation to the nearest dialysis provider using Vincenty's formula and stratified based on a previous Canadian report"

4. "The study included 31,778 patients who initiated dialysis in 56 facilities across 14 regions. Patients on PD by 90 days were younger, more likely to be female, more likely to receive pre-dialysis care and have fewer co-morbid conditions (Table 1)."

a. What about the distances from the facilities as a baseline characteristic? Should this be listed to allow the reader compare HD to PD overall?

b. Also, it would be nice to know how many patients fell into each of the distance groups.

Response: Agree and added to Table 1 as a proportion. More patients on HD resided within 50 km of a dialysis facility (76.8 vs. 70.4%) and more patients on PD resided > 150 km (11.8 vs. 8.0%). In the smallest group (8% > 150 km on HD, there were 1895 patients).

RESULTS

5. Table 3: Was the 'age' variable measure in per year? (or something else per decade)

Response: Correct. Age was per year.

DISCUSSION:

6. Relative to other factors, how significant is the variation due to facility and geographic region? Are there factors (e.g. patient-level) that are this impactful? Although you cannot describe explicitly (due to limitations of the data set) is patient choice the biggest driver of the discrepancy here?

Response: To give the reader some context on the extent of the variation we added the following dialysis-based examples to the discussion:

"In our study, the measured variability in peritoneal dialysis uptake at the facility level is comparable to other reported facility-level variations in dialysis care. Two US studies reported facility-level variations in arteriovenous fistula use and achievement of dialysis adequacy of 7.6 and 11.5%, respectively among 173 facilities (38, 39)"

We do think patient choice is a big part of it however a lot of patient choice will be influenced by education. Not all Canadian centres will have multi-disciplinary care clinics, modality coordinators and educators and these differences, we believe, will ultimately lead to variations in modality usage.