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## Relationship between sufficiency and usefulness of patient education: A cross-sectional study of patients with chronic kidney disease

### Abstract

The aim of this descriptive study was to analyze the relationship between the sufficiency and usefulness of patient education from the perspective of people with chronic kidney disease. The goal was to discover whether both sufficiency and usefulness need to be analyzed in the quality evaluation of patient education. Patients undergoing predialysis or home dialysis care in Finland (n=162) evaluated both the sufficiency and usefulness of patient education provided by nephrology nurses by using parallel structured questionnaires. A strong relationship was found between the sufficiency and usefulness of patient education. The relationship was significant across all dimensions of empowering knowledge, but no systematic association was found between the sufficiency-usefulness relationship and background variables. Depending on the purpose of evaluating patient education, either aspect, i.e. sufficiency or usefulness, can be used, but it is not necessary to use both due to their strong inter-correlation. In terms of implications for practice, consideration of both sufficiency and usefulness is important when providing empowering patient education for people undergoing pre- or home dialysis, but only one aspect needs to be evaluated.

Key words: Hemodialysis, Home; Kidney Diseases; Nephrology Nursing; Patient Education as Topic; Peritoneal Dialysis; Surveys and Questionnaires

## 1 Introduction

The number of **people affected by** chronic kidney disease (CKD) is high globally, and **it is** expected to increase in the future. CKD is a complex disease that changes **people's** lives and burdens societies (Hill et al., 2016). **Patients receiving long-term care for chronic diseases, such as CKD, expect educational support through patient education in order to maintain and improve their health and wellbeing** (Chon, Yeun, Jung, Jo, & Lee, 2019; Narva, Norton, & Boulware, 2016). The quality of patient education must be ensured, and several different criteria **have been suggested for measuring the quality** (Narva et al., 2016). In this study, we focus on the sufficiency and usefulness of patient education. **There is a limited body of** research on these **two** criteria, especially **on the relationship** between them.

## 2 Background

Patients with CKD face complex problems, symptoms, and treatments, **which affect** their lives comprehensively (Alhajim, 2017; Eckert, Motemaden, & Alves,

2018; Narva et al., 2016). Patient education can support people's knowledge of CKD, their self-management of the disease (Enworom & Tabi, 2015), and their life quality (Eckert et al., 2018; Shahnavazi et al., 2018). Patient education can also support slowing down the progression of CKD (Devins, Mendelssohn, Barré, & Binik, 2003) and increase the survival rate (Devins, Mendelssohn, Barré, Taub, & Binik, 2005; Kurella Tamura et al., 2014). In order to achieve good care outcomes, patient education has to be high in quality, which includes that it is sufficient and useful (Narva et al., 2016; Zee et al., 2018).

Sufficient patient education means that an adequate degree of essential knowledge is delivered to support patients' empowerment (Funnell et al., 1991; Oxford Dictionary of English, n.d.). Sufficient patient education indicates that patients possess adequate ability, control and resources to manage their health problems, to make informed decisions, and to implement and evaluate the decisions (Funnell et al., 1991; Funnell & Anderson, 2003; van der Steen et al., 2018). Patient-centeredness (Borgsteede, Karapinar-Carkit, Hoffmann, Zoer, & van den Bemt, 2011) and starting the patient education in the early stages of CKD (Teasdale et al., 2017) have been connected with the sufficiency of patient education. Sufficiency evaluations conducted by patients themselves are subjective in nature and depend on patients' expectations. Furthermore, sufficiency does not necessarily inform us about the usefulness of patient education.

Useful patient education refers to education which patients need for their use and can implement in their lives and care (Kang & Lee, 2019). People with CKD have reported that patient education is useful and fairly sufficient (Zee et al., 2018) but the education has also been found to be complicated, confusing, too detailed (Combes, Sein, & Allen, 2017; Zala, Rütli, Arampatzis, & Spichiger, 2017), or sufficient only in some aspects (Combes et al., 2017).

The importance of both sufficiency and usefulness of patient education for people with CKD has been emphasized in some studies (Chan et al., 2019; Zala et al., 2017). For people in predialysis care, sufficient patient education involves crucial features, as these people are preparing to make a decision concerning the mode of dialysis (Devoe et al., 2016; Fortnum, Smolonogov, Walker, Kairaitis, & Pugh, 2015; Winterbottom et al., 2015). For people receiving peritoneal or home hemodialysis care, useful patient education is a precondition for the success of home dialysis (Rioux et al., 2015). As the advantages of home dialysis become more evident and its usage increases, the importance of patient education becomes even more pronounced (Morfin, Yang, Wang, & Schiller, 2018; Rioux et al., 2015). However, the amount of research in this clinical field is limited. The definitions of sufficiency and usefulness in patient education are equivocal and the relationship between sufficiency and usefulness is not clear. In this study, we aimed to analyze this relationship in order to investigate whether both sufficiency and usefulness need to be included in quality evaluations concerning pre and home dialysis

care. Thus, our main focus was to analyze the possible relationship between these two aspects of patient education.

The concept of empowering patient education was used as a theoretical framework. Important aspects of empowerment involve the patient's development, growth, activeness and control. Active collaboration, decision-making and problem-solving are also emphasized (Kuokkanen & Leino-Kilpi, 2008; Leino-Kilpi, Luoto, & Katajisto, 1998; Vaartio-Rajalin et al., 2014). In order to become empowered, patients require multidimensional knowledge. This study uses a division into six dimensions of empowering knowledge. The dimensions are biophysiological (e.g. biological changes and symptoms), functional (e.g. functions of the body and mind), social (e.g. social interaction), experiential (e.g. experiences and self-esteem), ethical (e.g. feeling of being valued as an individual human being), and economical (e.g. costs and financial benefits) (Leino-Kilpi et al., 1998).

## 2.1 Study aim

The aim of this study was to describe the relationship between sufficiency and usefulness of patient education from the perspective of patients with CKD undergoing predialysis (expecting dialysis in the future) or home dialysis care (peritoneal or home hemodialysis). The research questions were: 1. What kind

of relationship, if any, is there between **the** sufficiency and usefulness of patient education for patients in pre- and home dialysis **care**? 2. What background variables, if any, are **associated** to the relationship between sufficiency and usefulness of patient education for patients in pre - and home dialysis **care**?

### 3 Methods

#### 3.1 Design

**This descriptive cross-sectional study** was conducted in **the** dialysis units of **two hospital districts** in Finland. There are 20 hospital districts, **of which the two involved in study** cover a large part, i.e. 38.7% of the population **in Finland** (Ministry of Social Affairs and Health, 2013). **The participants were people with CKD, treated as patients in dialysis units.** Finnish-speaking adults (18 years or older) undergoing predialysis care or home dialysis (peritoneal dialysis and **home hemodialysis**) were eligible to participate in the study (N=322). Written informed consent was given by all **respondents**. This study was carried out in accordance with the Code of Ethics of the World Medical Association (Declaration of Helsinki) (World Medical Association, 2003). The study received ethical approval from the Ethics Committee of the University of Turku (19/2016).

In this study, patient education for patients in predialysis, peritoneal dialysis and home hemodialysis care was provided by nephrology nurses. The education was aimed at supporting knowledge, engagement in care and self-management of CKD. The content of the patient education varied based on patients' needs, expectations and stage of CKD, but the importance of self-care in the home environment was a common feature for all the patient groups included. The nurses utilized check lists to ensure the consistency of the education. All the six dimensions of empowering knowledge were covered in the education for all patients (Leino-Kilpi et al, 1998). Educational discourse, demonstrations and practical training with equipment were used, supported by written material. The education was structured and it continued for weeks.

### 3.2 Data collection

Data was collected using a written, structured questionnaire aiming to evaluate the sufficiency and usefulness of patient education. The content of the questionnaire was informed by the Dialysis Patient Informational Needs scale (Rantanen et al., 2008), Expected Knowledge of Hospital Patients scale (EKhp, Rankinen et al., 2007), Received Knowledge of Hospital Patients scale (RKhp, Leino-Kilpi et al., 2005) and relevant studies of patient education (e.g. Enworom & Tabi, 2015; Klemetti et al., 2015; Rioux et al., 2015), and negotiated in collaboration between researchers and clinicians. Permission to use and modify the copyrighted scales was obtained. The scales had been tested in earlier

studies and their validity and reliability had been demonstrated to be satisfactory (e.g. Klemetti et al., 2015; Rantanen et al., 2008).

Parallel versions of the questionnaire were used; the respondents were asked to respond to the same items to evaluate the sufficiency and usefulness of the patient education provided by nurses (34 items about sufficiency and 34 items about usefulness). The items in the questionnaire represented biophysiological (9), functional (10), social (6), experiential (3), ethical (3), and financial (3) dimensions of empowering knowledge (Table1, Leino-Kilpi et al., 1998). Furthermore, both general sufficiency and usefulness were evaluated with one item. A Likert scale (from 1: strongly disagree, to 4: strongly agree) was used, with higher scores indicating higher sufficiency and usefulness. The questionnaire also contained nine structured background variables: age, gender, perceived current health, care phase, family members' participation in education sessions, written education material received, information searched by patients themselves, experience of safe care, and experience of confidential care.

Based on piloting with five CKD patients, the questionnaire was amended to make it clearer and more succinct. Content and face validity were considered to be adequate by nephrology nurses and researchers. An acceptable level of internal consistency was also reached, with Cronbach's alpha ranging from 0.78 to 0.96 in the total scale and in the six dimensions of empowering knowledge.

Data was collected between September 2016 and November 2017. **The respondents** completed the questionnaire at the dialysis unit or at home.

### 3.3 Analysis

In this analysis, we concentrated on the relationship between the sufficiency and usefulness of patient education. Statistical analysis was conducted using SAS 9.3 software (SAS Institute, Inc., Cary, NC). **The sum variables were formed by calculating the mean of all items in the six dimensions of empowering knowledge.** The relationship between **the** sufficiency and usefulness of patient education was analyzed with Pearson correlation on the level of the sum variables of the instrument. Correlations of sufficiency and usefulness between dimensions of empowering knowledge were compared using the Raghunathan, Rosenthal, and Rubin's test. To compare correlations between the categories of background variables, the Fisher r-to-z transformation was used. Linear regression analysis was **also** used to reveal potential effects of background variables on the relationship between sufficiency and usefulness. P-values  $\leq 0.05$  were considered statistically significant.

## 4 Results

#### 4.1 Respondent characteristics

Of 322 eligible patients, 162 (50.3%) completed the questionnaire. Of the respondents, 45.3% were undergoing peritoneal dialysis, 30.2% predialysis, and 24.5% home hemodialysis. The mean value of current health perceived by the respondents was 7.2 on a scale from 0: very weak, to 10: very good (range 2.7–10, SD 1.8). The mean age of all respondents was 61 years (range 24–85 years, SD 14.3). More men (n=103, 63.6%) than women (n=59, 36.4%) participated in this study. Family members did not participate in education sessions for the majority of the respondents (n=102, 63%). Most of the respondents had received written information (n=143, 93.5%) and searched for information by themselves (n=126, 79.3%). The majority of the respondents experienced the care as fairly safe or very safe (n=155, 98.7%) and as fairly confidential or very confidential (n=145, 97.3%).

#### 4.2 Relationship between sufficiency and usefulness of patient education

Patients undergoing pre- and home dialysis care evaluated the patient education as both sufficient and useful. The mean value for general sufficiency was 3.273 (SD 0.544, scale 1–4). In the six dimensions of empowering knowledge, the range of mean values of sufficiency was 2.802–3.517.

Usefulness reached the mean value of 3.279 (SD 0.573), with the values for the dimensions of empowering knowledge ranging between 2.817 and 3.464.

The sufficiency and usefulness of patient education had a strong relationship (Table 1): when patient education was considered on a general level, the Pearson correlation between sufficiency and usefulness was 0.889, which is a statistically significant ( $p < 0.0001$ ) result. In addition, a statistically significant relationship ( $p < 0.0001$ ) was discovered in all empowering knowledge dimensions between the sufficiency and usefulness of patient education (range 0.716–0.843). The highest Pearson correlations between the sufficiency and usefulness were observed in the ethical ( $r = 0.843$ ) and experiential ( $r = 0.838$ ) dimensions of patient education. In contrast, the lowest Pearson correlations between sufficiency and usefulness concerned the biophysiological ( $r = 0.716$ ) and financial dimensions ( $r = 0.767$ ) of patient education. The difference was significant between the biophysiological and ethical dimensions ( $p = 0.002$ ) and between the biophysiological and experiential dimensions ( $p = 0.006$ ). The difference between ethical and financial dimensions was barely significant ( $p = 0.049$ ).

#### 4.3 Association of background variables with the sufficiency-usefulness relationship in patient education

Certain background variables were associated with the sufficiency-usefulness relationship in patient education in some dimensions (Table 2). It is, however, difficult to determine the underlying logic of these associations.

If respondents had not received written educational material, the relationship appeared to be stronger when patient education was considered on a general level ( $r = 0.976$  vs.  $0.881$ ,  $p=0.048$ ), and in two dimensions as well (biophysiological,  $r = 0.954$  vs.  $0.683$ ,  $p=0.013$  and financial,  $r = 0.982$  vs.  $0.817$ ,  $p=0.008$ ). The relationship was stronger in the ethical dimension in respondents who had not searched for information by themselves ( $r = 0.947$  vs.  $0.824$ ,  $p = 0.004$ ) and in respondents who had experienced the care to be slightly or fairly safe, compared to those who had experienced it as very safe ( $r = 0.908$  vs.  $0.757$ ,  $p = 0.005$ ). Furthermore, the relationship was stronger in the experiential dimension ( $r = 0.880$  vs.  $0.767$ ,  $p = 0.046$ ) in respondents whose family members had not participated in education sessions. Linear regression analysis did not reveal any further significant effects of background variables on the sufficiency-usefulness relationship.

## 5 Discussion

The objective of this study was to describe the relationship between sufficiency and usefulness of patient education for patients in pre- and home dialysis.

Sufficient patient education provides **adequate skills**, control and knowledge for **the** empowerment of patients (Funnell et al., 1991), while useful patient education meets patients' practical needs (Kang & Lee, 2019). Both sufficiency and usefulness are essential for patient education that aims to support patients' self-management in the home environment (Chon et al., 2019; Rioux et al., 2015; Teasdale et al., 2017). This study **showed** that there is a positive relationship between sufficient patient education and useful patient education. **In other words**, when **people undergoing pre- and home dialysis care evaluate patient education as sufficient**, it is also useful, and vice versa. This gives **us a** possibility to evaluate both **aspects even when** measuring only one of them. Information about **these two** aspects of patient education can be obtained by assessing either sufficiency or usefulness, a finding that can be utilized in research and practice.

**People** with CKD have diverse needs for patient education (Narva et al., 2016; Zala et al., 2017). This study **showed** that the sufficiency and usefulness of patient education **were related to** various dimensions of patients' lives, which means that when patient education is evaluated as sufficient, **it can also be considered** useful in that same dimension. The strongest **relationships** between sufficiency and usefulness **were observed** in the ethical and experiential dimensions. **The sufficiency-usefulness relationship was weakest** in the biophysiological dimension, **even though when assessed separately**, the sufficiency and usefulness of the biophysiological dimension had the highest mean values. Previous studies suggest that **patients with CKD require more**

information about biophysiological aspects of their health problem. (Lopez-Vargas et al., 2014; Teasdale et al., 2017). The same observation has been made with patients with cancer (Mesters, van den Borne, De Boer, & Pruync, 2001; Vaartio-Rajalin et al., 2014). The findings of our study suggest that even if patient education is sufficient as regards biophysiological issues, it may lack usefulness from the patients' perspective, or the other way around.

The data analysis further revealed that the relationship between sufficiency and usefulness was significantly strong across all empowering knowledge dimensions. This finding suggests that if patient education is sufficient in some dimensions, it can be useful for patients in other dimensions, too. Based on these results, we can assume that when evaluating the sufficiency and usefulness of patient education, it is not necessary to assess all dimensions with multiple items since there is a strong relationship across all dimensions.

No systematic association was found between background variables and the sufficiency-usefulness relationship. Nevertheless, a stronger relationship between sufficiency and usefulness was observed in several dimensions when family members had not participated in education sessions, when respondents had not received written educational material or had not independently searched information, or when they had experienced the care as slightly or fairly safe. These findings indicate that if patients have less information, less support from family members, or have doubts about the safety of the care, they are

more likely to experience sufficient patient education as useful. Although no clear logic was found, some reasoning might explain the results. For example, patients who have received written educational material, may experience the relationship between sufficiency and usefulness of patient education as less strong. In other words, these patients might have more knowledge and thus feel that they have no need for patient education, and hence evaluate it as being less useful for them. As a result, even though patient education is sufficient, a weaker relationship between sufficiency and usefulness of patient education may be observed. However, this reasoning requires more research.

This study has a few limitations concerning the patient education, questionnaire, and sample. First, in this study design, we only know about the standard practice of patient education for people undergoing pre- and home dialysis care. In practice, education is modified individually and different dimensions may be emphasized based on individual patients' needs. Consequently, conclusions about the relationship between sufficiency and usefulness of patient education must be made with caution.

Second, the limitations concerning the questionnaire have to do with the finding that the sufficiency-usefulness relationship was strong across all dimensions of empowering knowledge. This can indicate that the dimensions in the questionnaire may have not been distinct enough. We also have to consider the risk of acquiescence bias, which can lead to distortion of the inter-item

**correlation matrix pattern.** Respondents who are satisfied with the patient education tend to give favorable answers for similar items (Navarro-González, Lorenzo-Seva, & Vigil-Colet, 2016). **However, the** questionnaire was piloted with 5 patients before the study **and approved with minor changes based on the pilot test.**

**Third, we lack some information about the sample. We do not know why some people declined to take part in the study. Neither do we have information about the respondents' self-care motivation or educational background. In addition, some respondents completed the questionnaire at home, and family members may have assisted them. Family members may well be competent to evaluate patient education, yet the sufficiency-usefulness relationship needs to be confirmed using diverse samples in future studies.**

**As for the generalization of the results,** the number of respondents **was adequate** (n=162) **and** the response rate satisfactory (50.3%). **The respondents** came from two different hospital districts covering a large number of patients **undergoing** pre- and home dialysis **care** in Finland, so the results can be generalized in the context of this patient group. Education for patients with chronic diseases has common features, and the findings of this study are consistent with studies **on other diseases.** With caution, the results can thus be generalized to patients with other chronic diseases as well.

As interest towards home dialysis increases, the need for research concerning the quality of **education for patients with CKD becomes** emphasized (Ribitsch et al., 2012; Rioux et al., 2015). Successful patient education can support **people making dialysis modality decisions** (Zee, et al., 2018) and prevent problems in home dialysis (Rioux et al., 2015; Sayed, Abu-Aisha, Ahmed, & Elamin, 2012). Sufficiency and usefulness are important **aspects of** patient education; their **relationship is thus critical**. In this study, we demonstrated a strong, correlational relationship between the sufficiency and usefulness of patient education. However, the relationship must be studied more profoundly **in future studies**. **In addition to correlation, other relationships may exist** between sufficiency and usefulness, **so the quality** of the relationship warrants more research.

In future studies, the role of sufficient and useful patient education for patients' management of home care should be studied in more detail. The elements of sufficiency and usefulness of patient education need to be investigated. This study did not describe what makes patient education sufficient or useful from patients' perspective; this needs to be elucidated. **Other points of view, for example the perspectives of nurses or family members, could be included to gain more knowledge about the relationship between sufficiency and usefulness in patient education.**

## 6 Conclusion

This is the first study attempting to analyze the relationship **between** sufficiency and usefulness in patient education for **people undergoing** predialysis, peritoneal dialysis, and home hemodialysis care. **There is a strong correlational relationship between the sufficiency and usefulness of patient education.** The relationship is strong in all dimensions of empowering knowledge regardless of **respondents'** background variables. This is an important finding for the evaluation of the quality of patient education. However, more research is needed to study this relationship more profoundly.

## 7 Relevance for clinical practice

As research about **the** sufficiency and usefulness of patient education is scarce, acknowledging them in clinical practice is **all the more** important. Nephrology nurses' role is crucial: both sufficiency and usefulness must be secured in patient education to ensure quality. Continuing education of nurses can improve the quality of patient education.

Based on our results, sufficient patient education **can be considered useful and thus be seen to support the self-management** of CKD. When patient education is planned and realized, information about both elements can be **obtained through** evaluating **only one of them**, either sufficiency or usefulness. Nurses

and other health care professionals providing patient education can take advantage of this **information**.

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Author contributions:

Study design: VH, TR, LKH

Data collection: KT, LJ, TR

Data analysis: IS, PP, LKH

Manuscript writing: IS, VH, KT, LJ, PP, TR, LKH

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**Table 1**

Relationships between sufficiency and usefulness of patient education in questionnaire's dimensions

| <b>Dimension</b>                              |            | Sufficiency          | Usefulness           |              |
|---|------------|----------------------|----------------------|--------------|
| Description of items                          | n          | mean (SD)†           | mean (SD)            | r‡           |
| <b>Sufficiency and usefulness</b>             |            |                      |                      |              |
| <b>on general level</b>                       | <b>149</b> | <b>3.273 (0.544)</b> | <b>3.279 (0.573)</b> | <b>0.889</b> |
| <b>Biophysiological</b>                       | <b>142</b> | <b>3.517 (0.486)</b> | <b>3.464 (0.525)</b> | <b>0.716</b> |
| Functions of kidneys                          |            |                      |                      |              |
| Symptoms of CKD§                              |            |                      |                      |              |
| Medication                                    |            |                      |                      |              |
| Present condition and care plan               |            |                      |                      |              |
| Different dialysis types                      |            |                      |                      |              |
| Kidney transplant                             |            |                      |                      |              |
| <b>Functional</b>                             | <b>151</b> | <b>3.285 (0.589)</b> | <b>3.285 (0.629)</b> | <b>0.791</b> |
| Diet, liquids                                 |            |                      |                      |              |
| Medication at home                            |            |                      |                      |              |
| Physical exercise                             |            |                      |                      |              |
| Weight management                             |            |                      |                      |              |
| Sexuality                                     |            |                      |                      |              |
| Alcohol and tobacco                           |            |                      |                      |              |
| Complications and problems with dialysis care |            |                      |                      |              |
| <b>Social</b>                                 | <b>145</b> | <b>3.233 (0.616)</b> | <b>3.241 (0.631)</b> | <b>0.781</b> |
| Adjustment and arrangements for home dialysis |            |                      |                      |              |
| Combining dialysis care and daily life        |            |                      |                      |              |
| Holiday trips                                 |            |                      |                      |              |
| Patient association                           |            |                      |                      |              |

Peer support

Next of kin's participation in care

**Experiential**                      **136**    **2.802 (0.881)**                      **2.817 (0.932)**                      **0.838**

Feelings related to disease and its care

Effect of disease and its care on appearance

**Ethical**                                **148**    **3.339 (0.708)**                      **3.403 (0.701)**                      **0.843**

Decision-making in care

Right to information

Responsibilities in care

**Financial**                              **142**    **3.137 (0.855)**                      **3.210 (0.815)**                      **0.767**

Expenses caused by disease and its care

Social security benefits

Working while undergoing dialysis care

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All correlations,  $p < 0.0001$

† Standard deviation, ‡ Pearson correlation, § Chronic kidney disease

**Table 2**

Association of background variables† with the sufficiency and usefulness of patient education

| Background variable                                 |                  | n   | Sufficiency/ usefulness on general level | Biophysical | Experimental | Ethical | Financial |
|---|------------------|-----|--|-------------|--------------|---------|-----------|
| Family member's participation in education sessions | yes              | 58  | -  | -           | 0.767        | -       | -         |
|   | no               | 92  | -  | -           | 0.880        | -       | -         |
|   | p‡               |     | -  | -           | 0.046        | -       | -         |
| Received written educational material               | yes              | 135 | 0.881                                    | 0.683       | -            | -       | 0.817     |
|   | no               | 9   | 0.976                                    | 0.954       | -            | -       | 0.982     |
|   | p‡               |     | 0.048                                    | 0.013       | -            | -       | 0.008     |
| Searched information by themselves                  | yes              | 126 | -  | -           | -            | 0.824   | -         |
|   | no               | 33  | -  | -           | -            | 0.947   | -         |
|   | p‡               |     | -  | -           | -            | 0.004   | -         |
| Care experienced to be safe                         | slightly, fairly | 45  | -  | -           | -            | 0.908   | -         |
|   | very             | 106 | -  | -           | -            | 0.757   | -         |
|   | p‡               |     | -  | -           | -            | 0.005   | -         |

† Only statistically significant results included.

‡ Comparison of Pearson correlations between categories of background variables.