

# Registered nurses' self-rated research utilization in relation to their work climate: Using cluster analysis to search for patterns

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## Abstract

**Aim:** To describe and study the association between registered nurses' self-rated research utilization and their perception of their work climate.

**Background:** Research utilization is an important part of evidence-based nursing, and registered nurses value a work climate that supports the possibility to work evidence-based.

**Method:** This cross-sectional study was conducted using the Creative Climate Questionnaire together with three questions measuring instrumental, conceptual and persuasive research utilization. The analysis was done using variable- and pattern-oriented approaches.

**Results:** An association was found between research utilization and experience of dynamism/liveliness. Women reported higher use of conceptual research utilization. Regarding work climate, younger registered nurses and registered nurses with less work experience gave higher scores for playfulness/humour and conflicts. The results showed an association between having a Bachelor's or Master's degree and higher instrumental research utilization.

**Discussion:** Research utilization was higher in registered nurses with higher academic education. Low users of research tended to experience a lack of dynamism and liveliness, which indicates the importance of improving the work climate by creating a climate that allows opinions and initiate discussions.

**Conclusion:** The findings support the importance of creating a work climate that encourages reflection and discussion among registered nurses, and to promote academic education for nurses plus an optimal work-place staffing-mix.

**Summary Statement:** What is already known about this topic?

- Research utilization is an important part of evidence-based nursing.
- Registered nurses value a work climate that supports the possibility to work evidence-based.

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- Little is known about the association between how nurses use research in clinical work and how they perceive their work climate.

What this paper adds?

- Low research users tended to experience low dynamism and liveliness in their work climate, showing the importance of improving the work climate in health care organizations to support clinical nurses' ability to express opinions and initiate discussions.
- The association between work climate and the use of research among nurses needs further investigation.
- Our findings support previous research showing that a higher academic level is associated with increased research among registered nurses working clinically, and therefore benefits patient outcomes.

The implications of this paper:

- The association between low research utilization and experience of low dynamism and liveliness indicates the importance of improving the work climate by creating an atmosphere where nurses can express their opinions and initiate discussions.
- There is a need to support clinical registered nurses to maintain their research utilization throughout their working career.
- The health care sector and the individual workplace should support registered nurses in furthering their academic level.

#### KEYWORDS

cluster analysis, evidence-based nursing, registered nurse, research utilization, work climate

## 1 | INTRODUCTION

It has been reported that registered nurses (RNs) in clinical nursing want to work in an evidence-based way, but that for various reasons they find this hard to accomplish (Morténus et al., 2013). It is also known that, after starting their career, many RNs consider giving up nursing (Rudman et al., 2014) or actually do give up and leave the profession altogether. The health care sector is struggling to fill vacant positions for RNs, although nursing education is expanding and the number of nurses with a Bachelor's degree is increasing. If RNs were to have better opportunities to perform their clinical work in an evidence-based manner, this could possibly create a more attractive working environment that would make them stay in clinical work (Homburg et al., 2013). There have been attempts to develop organizational models, such as the Magnet Model, whose focus has been to create an environment in direct relation to how nurses can achieve satisfaction with their work situation (Kol et al., 2017).

### 1.1 | Research utilization

One aspect of evidence-based nursing is the use of research in clinical nursing (Hörberg et al., 2011; Scott & McSherry, 2009). It is

important that RNs have a reflective and active approach to research in order to achieve evidence-based nursing, and that they engage in research utilization (RU) (Squires et al., 2011). The body of research on how nursing should be performed is growing. It is a time-consuming and sometimes difficult task to search for, read and evaluate research and its relevance for the daily clinical work performed by RNs.

Research utilization in nursing can be understood as using recent research that is relevant for nursing to the benefit of the patient (Estabrooks, 1999). It can be conceptualized as instrumental, conceptual and persuasive (Estabrooks et al., 2011). With instrumental RU, the research findings are used in a specific and concrete way; implementation of guidelines is an example of this. Conceptual RU is a more general use of research, leading to new insights and use of concepts or theories in a less specific manner. The term 'persuasive RU', finally, refers to the use of research findings to legitimate, justify, or mobilize support for actions or decisions (Estabrooks et al., 2011). These three types of RU have been previously studied in a Swedish context as part of the national Longitudinal Analysis of Nursing Education (LANE) project (Rudman et al., 2010). Its findings showed that newly graduated nurses' self-reported RU was relatively low during the first 3 years post-graduation (Forsman et al., 2009; Forsman et al., 2010).

## 1.2 | Work climate

'Work climate' is a broad term that needs clarification in the context of nursing. In this study, the concept of a creative work climate, as presented by Ekvall (1996), comprises attitudes, feelings and behaviours in an organization, in a nested way. (Ekvall's term 'the creative work climate' (1996) is herein referred to, simply, as 'the work climate'.)

Work climate entails the interaction between the members of an organization and can be seen as *a part of* the organization and the organizational climate (Ekvall, 1996), where the organization also includes, for example, money, the staff and guidelines that influence processes and the official lead of the organization (Ekvall, 1996). Regarding organizational climate, it may, for example, be asked: Is there a certain degree of openness and trust, together with commitment and motivation? Other parameters, besides trust/openness, that can have an impact on the work climate, according to Ekvall (1996), are challenge, freedom, idea support, dynamism/liveness, playfulness/humour, debate, conflicts, risk taking and idea time. When measured, these different dimensions are parameters of how the creative work climate can be evaluated (Ekvall, 1996). To this end, Ekvall (1996) developed the Creative Climate Questionnaire (CCQ) instrument, which has been used in previous studies in the health care sector (Carlfjord et al., 2010; Söderlund et al., 2014).

Work climate is an important factor in work satisfaction for RNs (Caricati et al., 2014). Work climate has, among other things, been proposed to have an impact on nurses' work satisfaction and commitment (Caricati et al., 2014), which in turn is linked to the quality of nursing and patient outcome and satisfaction. The work climate can either support or undermine the feeling of being able to provide care of good quality, including being able to work evidence-based (Melnyk et al., 2010; Morténus et al., 2013; Rytterstrom et al., 2009).

The possibility to learn and improve knowledge at work is important for nurses to remain in work (Ahlstedt et al., 2019). Previous qualitative research has indicated that there is a connection between leadership, work climate and the use of research among RNs (Jansson & Forsberg, 2016; Karlberg Traav et al., 2018), which warrants further investigation. Other contextual structures, such as nursing research culture, have been studied and the use of research has been found to be a significant attribute to staying in work (Berthelsen & Hølge-Hazelton, 2016). Therefore, it is of importance to investigate how RNs report on the association between the work climate, their use of research and their possibilities to work in an evidence-based way.

## 2 | AIM

The aim of this study was to describe and study the association between RNs' self-rated RU and their perception of their work climate.

### 2.1 | Design

This cross-sectional survey study was conducted from March to June 2015. The first part of the survey measured how RNs perceived the

work climate in the ward where they worked. The items in the second part of the survey were designed to measure three types of RU among RNs: instrumental, conceptual and persuasive.

### 2.2 | Setting, participants and data collection

The study was performed in Sweden at a university hospital with approximately 550 beds. The eligible participants were RNs working in a clinical setting at the university hospital. To qualify for inclusion, the RNs had to have an active email address at work, as the questionnaire was distributed by email. Nurses' email addresses were obtained from the Human Resources Department at the hospital. A link to the web-based survey was distributed to the RNs' email addresses at work with the option to resend the link to a private email address if preferred. Two reminders after 2 and 4 weeks were sent out via email to all registered nurses and a paper questionnaire was thereafter distributed a further 2 weeks later through the internal mail system of the hospital. The paper questionnaires were sent to the first line nurse manager at the different wards, as a final reminder to distribute to RNs who had not responded.

### 2.3 | Instruments

To measure the work climate, the CCQ developed by Ekvall (1996) was used. The purpose of the CCQ is to describe the climate in an organization as either innovative or stagnated, through 10 dimensions considered to either underpin or undermine a creative work climate: The dimension *challenge* is understood as involvement and commitment to the organization's goals; while *freedom* is the feeling of independence in decisions regarding the work; *idea support* is the experience that space is given for new ideas and suggestions; and *trust/openness* is a trustful, honest, and open climate in the discussion of different opinions. Further, a workplace has: *dynamism/liveness* if it can be described as eventful and dynamic; *playfulness/humour*, if the atmosphere is relaxed; *debate*, if there is space for different opinions, together with respect for knowledge and experience; *conflicts*, if there is undesirable tension and a poor climate for handling conflicts; *risk taking*, if decisions, uncertainties, and initiatives are handled with confidence; and, finally, *idea time*, if time and space are given for implementing and elaborating ideas (Ekvall, 1996). For each dimension, five different statements are given, adding up to a total of 50 statements, and the respondent is required to answer these on a four-point Likert-type scale, from 0 = 'not at all', to 3 = 'to a high degree'. The mean value for each dimension is calculated and a high value indicates a creative climate at the workplace except for the conflicts dimension, where a high value indicates the opposite. The CCQ questionnaire has been validated and tested for reliability in different settings, including health care organizations (Carlfjord et al., 2010; Ekvall, 1996; Söderlund et al., 2014).

In addition to the CCQ, three single-item measures of RU, designed for the LANE project (Forsman et al., 2012) and originally

developed by Estabrooks (1999), were used. As previously mentioned, RU in nursing means using recent nursing research to the benefit of the patient. Estabrooks et al. (2011) identified three types of RU in nursing, namely, instrumental, conceptual, and persuasive RU (for a definition, see 'Research utilization' above). The single-item measures about the three different types of RU contained definitions as well as examples of instrumental, conceptual, and persuasive RU. The respondents answered how often they had used RU during their work shifts in the last 4 weeks, on a five-point scale where 1 = 'never', 2 = 'occasionally on a work shift', 3 = 'during approximately half of the work shifts', 4 = 'on more than half of the work shifts', and 5 = 'during almost all work shifts'. Respondents put 6 to indicate 'I don't know'.

## 2.4 | Analysis

Data are presented as number and percentage (%), with means and standard deviation or medians and interquartile range (IQR) indicated. Differences between groups were analysed with the chi-square test for nominal data, Student's *t* test or one-way analysis of variance (ANOVA) for continuous data, and the Mann-Whitney *U* test or Kruskal-Wallis test for ordinal data and continuous data that were non-normally distributed. The significance level was set to 0.05 and multiple significance tests were conducted, with Bonferroni correction applied. The analyses were performed using IBM SPSS Statistics version 24 (IBM Corp., Armonk, NY, USA).

A cluster analysis was performed to study different RU profiles (clusters) among the RNs. Each cluster consisted of a group of RNs with a similar individual response profile across all three types of RU. Calculations of clusters were made in SPSS using Ward's hierarchical agglomerative method, including only respondents with responses on the three RU variables. Single linkage was used to identify outliers ( $n = 2$ ), resulting in a cluster sample of 453 nurses. The decision on the number of clusters was guided by the agglomeration schedule and a scree plot showing the change in the distance coefficient. Practical considerations concerning meaningfulness and interpretability of the cluster solutions also guided the decision on the number of clusters (Mooi & Sarstedt, 2011).

To assess the stability of the cluster solution, K-means analysis was conducted using cluster centroids from Ward's method as seed points. Furthermore, cases in the dataset were randomly ordered and the cluster solution was repeated three times on the rearranged data (Mooi & Sarstedt, 2011).

## 2.5 | Ethical Considerations

Ethical permission for the study was granted by the Regional Ethical Review Board in Uppsala (Reg. No. 2015/049). Participants were given written information about the study. Voluntary participation was emphasized, as was the possibility to withdraw from the study at any time without having to give a reason. Participants were assured of confidentiality.

## 3 | RESULTS

Demographic data are presented in Table 1. In total, 1563 clinical RNs were approached, and the response rate was 38.3% ( $n = 599$ ), with 493 responding via the web, and 106 on paper. The majority of the participants were women and more than half of the sample held a Bachelor's degree.

The analysis showed two significant relations between background variables and RU. Women reported higher conceptual RU compared to men ( $p = 0.044$ ) and instrumental RU increased with increasing academic level (no academic degree vs. a Master's degree,  $p = 0.027$ ; overall effect [Kruskal-Wallis]  $p = 0.024$ ). For persuasive RU, no significant differences were seen (Table 2).

Concerning the work climate, the Kruskal-Wallis test with Bonferroni correction showed that age had a significant effect on the playfulness/humour dimension ( $p < 0.001$ ). There was a pairwise significant difference between the age groups 20–39 years and 40–54 years ( $p = 0.003$ ), and between 20–39 and 55–69 years ( $p = 0.001$ ). Also, the values for the conflicts dimension were higher in the 20–39 ( $p = 0.001$ ) and the 40–54 ( $p = 0.004$ ) than in the 55- to 69-year age group (overall effect  $p = 0.001$ ).

Similar patterns were seen for years worked, both for RNs who had worked 0–14 years in nursing and reported higher values for playfulness/humour compared to RNs who had worked 15–29 years ( $p < 0.001$ ) or 30–44 years ( $p < 0.001$ ) (overall effect  $p < 0.001$ ), and for nurses who had worked 0–14 years, compared to 15–29 years ( $p = 0.013$ ), in the current ward (overall effect  $p = 0.010$ ). Finally, nurses who had worked 15–29 years in the current ward scored higher values for idea time compared to those who had worked there for 30–50 years ( $p = 0.033$ ) (overall effect  $p = 0.037$ ).

To study groups with different profiles of self-reported RU, cluster analysis was performed, resulting in five different RU profiles (Table 3). The response profile illustrating low overall RU across all

**TABLE 1** Demographic data on the respondents ( $n = 599$ ), presented as number ( $n$ ), percentage (%), median (md) and interquartile range (IQR)

Age, yrs, md (IQR)	43 (33–53)
Missing, $n$	3
Gender, female/male, $n$ (%)	507/90 (85/15)
Missing, $n$	2
Years working as a nurse, md (IQR)	12 (5–25)
Missing, $n$	5
Years working in the current ward, md (IQR)	7 (2–15)
Missing, $n$	27
Academic level, $n$ (%)	
Missing, $n$	0
No academic degree	162 (27.2)
Bachelor's degree	340 (57.0)
Master's degree	88 (14.8)
PhD or higher	6 (1.0)

**TABLE 2** Mean values (standard deviation) for the three types of research utilization (RU)

	Instru-mental RU	p value	Conceptual RU	p value	Persuasive RU	p value
Gender						
Women	3.23 (1.57)	0.216	2.97 (1.43)	<b>0.044</b>	2.10 (1.16)	0.598
Men	2.99 (1.58)		2.62 (1.29)		2.03 (1.15)	
Academic level						
No academic degree	2.89 (1.62)	<b>0.030</b>	2.79 (1.49)	0.201	1.98 (1.06)	0.159
Bachelor's degree	3.23 (1.54)		2.91 (1.40)		2.07 (1.16)	
Master's degree	3.50 (1.54)		3.20 (1.35)		2.32 (1.26)	
PhD or higher	3.80 (1.79)		2.80 (1.48)		2.50 (1.92)	

Note: Respondents answered 1 = 'never', to 5 = 'during almost all work shifts'.

**TABLE 3** Mean research utilization (RU) (cluster centroids) in the five clusters (profiles)

Cluster	n	%	IRU	CRU	PRU	Description
1	82	18	4.61	4.46	1.79	Instrumental and conceptual RU
2	94	21	3.89	2.11	1.87	Instrumental RU
3	46	10	1.74	4.28	1.59	Conceptual RU
4	75	17	4.71	3.84	4.27	High RU
5	156	34	1.51	1.65	1.46	Low RU
Total	453	100	3.12	2.88	2.08	

Note: CRU = conceptual RU; IRU = instrumental RU; and PRU = persuasive RU.

three types of RU appeared to be most frequent (34%). High conceptual RU together with low instrumental and persuasive RU was reported the least frequently (10%).

The tests of cluster stability of the five-cluster solution showed 90.5% agreement between Ward's method and K-means clustering. Three iterations of the cluster analysis, with the data randomly rearranged, showed 94% agreement, on average, between the three different iterations.

To compare the group with low RU to the group of individuals with a higher reported RU in at least one of the three RU types, we merged clusters 1–4 into one single group of RNs reporting high RU in one or more RU type. This research user group ( $n = 297$ ) was then compared to cluster 5 (low users,  $n = 156$ ). Comparisons between the two cluster groups showed that in the group of low users, 66.7% had a Bachelor's or Master's degree compared to 79.0% among the research users ( $p = 0.004$ ). There were no significant differences in age, gender, years in nursing, or years working in the current ward. The association between the different groups and the work climate showed that low research users had lower values for the dimension of dynamism/liveliness ( $p = 0.021$ ) (Figure 1).

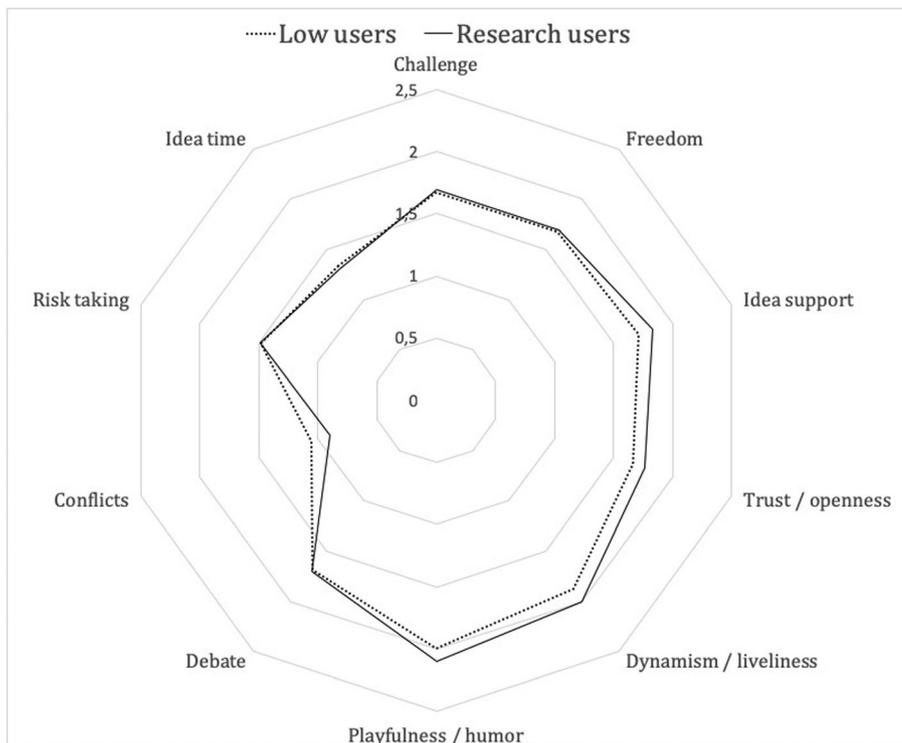
## 4 | DISCUSSION

The present study built on the assumption that RNs would value a work climate that embraces RU as a natural part of evidence-based nursing (Morténus et al., 2013). The aim was to investigate the association between the work climate and the use of research among

nurses working in a university hospital. Although our results do not show a strong association between the two factors, a few significant associations were found.

In the public and professional debate about important issues that have to be solved to make the health care sector a more attractive employer for RNs, an improved work climate, as well as better pay, has been proposed, among other improvements (Homburg et al., 2013). A study from Egypt shows positive relations between RNs' perceptions of the ethical work climate and job satisfaction, and organizational support and commitment (Abou Hashish, 2017). This, together with learning outcomes of the Magnet hospital movement, points to the importance the work climate has for RNs. Work climate impacts the safety of patients and makes RNs stay in, or leave, the health care sector (Kol et al., 2017).

The higher conceptual RU of female nurses in this study is in line with findings of the LANE project (Forsman et al., 2012) where women reported higher values compared to men in all three types of RU. We also found that RNs without an academic degree had lower instrumental RU, which is in line with previous research findings. For example, Linda Aiken and colleagues showed the importance, for patient outcome, of clinical nurses having an academic degree (Aiken et al., 2014). Another large study, likewise performed by Aiken and colleagues, showed that there must be an optimal mix of nursing skills. Where the RN–nurse associate ratio was unbalanced, negative effects were seen, not only on patient outcome in terms of mortality, but also on the patient-rated experience of care and the nurses' decision to leave their workplace (Aiken et al., 2017). Based on our and Aiken et al.'s (2014, 2017) results, together with the results from another



**FIGURE 1** Mean values for the 10 work climate dimensions reported by low users of research, and research users

large study (Ball et al., 2018) that showed the importance of nurse staffing for patients' recovery after surgery, we argue for increased nurse attendance in all types of nursing care, together with raising nurses' academic level to enable them to perform evidence-based nursing in the interests of the patient. This does not remove the employer's responsibility to provide ongoing workplace education and development of the professional role, but we cannot ignore the growing body of evidence for the association between academic level and patient outcome (Audet et al., 2018).

In this study, RNs who were younger and had worked a shorter time as nurses in their ward reported higher values for playfulness/humour. This probably reflects that individuals entering nursing as professional RNs, and trying to develop their role as RNs, experience a higher degree of enthusiasm compared to nurses who have been in the same ward, and the same work, for years. It can be speculated that young nurses are enthusiastic and optimistic that they can perform clinical care and are committed and confident that their impact on the health care sector is high. Over time, and with increased clinical experience, the need for RU may be experienced less often, as suggested by our results. This could be understood in two ways: either that the more experienced RN feels confident in, and safe with, her or his skills, or that the longer she or he has worked, the less interest she or he takes in nursing research, especially when she or he experiences clinical work as routine.

The pattern-oriented cluster analysis resulted in five different clusters, or profiles, the first four of which showed high RU in at least one of the three RU types, and the fifth of which showed low overall RU. The profiles were similar to those reported in previous studies from the LANE project (Forsman et al., 2009, 2010). For example, the

profile representing low scores in all three types of RU was most common in the sample. Profiles representing high persuasive RU only, or high conceptual RU together with high persuasive RU, were not identified. We could not see an association between RU and work experience, but the findings from the LANE project show that the way RNs relate to RU during their training to become RNs reflects the way they will use research throughout their professional career (Forsman et al., 2012). To support a different approach towards RU among low research users, we will need interventions in which the intention to break or change a pattern is in focus (Saunders et al., 2016).

One notable association seen in this study was that individuals with low RU also reported low scores in the dimension of dynamism/liveliness. This can be understood as the work climate did not support or encourage discussion and reflection among RNs, as for example seen in a qualitative study by Karlberg Traav et al. (2014), which may have reduced the possibility to implement or even discuss research and theory in the clinical context.

The findings of this study agree with previous research using the CCQ, such as the study performed by Söderlund et al. (2014). Some studies that have used the CCQ to investigate the work climate in the health care sector, for example by measuring the effects before and after an educational intervention (Söderlund et al., 2014) or comparing the work climate of different units (Carlford et al., 2010), show no cut-off values that can lead to a conclusion on whether the climate at a studied hospital can be considered as stagnated or innovative; but this was not the aim of this study. The conclusion drawn from this earlier research would be that high values in all dimensions except the conflicts dimension indicate a more creative, rather than stagnated, climate at a workplace and can therefore be considered desirable.

## 4.1 | Study limitations and strengths

The results of this study should be viewed in the context of the low response rate, which indicates either low interest in the questions asked, or too little time to participate, or indeed that we did not reach all potential respondents. The age and gender distribution, however, is in agreement with that among clinical RNs working at the university hospital at the time the study was completed (personal communication with the Human Resources Department, January 2018). Regarding gender, the distribution is in line with the national statistics for RNs in the health care sector (The National Board of Health and Welfare, 2018). The decision to use a web-based survey was made to avoid socially desirable bias.

The variable- and pattern-oriented approaches used in this study complemented each other well and provided a broader illustration of data, since data based on each RU variable was reflected against the picture of research users and their profiles, across all three types of RU. Stability tests of the cluster solution showed relatively high agreement. Respondents in the 'low RU' cluster were stable over all three repeated tests, which completely supports the next step of the analyses, that is, the division into two RU groups, of low research users versus the rest of the sample. The cluster profiles identified in the present study were similar to those identified in previous studies using the same RU measures among RNs (Forsman et al., 2009, 2010), which supports the cluster solution and the evidence base for the RU cluster profiles that seem to occur naturally.

## 5 | CONCLUSIONS

The finding that low research users also tended to experience low dynamism and liveliness indicates the importance of improving the work climate by giving the feeling of being able to express opinions and initiate discussions for clinically working nurses. The research question of how work climate and RU are related, and how the organization can improve the work climate, needs further investigation.

The findings from this study, that RU was higher in RNs who had a higher academic degree, which are in line with previous research, calls for an active approach from the health care sector to support and inspire RNs who want to continue to higher academic levels after graduation. When training nursing students, it is highly desirable to inspire them to improve their academic level so that newly graduated nurses will be able to become active research users. Also, as pointed out in the discussion, the attendance of nurse in all types of nursing care, together with raising nurses' academic level would enable nurses to perform evidence-based nursing in the interest of the patient.

### ACKNOWLEDGEMENT

There were no sources of funding for this study.

### CONFLICT OF INTEREST

None to declare.

### AUTHORSHIP STATEMENT

All authors are responsible for the reported research, and worked together with design, analysis and interpretation of data. All authors also approved to resubmit the paper to your journal.

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**How to cite this article:** Karlberg Traav M, Forsman H, Eriksson M. Registered nurses' self-rated research utilization in relation to their work climate: Using cluster analysis to search for patterns. *Int J Nurs Pract*. 2021;e12944. <https://doi.org/10.1111/ijn.12944>