ORIGINAl RESEARCH

Use of research by nurses during their first two years after graduating

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Abstract

Title. Use of research by nurses during their first two years after graduating.

Aim. This paper reports on a study of research use among nurses two years after graduation, as well as changes over time in research use in relation to changes in working conditions.

Background. The demand for evidence-based practice is widely expressed, and newly graduated nurses should possess the skills to provide high-quality care based on the best knowledge available. The way in which nurses use research during the first few years after graduating is, however, largely unknown.

Method. As part of a national longitudinal survey, nurses reported their extent of instrumental, conceptual and persuasive research use in 2006 ($n = 1365$) and 2007 ($n = 1256$). Data were analysed cross-sectionally and prospectively, using variable- and pattern-oriented methods.

Results. Instrumental research was reported most frequently, on about half of the working shifts. Seven profiles of research use were found, showing structural stability over time when compared with results from year 1. Most typically, nurses maintained the same profile over time; moreover, low users tended to become even lower users. Two years after graduation, 54%–9% reported overall low use. Changes in working conditions did not explain the decrease in research use.

Conclusion. The results support previous claims of a gap between research and clinical practice. The predominance of overall low users is alarming and requires further research, including investigation of individual and organizational factors, to study their impact on nurses’ research use.

Keywords: clinical practice, cluster analysis, evidence-based practice, nurses, prospective, questionnaire, research use

Introduction

Evidence-based (including research-based) clinical practice is a widespread requirement today; its aim is to improve patient outcomes and effectiveness of nursing care, as well as reducing healthcare costs (Youngblut & Brooten 2001). However, the demand for evidence-based nursing is no new phenomenon. As early as the 1950s, Swedish regulations stipulated that nurses were expected to keep themselves informed about new findings relevant to their work (The
Swedish Code of Statutes 1957). Most researchers agree that a research transfer gap still exists, and the teaching of evidence-based practice within undergraduate nursing education is assumed to be one necessary prerequisite to achieving improvements in practice (Giliska 2006).

Nursing education has undergone several educational reforms. In 1993, nursing education in Sweden moved from vocational training into higher education, including an emphasis on the ability to search for, critically appraise and apply research findings in clinical practice (The Swedish Code of Statutes 1992, 1993, The National Board for Health and Welfare 2005). Similar reforms in nursing education have occurred internationally in recent decades, a development including issues such as the capacity of nursing educators, the structure and content of nursing curricula, and the preparation of graduates for practice (Spitzer & Perrenoud 2006a,b). Thus, although today’s newly graduated nurses are expected to have the necessary skills for performing evidence-based practice, the extent to which academic objectives are mediated and acquired during education is questionable. Furthermore, recent graduates enter clinical practice where evidence-based nursing is not always a common feature, and this may hinder them from applying their skills (Maben et al. 2006, Mooney 2007).

Background

A distance similar to the research-practice gap also seems to exist between nursing education and clinical practice. Nurses in service tend to consider that newly graduated nurses are inadequately prepared for practice, while educators claim that today’s new graduates are ‘beginning practitioners’ equipped with skills in critical reflection and committed to lifelong learning, and that practice should be adjusted accordingly (Greenwood 2000). As early as the 1970s, the term ‘reality shock’ was used to describe the transition from nursing education to clinical practice (Kramer 1974), and recently a ‘transition shock’ has been described by Duchscher (2008). Circumstances suggested as restricting newly graduated nurses’ ability to provide evidence-based practice are, for example, work-related stress, lack of experiential knowledge and the fact that their clinical judgement is still under development (Ferguson & Day 2004, 2007). However, little is known about how academic attitudes and skills are applied in clinical practice and developed during the first few years after graduation. In previous studies, nurses’ experiences and skills shortly after graduation seem to have been explored primarily using qualitative methods. To our knowledge, no quantitative studies have been published on actual research use (RU) over time among relatively recent nursing graduates.

Previous studies have illustrated a problematic situation for new nurses when it comes to RU. Mooney (2007) reported that, 6–10 months after their graduation, nurses described practice as constituting rituals and routines ‘set in stone’, and how they failed when they tried to change this practice. Moreover, common barriers to RU reported by novice nurses with 1–3 months of work experience include insufficient time for implementing new ideas and reading research reports, and facilities being inadequate for implementation (Andersson et al. 2007). Gerrish et al. (2008) concluded that junior nurses seemed to be disempowered by the nursing culture in implementing evidence-based practice. In the study by Danielson and Berntsson (2007), Swedish nurses with 3 years of work experience rated the teaching of research methodology during education as least important for their professional work.

Researchers have called for longitudinal research to evaluate the sustainability of RU (Estabrooks et al. 2003) and to study the views and attitudes of newly graduated nurses over time (Hek & Shaw 2006). The situation of newly graduated nurses is illustrated in a few longitudinal studies. Maben et al. (2006) describe how nursing students approaching graduation had espoused ideals including nursing care based on research evidence. However, in post-graduation interviews at 4–6 and 11–15 months, the nurses described how they had failed to put their ideals into practice due to “organizational and professional sabotage” (Maben et al. 2006, p. 468). Three years after qualifying (Maben et al. 2007), the nurses were categorized as sustained, compromised or crushed idealists. In another study, conducted 3–4 years after graduation (Kelly 1996), nurses also described difficulties in maintaining professional standards after graduating. In a study of nurses’ development of professional self during education and up to 3–5 years after graduating, ratings of ‘knowledge mastery’ increased during education but decreased after graduation (Björkström et al. 2008).

As indicated in the studies cited, it is very likely that part of the challenge for newly graduated nurses to establish evidence-based practice stems from the organizational context. The commonly cited PARIHS framework for implementing research in practice emphasizes context, with its sub-elements of culture, leadership and evaluation, as a key element for successful implementation (Rycroft-Malone et al. 2002). Also, many studies point at the importance of the organizational context and its characteristics, e.g. workload, work tempo, co-worker interactions and organizational support, for the achievement of RU and evidence-based practice (e.g. Wallin et al. 2006, Cummings et al. 2007, Estabrooks et al. 2008).

In the study reported in this paper, nurses’ self-reported RU was studied by using measures of three types of RU:
instrumental (a concrete/direct application of research-based knowledge), conceptual (a cognitive and enlightening way of using research) and persuasive (research used to bring about or influence change) (Estabrooks 1997, 1999a). These measures have previously been used in several studies (Estabrooks 1999b, Profetto-McGrath et al. 2003, Kenny 2005, Milner et al. 2005, Estabrooks et al. 2007), and have also been translated and used in a Swedish context (Forsman et al. 2009).

In our previous study (Forsman et al. 2009), a set of seven different profiles of RU were identified in two separate nursing samples at 1 and 3 years after graduation. Profiles comprising low and very low RU were predominant, and nurses reporting very low RU were more common in the sample 3 years after graduation. These findings, although not longitudinal, indicated that RU does not increase over time; if anything, it deteriorates. The present study was conducted to address the lack of research on the course of nurses’ RU after graduating, and to investigate the association between changes in RU over time and major changes in working conditions.

The study

Aim

The aim of the study was to describe nurses’ use of research 2 years after graduating and also the change in nurses’ research use in relation to working conditions, between the first and second year after graduation.

The specific objectives were to examine:
- the extent of nurses’ self-reported instrumental, conceptual and persuasive RU 2 years after graduating.
- whether typical clusters of RU could be detected 2 years after graduation, and if so, whether these clusters were stable over time.
- if employee turnover and major changes in working conditions explained changes in nurses’ RU.

Design

The study was prospective and conducted as a part of the Swedish LANE project (Longitudinal Analysis of Nursing Education) (Gustavsson et al. 2007). LANE is based on a nationwide survey of undergraduate nursing students studied during their education and their first years as Registered Nurses working in clinical practice. The initial overall aim of the LANE project was to study the development of health and ill-health among newly graduated nurses. The LANE database includes a large number of variables related to the education and life of a student nurse and as a Registered Nurse and the working context. Data collection started in 2002, has been performed annually since then and is still ongoing. The RU part of the survey was included in the questionnaire in 2006 and the study presented here includes data on the nurses’ RU in clinical practice, collected in 2006 and 2007.

Participants

The target population of the LANE project was defined in 2002 as including nursing students enrolled at any of the Swedish universities and university colleges running nursing programmes (N = 26). All but two of the institutions provided student registers, and their students were asked to participate in the study. By the 2006 data collection, the respondents were expected to have completed year 1 (Y1, n = 1365), and in 2007 year 2 (Y2, n = 1256) as Registered Nurses. In the Y2 sample, younger respondents were statistically significantly underrepresented in comparison with the students available for recruitment in 2002. Survey items on RU were directed towards respondents currently working as nurses, implying a somewhat reduced sample size (due to maternity leave, speciality training etc.). Furthermore, data analyses of RU patterns were performed including nurses who gave responses on all three RU items (‘Don’t know’ responses excluded). See Figure 1 for sample sizes and analyses at the different time points, and Table 1 for background characteristics for the Y2 sample.

Data collection

Research use variables

Self-reported RU was studied using three single items measuring instrumental (direct), conceptual (indirect) and symbolic (persuasive) RU (Estabrooks 1997, 1999a, Forsman et al. 2009). These conceptualizations of RU derive from previous work in social science, where instrumental and conceptual (Rich 1975, 1977, Weiss 1979) as well as symbolic use (Pelz 1978, Beyer & Trice 1982) were suggested to occur as different forms of knowledge utilization. The concepts were later adopted into nursing (Stetler 1994a, 1994b) and operationalized as measures of RU (Estabrooks 1997, 1999a). Through structural equation modelling, Estabrooks (1997, 1999a) found support for the existence of the three types of RU. For the present study, based on how the questions were phrased in previous work by Estabrooks et al. (2004), the items were translated and adapted to a Swedish context by members of the research group. Each question was initiated with a definition of the concept, followed by examples of its application in clinical practice. Respondents were then asked to estimate their current frequency of use (see Figure 2).
Variables on changes in working conditions

From data available in the LANE database, variables indicating employee turnover and major changes in the nurses’ working conditions were selected (see Figure 3). Changes in those variables could be considered to represent alterations in major contextual factors previously described as having an impact on RU, such as culture, leadership or workload.

Ethical considerations

The appropriate research ethics committees approved the study.

Data analysis

Analyses were performed according to both a variable- and a pattern-oriented approach. The two approaches differ in their units of analysis: in the variable-oriented approach the unit of analysis is the RU variable and in the pattern-oriented approach, here operationalized by the use of cluster analysis, the unit of analysis is the individual as a research user. A brief overview of the analyses is given below and presented in more detail in Figure 4.

Extent and patterns of research use

The extent of each type of RU at Y2 was analysed by descriptive statistics. To identify and study individuals’ response profiles across the three RU items, cluster analysis was performed in SLEIPNER version 2.1 (Bergman & El-Khoury 2002, Bergman et al. 2003). The final cluster solution was evaluated mainly based on theoretically reasonable RU profiles and the ‘explained error sum of squares’ (EESs), where 67% is usually considered as the lower limit for a well-functioning and satis-

Figure 1 Overview of sample sizes at the two time points and for the different analyses (RU, research use).

Table 1 Sample characteristics of respondents working as a nurse at Y2 (n = 1065)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, mean (SD)</td>
<td>34.1 (7.5)</td>
</tr>
<tr>
<td>Missing</td>
<td>0 (0.0)</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
</tr>
<tr>
<td>Women</td>
<td>952 (89.4)</td>
</tr>
<tr>
<td>Men</td>
<td>113 (10.0)</td>
</tr>
<tr>
<td>Missing</td>
<td>0 (0.0)</td>
</tr>
<tr>
<td>Previous college experience</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>266 (25.0)</td>
</tr>
<tr>
<td>No</td>
<td>788 (74.0)</td>
</tr>
<tr>
<td>Missing</td>
<td>11 (1.0)</td>
</tr>
<tr>
<td>Previous health care</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>661 (62.1)</td>
</tr>
<tr>
<td>No</td>
<td>395 (37.1)</td>
</tr>
<tr>
<td>Missing</td>
<td>9 (0.8)</td>
</tr>
<tr>
<td>Present employment (form of organization)*</td>
<td></td>
</tr>
<tr>
<td>Hospital ward</td>
<td>703 (63.4)</td>
</tr>
<tr>
<td>Outpatient clinic</td>
<td>114 (10.3)</td>
</tr>
<tr>
<td>Primary care</td>
<td>31 (2.8)</td>
</tr>
<tr>
<td>Home nursing</td>
<td>67 (6.1)</td>
</tr>
<tr>
<td>Nursing home</td>
<td>83 (7.5)</td>
</tr>
<tr>
<td>Ambulance service</td>
<td>56 (5.1)</td>
</tr>
<tr>
<td>Education</td>
<td>3 (0.3)</td>
</tr>
<tr>
<td>Research</td>
<td>3 (0.3)</td>
</tr>
<tr>
<td>Other</td>
<td>47 (4.2)</td>
</tr>
<tr>
<td>Total</td>
<td>1107 (100.0)</td>
</tr>
</tbody>
</table>

Values are given as n (%).

*More than one alternative could be reported.
factory solution (Bergman et al. 2003). Analyses of data from Y1 have been reported previously (Forsman et al. 2009) and were performed according to the same procedure, making comparison between the two time points relevant.

Change in research use

From a variable-oriented approach, the stability of RU was analysed by comparison of mean values. Structural and individual stability were studied by comparison of cluster solutions. For the analysis on individual stability, individuals lacking complete RU responses at each time point (not included in cluster analyses) constituted an additional group. Using Bonferroni’s inequality method, the P value was adjusted to < 0.002 (Hair et al. 2006).

Associations between changes in research use and changes in working conditions

An outcome variable with two categories illustrating individual change in RU was created and analysed in relation to turnover and changes of working conditions (see Figure 3 for included variables), using chi square tests ($P < 0.05$). Such comparisons were made for each work situational variable separately, but also through collapsing these to a ‘global work situational change’ variable, where individuals with change in one or more of the variables comprised one category and those with no change comprised the other category.

Validity

Construct validity of the RU items has been reported by Estabrooks (1997, 1999a). Several subsequent researchers (Estabrooks 1999b, Profetto-McGrath et al. 2003, Kenny 2005, Milner et al. 2005, Estabrooks et al. 2007) used the items for regression and correlation analyses and reported credible results, which supports validity (Goodwin 2002). In addition, cluster analyses performed on the RU variables in our previous study (Forsman et al. 2009) indicated consistent scorings, which strengthens the validity and reliability of the RU items. The Swedish version has been reviewed by clinical nurses and scrutinized by the technical and language laboratory at Statistics Sweden, confirming the feasibility and face validity of the items in a Swedish context.
Extent and patterns of research use

<table>
<thead>
<tr>
<th>Purpose</th>
<th>Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extent of RU</td>
<td>Frequency distributions, proportions, mean values, standard deviations¹</td>
</tr>
<tr>
<td>To develop a classification of homogeneous clusters (subgroups) of individuals presenting similar response profiles</td>
<td>Cluster analysis: Ward's hierarchical agglomerative method², ³. In the clustering procedure, fusions of clusters/individuals that are most similar proceed step by step, resulting in subgroups/clusters comprising nurses that are similar in their response-patterns.</td>
</tr>
<tr>
<td>To optimize and refine the cluster solution</td>
<td>The RESIDUE module to identify outliers²</td>
</tr>
<tr>
<td>To illustrate deviance of cluster centroids in the clusters in relation to mean values for each RU variable in the cluster sample as a whole</td>
<td>Effect size: standardized RU levels (z-values)¹</td>
</tr>
</tbody>
</table>

Change in research use

<table>
<thead>
<tr>
<th>Purpose</th>
<th>Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>RU stability – comparison of mean values between Y1 and Y2</td>
<td>Paired t-test statistics (P &lt; 0·05, two-tailed)¹</td>
</tr>
<tr>
<td>Structural stability – the similarity (in form and level) of cluster profiles between Y1 and Y2</td>
<td>The CENTROID module, pair-wise matching of centroids between the two cluster solutions²</td>
</tr>
<tr>
<td>Individual stability and change in cluster membership between Y1 and Y2</td>
<td>The EVALUATE module to compare original cluster solution (Y2) against K-means solution (Y2 according to Y1)², ⁴</td>
</tr>
</tbody>
</table>

¹SPSS, version 16·0 (SPSS Inc, Chicago, IL, USA). ²SLEIPNER version 2·1 (Bergman & El-Khoury 2002, Bergman et al. 2003). ³The squared Euclidian distance served as measure of similarity of profiles (Bergman & El-Khoury 2002, Bergman et al. 2003). ⁴The adjusted rand index served as a measure of structural similarity, where a high value indicates high stability (Hubert & Arabie 1985). ⁵Exact tests and one-tailed hypergeometric probabilities (Bergman & El-Khoury 1987, 2002, Bergman et al. 2003).

Figure 4 Overview of statistical analyses.

Results

Extent of research use

The extent of each type of RU at Y2, according to the variable-oriented approach, is presented in Table 2. Instrumental RU was reported to occur most frequently, and persuasive RU least frequently. For each item, RU on more than half of the working shifts during the four previous working weeks (response alternatives 4 and 5) was reported by 33·5% (instrumental), 21·1% (conceptual) and 5·1% (persuasive) of the nurses.

Patterns of research use

From the cluster analyses of self-reported RU at Y2, a seven-cluster solution was selected as the most appropriate solution (see Table 3 and Figure 5), illustrating seven subgroups of nurses with different response profiles. EESS for the cluster solution was 81·5%, indicating high cluster homogeneity. Two clusters presenting low and very low RU in all three variables were identified. These two clusters together comprised more than half (54·9%) of the clustered individuals (‘Low users’ 23·8%, ‘Very low users’ 31·1%). The remaining clusters were named based on where the high RU scores occurred in each profile. Being an overall high user was second least common (5·3%); only the cluster representing high instrumental and persuasive use was less common (2·2%).

Change in research use over time

No statistically significant mean differences in RU levels were identified between Y1 and Y2, indicating stability from a variable-oriented approach. Also the pattern-oriented analyses indicated high stability. CENTROID analysis, performed to investigate the structural stability of the profiles between the two time points, showed that ASED (Average Squared Euclidian Distance) values ranged between 0·06 and 0·20
Table 2 Research use extent at Y2, variable-oriented approach

<table>
<thead>
<tr>
<th>Cluster Description</th>
<th>Instrumental</th>
<th></th>
<th>Conceptual</th>
<th></th>
<th>Persuasive</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>Never</td>
<td>211</td>
<td>19.8</td>
<td>193</td>
<td>18.1</td>
<td>427</td>
<td>40.1</td>
</tr>
<tr>
<td>On some shifts</td>
<td>297</td>
<td>27.9</td>
<td>381</td>
<td>35.8</td>
<td>415</td>
<td>39.0</td>
</tr>
<tr>
<td>On about half of the working shifts</td>
<td>101</td>
<td>9.5</td>
<td>127</td>
<td>11.9</td>
<td>51</td>
<td>4.8</td>
</tr>
<tr>
<td>On more than half of the working shifts</td>
<td>101</td>
<td>9.5</td>
<td>97</td>
<td>9.1</td>
<td>29</td>
<td>2.7</td>
</tr>
<tr>
<td>On almost every shift</td>
<td>256</td>
<td>24.0</td>
<td>128</td>
<td>12.0</td>
<td>26</td>
<td>2.4</td>
</tr>
<tr>
<td>Don’t know</td>
<td>84</td>
<td>7.9</td>
<td>127</td>
<td>11.9</td>
<td>102</td>
<td>9.6</td>
</tr>
<tr>
<td>Missing</td>
<td>15</td>
<td>1.4</td>
<td>12</td>
<td>1.2</td>
<td>15</td>
<td>1.4</td>
</tr>
<tr>
<td>Total</td>
<td>1065</td>
<td>100</td>
<td>1065</td>
<td>100</td>
<td>1065</td>
<td>100</td>
</tr>
<tr>
<td>Mean (sd)*</td>
<td>2.9 (1.5)</td>
<td>2.6 (1.3)</td>
<td>1.7 (0.9)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Don’t know’ excluded.

Table 3 Clusters presented for the nurses at Y2 (n = 845)

<table>
<thead>
<tr>
<th>Cluster Description</th>
<th>Instrumental</th>
<th></th>
<th>Conceptual</th>
<th></th>
<th>Persuasive</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>sd</td>
<td>ES</td>
<td>M</td>
<td>sd</td>
<td>ES</td>
</tr>
<tr>
<td>1. Overall high users</td>
<td>4.5</td>
<td>0.9</td>
<td>1.1</td>
<td>4.6</td>
<td>0.5</td>
<td>1.6</td>
</tr>
<tr>
<td>2. Instrumental and conceptual users</td>
<td>4.7</td>
<td>0.3</td>
<td>1.3</td>
<td>4.1</td>
<td>0.8</td>
<td>1.2</td>
</tr>
<tr>
<td>3. Instrumental and persuasive users</td>
<td>4.7</td>
<td>0.6</td>
<td>1.3</td>
<td>2.1</td>
<td>0.6</td>
<td>0.4</td>
</tr>
<tr>
<td>4. Instrumental users</td>
<td>4.7</td>
<td>0.5</td>
<td>1.3</td>
<td>1.9</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>5. Conceptual users</td>
<td>2.1</td>
<td>0.7</td>
<td>0.5</td>
<td>4.6</td>
<td>0.5</td>
<td>1.6</td>
</tr>
<tr>
<td>6. Low users</td>
<td>2.3</td>
<td>0.5</td>
<td>0.4</td>
<td>2.3</td>
<td>0.5</td>
<td>0.2</td>
</tr>
<tr>
<td>7. Very low users</td>
<td>1.4</td>
<td>0.5</td>
<td>1.0</td>
<td>1.5</td>
<td>0.5</td>
<td>0.8</td>
</tr>
<tr>
<td>M and sd for total cluster sample</td>
<td>2.8</td>
<td>1.5</td>
<td>0.0</td>
<td>2.5</td>
<td>1.3</td>
<td>0.0</td>
</tr>
</tbody>
</table>

Cluster centroids (mean values, M, for each type of RU in each cluster profile), standard deviations (sd), effect size values (ES), measures of structural stability (ASED, Average Squared Euclidian Distance) between Y1 and Y2.

with a mean value of 0.11 (Table 3). EVALUATE analysis resulted in an adjusted rand index of 0.70, also indicating high stability. Thus, from a pattern-oriented approach, the seven cluster profiles were similar in both form and level between Y1 and Y2 (see Figure 5).

We also investigated whether individuals remained in their cluster from Y1 to Y2. All but ‘Instrumental and persuasive users’ essentially remained in a similar cluster, as did the group of individuals with non-complete RU-responses. Consequently, individuals in all but one cluster tended to present the same RU profile at both time points. However, in addition to being stable, it was also typical for ‘Low users’ to become even lower in RU (i.e. ‘Very low users’) over time, indicating individual change. Comparison of RU profiles at Y2 and Y1 showed that the proportion of low and very low users at Y1 was 45.6% (‘Low users’ 31.9%, ‘Very low users’ 13.7%) (Forsman et al. 2009), compared with 54.9% at Y2. Further analyses showed that individuals (n = 121) who changed from being high users in one or more of the RU variables (clusters 1–5) at Y1 towards becoming overall low (cluster 6 or 7) at Y2 reported statistically significantly lower RU over time in all three RU variables (P < 0.001).

Association between changes in research use and changes in working conditions

Change in RU was dichotomized as follows: being in clusters 1–5 at Y1 towards becoming overall low (cluster 6 or 7) at Y2 (n = 121) vs. being stable or making other changes (n = 207). Individuals (n = 604) already in cluster 6 or 7 at Y1 or lacking complete RU responses at Y1 and/or Y2 were excluded. Change in RU was then analysed in relation to employee turnover and other changes in working conditions. No statistically significant associations were found. Comparison of the collapsed ‘global change’ variable [change (n = 251) vs. non-change (n = 77)] with changes in RU also showed non-statistically significant results. Thus, no relationship between change towards low RU and changes in working conditions could be identified.

Discussion

While educational reforms have been implemented to equip nurses with the necessary skills to perform evidence-based practice, results from this study must be considered as
discouraging. Nurses’ RU was reported as relatively low in both the first (Forsman et al. 2009) and second years after graduation. The seven RU profiles, found at both Y1 (Forsman et al. 2009) and Y2, showed structural stability and were dominated by the profiles comprising low and very low research users. It was most typical for nurses to maintain the same RU profile over time; however, low users also tended to become even lower users. Employee turnover and other changes in working conditions, as measured in the present study, were not related to individual change towards lower RU. These findings generate two questions: (i) What happens over time to educational ideals and values that are intended to be transferred to nursing students during their education? and (ii) What factors influence the course of RU after graduation?

**Study limitations**

The national sample and large sample size are strengths of this study and enhance its generalizability. Many reports of nurses’ RU are restricted to single-site studies. The respondents’ scoring consistency, making successful cluster analyses possible, speaks in favour of the instrument’s validity and reliability.

The RU profiles illustrate the nurses’ self-reported and conscious application of the three types of RU during their four past working weeks. Self-report does have its drawbacks, for example recall and social desirability biases, which are common problems among instruments tended to measure RU (Estabrooks et al. 2003) and have to be kept in mind also for the present results. RU is also a complex phenomenon, and a critical reader might find the measurement method used here too rudimentary. However, Estabrooks (1997, 1999a) argues that her measurement model provided strong evidence that RU can be measured with relatively simple questions. Because of the instrument’s condensed format, its base in theory and its psychometric properties (Estabrooks 1997, 1999a), we believe that the method was highly appropriate for this national survey. Another important methodological aspect is that the RU measures were related to RU ‘in general’ and not to specific research findings. This was necessary as we used a national sample of nurses who worked in various clinical disciplines.

We do not know if the different types of RU have been applied separately on different occasions, or if more than one type has been applied in relation to the same research finding and in the same situation. Such issues would be interesting to investigate further, since it has been suggested that different types of RU, according to a continuum model, may interact

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**Figure 5** Cluster profiles of instrumental, conceptual and persuasive RU (IRU, CRU, PRU) at 1 and 2 years after graduation (Y1 = continuous lines, Y2 = dashed lines). The graphs illustrate the structural stability of the profiles between the two time points. Values indicate centroids/mean values for each type of RU within each cluster, ‘n’ and ‘%’ show the size (number of individuals) of each cluster.
and occur concurrently (Nutley et al. 2007). Further, this study illustrates the course of nurses’ RU after graduation, between Y1 and Y2. Data on their use of research at Y0 as a point of reference, i.e., at the outset of their career, is unknown, and extended longitudinal studies are needed to examine nurses with longer work experience who have completed specialty training etc.

Consideration of low research use

The designation of RU as high or low in the present study can be justified statistically by looking at the effect size (ES) values calculated for the cluster centroids. For Y2 data, centroids considered as high corresponded to ES values ranging from 1.1 to 2.5, i.e., exceeding 0.8, which is considered the lower limit for large effects (Cohen 1988). ES values for low RU showed considerable deviance from the high values. This line of argument was also tenable for Y1 data (Forsman et al. 2009). Thus, our designation of RU as high or low can be justified in relation to the samples included in these studies.

In addition to the statistical justification of high and low RU, this designation needs to be interpreted and discussed in relation to the definition of RU in this present study. RU, especially instrumental RU, can be said to correspond to ‘daily’ use of research-based knowledge, e.g., clinical guidelines and protocols, rather than implementation of new research findings in clinical practice at the unit. Such ‘daily’ use can be expected to occur more frequently than reported here. Working as a nurse without applying research findings, at least instrumentally, seems almost impossible, since clinical practice is to a greater or lesser extent likely to be based on research. In order to be a reflective practitioner, it is crucial to use knowledge in a well-informed and conscious way (Plack & Greenberg 2005, Mantzoukas 2008). Consequently, the relatively low degree of self-reported RU reported here is worrying, since it indicates that nurses were to some extent unaware of the knowledge base of their clinical practice. Other important aspects of this issue of RU ‘quantity’ are the amount of RU that can be expected in different situations and settings etc. (which may differ between the three types of RU), and whether high RU is always good and desirable per se. Research is one of several sources of knowledge used by nurses (Estabrooks et al. 2005, Spenceley et al. 2008). RU differs from the term ‘evidence-based nursing’, in that the latter is defined as also encompassing additional sources of knowledge (e.g., knowledge from social interactions with colleagues and clinical experience) (Estabrooks 1998, Estabrooks et al. 2005, Spenceley et al. 2008). It is alarming that more than half of our nursing sample (low and very low users) at best reported RU corresponding to ‘some’ working shifts over the last 4 weeks. However, clear limits for high and low use are lacking and probably hard to clearly define.

Thoughts on the low extent, and deterioration of research use

There are several possible lines of reasoning regarding expectations of nurses’ RU during their first years after graduation. Number of years of nursing experience and their importance for RU have been investigated previously without showing any statistically significant relationships (Karkos & Peters 2006, Chau et al. 2008, McCloskey 2008). However, in a sample of US military nurses (Kenny 2005, Estabrooks et al. 2007), years working as a nurse correlated negatively with RU. It was suggested that this negative correlation might be an indication that nurses tend to solidify their practice over time, while becoming less inclined to incorporate new ways of doing things (Kenny 2005). Another possible explanation is that experience-based or tacit knowledge may increase over time, making it difficult to know whether or not that knowledge is based on research (Estabrooks et al. 2007). This could be a conceivable explanation for the increased proportions of low and very low users also in this present study, although nursing experience was only 2 years, i.e., a considerably shorter period than in the studies cited above.

The transition from student to Registered Nurse is well-described in the literature, for example as ‘reality shock’ (Kramer 1974) or ‘transition shock’ (Duchschere 2008), and is often described as challenging and an obstacle to evidence-based practice (Ferguson & Day 2004, 2007). The socialization process into the nursing profession (Kramer 1974, Melia 1987, Price 2009) may result in ritualized practice and a perpetuation of norms and values which are negative (Mackintosh 2000). A socialization process with the aim of fitting in and not rocking the boat (Mabon et al. 2006), and a need to conform to ward rules and routines (Mooney 2007) have been described previously as factors that stand in the way of change and hinder evidence-based nursing care. In the study by Mooney (2007), newly graduated nurses expressed vulnerability and powerlessness, illustrated as being ‘without a voice’. Reality shock is a phenomenon conceptually close to culture shock (Kramer 1974). Organizational culture has been emphasized previously as important for RU (Scott-Findlay & Golden-Biddle 2005). Consequently, if recent graduates encounter clinical practice that does not correspond with demands for evidence-based nursing care, and if nurses fail to retain values from their education (assuming that they have acquired such values), their use of research may deteriorate over time. The organizational variables used
What is already known about this topic

- To ensure healthcare quality, the ability to perform evidence-based practice is vital and constitutes a main learning outcome in nursing education.
- The transition from nursing education to working life is challenging and may entail obstacles to performing evidence-based practice.
- There is a lack of knowledge about nurses’ use of research over time and shortly after graduation.

What this paper adds

- Seven different profiles of research use were identified, showing structural stability over time and thus strongly supporting the fact that these are the profiles that occur naturally.
- The extent to which research was used remained relatively low during the first two years after graduation, and low users typically became even lower users, indicating a situation in urgent need of attention.
- Change towards low research use was not associated with major changes in working conditions, indicating the need for further studies on characteristics of nurses who are not inclined to use research.

Implications for practice and/or policy

- Actions are needed to overcome the gap between theory and practice, between research and clinical application, and between academic education and nursing practice.
- Further research should focus on the characteristics of low research users, to learn more about potentially effective interventions for enhancing nurses’ conscious use of research in clinical practice.

Research use profiles

The same seven RU profiles were identified at Y1, Y2 and Y3, and in two separate national samples in this present and our previous study (Forsman et al. 2009). Stability analyses of the profiles convincingly show that these are the RU profiles that occur naturally. According to the classic work by Rogers on diffusion of innovations (Rogers 2003), individuals can be categorized into adopter categories based on their degree of innovativeness, i.e. the time to the first use of a new idea. Adopter categories range from very early to very late adopters. Different adopter categories are distinguished by their specific characteristics and values. Rogers’ categorization has been widely used in diffusion research and is ‘a means of convenience in describing the members of a system’ (Rogers 2003, p. 267). We believe that our categorization of research users may serve a similar purpose. The identification of nurses’ RU profiles could, for example, form a basis for tailoring interventions aimed at improving their use of research. This is well in line with Rogers’ reasoning about ‘audience segmentation’. By breaking down the audience into several sub-audiences, change agents can adapt their approaches and communication channels and messages can be adapted to fit different sub-audiences with their specific characteristics and values (Rogers 2003). In agreement with
Rogers’ assertion, we believe that our reasoning about the different RU profiles, although giving a simplified picture of reality, has the potential to improve understanding of the meaning and consequences of these clusters of research users for evidence-based nursing practice at unit level. There is a call for new methodological approaches and advancements in this field of research (Estabrooks 2007), and cluster analysis might be one useful answer to that call.

Conclusion

The low and deteriorating RU found among newly graduated nurses in this present study can be considered as supporting previous claims of a continuing gap between theory and practice, research and clinical application, and academic education and nursing practice. The actual explanations for this unsatisfactory situation are, however, still unknown. Further research is needed to investigate interactions between individual and organizational factors and their impact on nurses’ use of research. In addition to the description of the extent of nurses’ RU during the first 2 years after graduation, which fills a knowledge gap in this research area, this present study confirms the stability of seven different profiles of RU. This strongly supports the existence of these seven different RU profiles, and underlines the variations in how research is used by nurses in clinical practice. The distribution of individuals between clusters could probably be influenced by interventions at the individual and/or organizational level.

However, it may not be an ultimate aim that every nurse should be an overall high user of research, as some degree of variation in individuals’ RU profiles might be expected in certain situations or nursing roles. Nevertheless, the fact that over half of the nurses in our sample presented overall low or very low RU profiles at Y2 is alarming. One strategy for further research would be to focus on the characteristics of such overall low research users in order to learn more about potentially effective interventions for enhancing nurses’ conscious use of research in clinical practice.

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Conflict of interest

No conflict of interest has been declared by the authors.

Author contributions

HF, AR, PG, AE and LW were responsible for the study conception and design. HF, AR, PG, AE and LW performed the data collection. HF, AR and PG performed the data analysis. HF was responsible for the drafting of the manuscript. HF, AR, PG AE and LW made critical revisions to the paper for important intellectual content. AR and PG provided statistical expertise. PG, AE and LW obtained funding. AR, PG, AE and LW supervised the study.

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