The Influence of Work-Related Fatigue, Work Conditions, and Personal Characteristics on Intent to Leave Among New Nurses

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Key words
Intent to leave, new nurses, structural equation modeling work conditions, work-related fatigue

Abstract
Purpose: This study aimed to (a) test the fit of the hypothesized model for new nurses’ intent to leave and (b) determine the extent to which personal characteristics, work conditions, and work-related fatigue predict intent to leave among new nurses.

Design and Methods: This study was a cross-sectional survey study. A total of 162 new nurses were recruited. A hypothesized model was proposed for model testing. Structural equation modelling was used for data analysis.

Findings: Work conditions only had an effect through work-related fatigue on new nurses’ intent to leave. Personal characteristics did not have a significant effect on new nurses’ intent to leave. The final model showed a good fit. Work-related fatigue, work conditions, and health explained 65% of the variance in new nurses’ intent to leave.

Conclusions: Work-related fatigue was a major determinant of new nurses’ intent to leave. More attention should be paid to fatigue reduction strategies among new nurses.

Clinical Relevance: Work-related fatigue should be monitored, particularly for new nurses who work more than 10 hr per day and who have greater workloads.

New nurses account for approximately 10% of the nursing workforce in acute care settings (Berkow, Virkitis, Steward, & Conway, 2009). However, the turnover rate among new nurses is 30% within the first year of practice, increasing to 57% by the second year (Mills & Mullins, 2008). A recent study reported that about 17.5% of new nurses resigned within the first year of work (Kovner, Brewer, Fatehi, & Jun, 2014). In Taiwan, the mean turnover rate has been reported at 15.8%, but this figure rises to 30.7% for new nurses (Chen & Lin, 2013). The average turnover cost per nurse ranges from US$20,561 to US$48,790 across countries (Duffield, Roche, Homer, Buchan, & Dimitrelis, 2014). Hence, the turnover issue of new nurses is vital for stable staffing and cost efficiency.

One of the major reasons for new nurses’ resignation within their first year after being hired is work-related fatigue (MacKusick & Minick, 2010). According to Winwood, Winefield, Dawson, and Lushington (2005), work-related fatigue can be classified as acute fatigue, recovery from exhaustion, and chronic fatigue. Acute fatigue is transient and is a state of energy depletion resulting from work activity that in turn leads to an inability to engage in normal tasks in nonwork time. Chronic fatigue results from long-term maladaptation to work stress or activities (McEwen, 2003). Nursing work requires higher psychological and physical demands, and thus, nurses are thought to have higher needs for recovery (Eriksen, Ihlebæk, Jansen, & Burdorf, 2006). Only employees with adequate recovery from work demands
and exhaustion can maintain adaptive responses. Insufficient recovery from work fatigue is an indicator of performance breakdown, health problems, sick leaves, psychological distress, and decision to leave (Jansen, Kant, & van den Brandt, 2002; Tei-Tominaga, 2013). New nurses with less knowledge and skills might have more difficulties adapting to a heavy workload, thereby developing chronic fatigue. According to Tei-Tominaga (2013), cumulative fatigue, which can be considered as chronic fatigue, is a risk factor for new nurses’ intent to leave (ITL). Few nursing studies have examined the effect of work-related fatigue on ITL. Most studies have instead focused on the effect of burnout on nurses’ ITL. However, burnout is a construct related to chronic emotional exhaustion and is not synonymous with chronic work-related fatigue (Winwood et al., 2005).

In addition to fatigue, work conditions, including work overtime and workload, have an important effect on nurses’ ITL (Brewer, Kovner, Greene, Shuser, & Djukic, 2012). According to Hayes et al. (2012), excessive workload might cause physical, emotional, and mental exhaustion, which in turn lead to nurses’ ITL. However, evidence in the literature has been inconsistent on this matter. Some studies have demonstrated that high workload and work overtime increase nurses’ intention to stay, as nurses might receive monetary compensation to satisfy their family needs (Mustapha, Ahmad, Uli, & Idris, 2010). Alternatively, it could present an opportunity for professional challenge (Mohamed & Mohamed, 2013). Accordingly, there is a need for further exploration.

Previous studies have demonstrated that nurses’ ITL is also influenced by personal characteristics, including age, education, work experience, and health status (Hayes et al., 2012). Younger, more experienced, and less healthy nurses are more likely to leave (Brewer et al., 2012; Hayes et al., 2012). It has also been found that more experienced nurses have more opportunities, and greater ITL (Tschanzenk, Kalisch, & Lee, 2010). However, inconsistent findings have been found regarding the relationship between education and ITL. Studies have shown that the relationship between education and ITL could be positive (Brewer, Kovner, Greene, & Cheng, 2009), negative (Borkowski, Amann, Song, & Weiss, 2007), or null (Chan, Luk, Leong, Yeung, & Van, 2009).

Furthermore, work-related fatigue might also be influenced by personal characteristics and work conditions. Studies have shown that younger and less experienced individuals with a higher workload tend to have higher work-related fatigue (Akerstedt, Fredlund, Gillberg, & Jansson, 2002; Fang, Kunavikitikul, Olson, Chontawan, & Kaewthummanukul, 2008). New nurses, who are younger and less experienced, might therefore have greater fatigue in comparison to experienced nurses. Work-related fatigue, personal characteristics, work conditions, and ITL may indeed form a complex relationship with mutual influences. Accordingly, a hypothesized model is presented in Figure 1. The model identifies direct relations among personal characteristics, work conditions, work-related fatigue, and ITL. Model testing is carried out to examine the complex relations.

**Aims**

This study aimed to (a) test the fit of the hypothesized model for new nurses’ ITL and (b) determine the extent to which personal characteristics, work conditions, and work-related fatigue predict ITL among new nurses.

**Methods**

**Design and Setting**

This study adopted a cross-sectional design using questionnaire survey methodology. Participants were recruited from two medical centers and three regional hospitals in southern Taiwan.

**Participants**

Participants were recruited using a convenience sampling method. The inclusion criteria were new nurses who (a) had worked for more than 1 month but not for more than 12 months, (b) had graduated within the preceding 1 year, and (c) were clinical frontline nurses. According to an a priori sample size calculation by Soper (2015), given 10 observed variables and three latent variables, with an anticipated effect size at .10, probability at .05, and power level of .80, the minimum sample size for the model structure was 156. In this study, a total of 200 new nurses were contacted, and 171 met the inclusion criteria. After the exclusion of outliers and cases with missing data, a total of 162 cases were included in the final data analysis.

**Measures**

In the hypothesized model, three latent variables (personal characteristics, work conditions, and work-related fatigue) and one measurable variable (ITL) were included. Additionally, some basic information regarding the background of new nurses was also collected, including sex, marital status, work unit, and type of hospital.

**Personal characteristics.** New nurses were asked to provide their age, educational level, work experience,
and overall health status. Self-rated health status (SRHS) was measured using one item with a 5-point Likert scale, from 1 (poor) to 5 (excellent). This single-item measurement has good reliability and validity (DeSalvo et al., 2006) and has been widely used (Krause & Jay, 1994). The test-retest reliability was .92 (Lorig et al., 1996).

**Work conditions.** Work conditions included average working hours per working day in the past week and overall workload. The average working hours item was self-reported. Overall workload was measured using a 0–10 scale. Originally, the overall workload scale was measured on a 0–100 scale (Vidulich & Tsang, 1987) and was considered to be just as sensitive as the multidimensional scales (Hill et al., 1992). The test-retest reliability was 0.88 (Vidulich & Tsang, 1987). In this study, the scale was modified as a 0–10 scale for easy use and analysis. The higher the score, the higher the workload.

**Work-related fatigue.** Winwood et al.’s (2005) Occupational Fatigue Exhaustion Recovery scale, which contains three subscales—chronic fatigue (CF), acute fatigue (AF), and intershift recovery (IR)—was used. There are five items for each subscale. Each item is rated on a 7-point Likert scale from 0 (strongly disagree) to 6 (strongly agree). The sum of each subscale is divided by 30 and multiplied by 100 to produce comparable scores between 0 and 100 (Winwood, Dawson, Lushington, & Winefield, 2006). Among the three subscales, the highest one indicates the dominant type of work-related fatigue. This scale has been tested in different populations, has robust psychometric properties, and is not influenced by gender differences (Winwood et al., 2005). Cronbach’s α for CF, AF, and IR in this study was 0.81, 0.83, and 0.73, respectively.

**Intent to Leave scale.** Leaving and ITL are very closely connected (Widerszal-Bazyl, Radkiewicz, Hasselhorn, Conway, & Heijden, 2008). In this study, researchers used three items to measure ITL, including “I am considering leaving this hospital,” “I am considering leaving nursing,” and “I want to keep doing my nursing work.” The third question is a reversed item. Each item is rated on a 7-point Likert scale from 0 (strongly disagree) to 6 (strongly agree). Higher scores indicated greater ITL. Cronbach’s α was 0.83.

**Data Collection**

After receiving approval from the Institutional Review Board (KMUH-IRB-20130169), the researchers contacted
the nursing department in each hospital and explained the purpose of the study. The inclusion criteria for participation were provided to hospital personnel to gather the name list of new nurses. New nurses were selected using the convenience sampling method. Research personnel went to the units in which new nurses were present and explained the purpose of the study. Participation was voluntary. Upon obtaining consent for participation, each new nurse received a questionnaire package including an informed consent form, a questionnaire, and an envelope. Participants filled out the questionnaire at their convenience. Once the questionnaire was completed, it could be sealed in the envelope. Another large envelope was left in the unit. When participants completed the questionnaire, they called the research personnel to collect the questionnaires, or research personnel went to each unit to collect the questionnaires 1 to 2 weeks after distributing the questionnaires. Each participant received one small gift in appreciation of their participation. The data were collected from January to May 2014.

Data Analysis

All data were analyzed using SPSS version 19.0 for Windows (IBM Corp., Armonk, NY, USA) and AMOS version 21.0 (SPSS Inc., Chicago, IL, USA). Personal characteristics, work conditions, and work-related fatigue were described using descriptive statistics, including frequency, percentage, range, mean, and standard deviation. Bivariate correlations were used to examine relationships between variables. Structural equation modeling (SEM) was used to test model fit. The model fit was examined using chi-square (\( \chi^2 \)), goodness-of-fit index (GFI), adjusted GFI (AGFI), Tucker–Lewis index (TLI), and the root mean square error of approximation (RMSEA). A good model fit is indicated by a non-significant \( \chi^2 \) value, GFI and AGFI greater than .90, TLI greater than .95, and RMSEA less than .05.

Results

Participant Characteristics

A total of 162 new nurses’ data were used in the analysis, 99 from two medical centers and 63 from three regional hospitals. Participants’ ages ranged from 20 to 35 years (\( M = 22.97, SD = 1.29 \)). Most participants were female (96.3%), unmarried (99.4%), had graduated from college (90.1%), and worked on rotating shifts (74.1%). The average duration of work experience was 6.7 months. Regarding SRHS, about 67% of participants were at or above the fair level. Demographic data are shown in Table 1.

Table 1. Characteristics of Participants (\( N = 162 \))

<table>
<thead>
<tr>
<th>Variable</th>
<th>( n (%) )</th>
<th>Variable</th>
<th>( n (%) )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td>Marriage</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>6 (3.7)</td>
<td>Single</td>
<td>161 (99.4)</td>
</tr>
<tr>
<td>Female</td>
<td>156 (96.3)</td>
<td>Divorced</td>
<td>1 (0.6)</td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td>Schedule</td>
<td></td>
</tr>
<tr>
<td>Junior college</td>
<td>9 (5.6)</td>
<td>Fixed shift</td>
<td>42 (25.9)</td>
</tr>
<tr>
<td>2-year diploma</td>
<td>6 (3.7)</td>
<td>Rotating shift</td>
<td>122 (74.1)</td>
</tr>
<tr>
<td>College</td>
<td>147 (90.7)</td>
<td>Age (years)</td>
<td></td>
</tr>
<tr>
<td>Hospital type</td>
<td></td>
<td>Mean (SD)</td>
<td></td>
</tr>
<tr>
<td>Medical center</td>
<td>99 (61.1)</td>
<td>Range</td>
<td>20–35</td>
</tr>
<tr>
<td>Regional</td>
<td>63 (38.9)</td>
<td>Work experience (months)</td>
<td></td>
</tr>
<tr>
<td>Present health</td>
<td></td>
<td>Mean (SD)</td>
<td></td>
</tr>
<tr>
<td>Excellent</td>
<td>0</td>
<td>Range</td>
<td>1.5–12</td>
</tr>
<tr>
<td>Very good</td>
<td>11 (6.8)</td>
<td>Working hours</td>
<td></td>
</tr>
<tr>
<td>Good</td>
<td>42 (25.9)</td>
<td>Mean (SD)</td>
<td>9.74 (1.18)</td>
</tr>
<tr>
<td>Fair</td>
<td>94 (58.0)</td>
<td>Range</td>
<td>5–16</td>
</tr>
<tr>
<td>Poor</td>
<td>15 (9.3)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Descriptive Statistics of Main Variables

For work conditions, the mean (SD) of overall workload and working hours was 6.55 (1.71) and 9.71 (1.17), respectively. This indicated that new nurses perceived a moderate to high workload, and usually worked about 2 hr overtime for an 8-hr shift. The mean (SD) of new nurses’ CF, AF, and IR was 58.19 (18.04), 57.24 (18.52), and 47.88 (13.39), respectively. CF was higher than AF, although the difference was minor. CF was considered the dominant fatigue type among new nurses.

Preliminary Analysis

In order to simplify the model, correlational analysis was performed to find significantly related factors. New nurses’ ITL was not significantly related to age (\( r = −.07, p > .05 \)), education (\( r = −.06, p > .05 \)), or work experience (\( r = −.02, p > .05 \)). However, ITL was significantly related to CF (\( r = .70, p < .001 \)), AF (\( r = .60, p < .001 \)), IR (\( r = −.60, p < .001 \)), overall workload (\( r = .54, p < .001 \)), working hours (\( r = .37, p < .001 \)), and SRHS (\( r = −.33, p < .001 \)). We conducted further analyses to categorize work experience into four different groups in 3-month increments. There were no significant differences among the four groups in the level of CF, AF, or ITL (\( F(3, 157) = .82, p = .48 \)). Further, new nurses working more than 10 hr showed more acute, \( t(160) = −5.11, p < .001 \), and chronic fatigue, \( t(160) = −4.43, p < .001 \), and less recovery, \( t(160) = 3.69, p < .001 \), compared to those working less than 10 hr.
As age, education, and work experience were not significantly correlated with ITL, all three factors were removed from the model. As health was significantly correlated with AF ($r = .41, p < .01$), CF ($r = .43, p < .01$), IR ($r = -.38, p < .01$), working hours ($r = .22, p < .01$), and workload ($r = .37, p < .01$), we added one additional path from work conditions to health. We used this modified model for model testing (Figure 2). For other categorical variables, t-tests and Kruskal–Wallis tests were performed. ITL did not differ by hospital type, $t(160) = -.183, p > .05$; work unit, $X^2(2) = 6.07, p > .05$; or shift schedule, $t(160) = .303, p > .05$.

**Structural Equation Model**

The fit statistics of the model showed a good fit, $X^2(10) = 9.29, p > .05$, GFI = .98, AGFI = .95, CFI = 1.00, TLI = 1.00, RMSEA = .000. The structural relationships with standardized coefficients are presented in Figure 2. The paths from work conditions to fatigue ($\beta = .77, p < .001$) and from fatigue to ITL ($\beta = .54, p < .01$) were significant, but the path from work conditions to ITL was not significant ($\beta = -.02, p > .05$). The standardized total effect of work-related fatigue on ITL was about .54, and the standardized direct effect was also .54. There was no indirect effect. The standardized total effect of work condition on ITL was about .75, with a standardized direct effect of .31 and an indirect effect of .44. This showed a mediating effect of work-related fatigue for the relationship between work conditions and ITL. The path from health to ITL was not significant ($\beta = -.02, p > .05$), indicating that new nurses’ health status was not a significant determinant of ITL. In the final model, work-related fatigue, work conditions, and health explained 65% of variance in new nurses’ ITL.

**Discussion**

The present study demonstrated how health, work conditions, and fatigue combined to affect new nurses’ ITL. In the extant literature, it has been shown that work conditions (work overtime and workload) directly influence nurses’ ITL. However, in this study, work conditions could only have a significant effect on ITL when they first led to work-related fatigue, which supported Hayes et al.’s (2012) statement that work conditions do not directly lead to ITL, and that other conditions must be present.

Two reasons were postulated for the mediating effect of work-related fatigue. First, in this study, new nurses’ average working hours were almost 10 hr, and the highest reached 16 hr. Those working more than 10 hr had more acute fatigue, chronic fatigue, and less recovery compared to those working less than 10 hr. According to Barker and Nussbaum 2011, long working hours are associated with fatigue. Without adequate recovery, acute fatigue might progress into chronic fatigue (Winwood et al., 2005), and chronic fatigue would become a major risk factor for new nurses’ ITL (Tei-Tominaga, 2013).

Second, nursing work is extremely demanding, both psychologically and physically, and thus, nurses are expected to have higher needs for recovery (Eriksen et al., 2006). In Taiwan, after work, most new nurses are still required to do homework and to review the literature or textbooks for problems they encountered or for questions that preceptors had asked. It seems that new nurses cannot withdraw from work for leisure time or adequate rest. An inability to withdraw from work obligations would further contribute to poorer recovery from work (Schwarz, 2011) and exacerbate fatigue levels. With less recovery time, new nurses might develop chronic fatigue (Barker & Nussbaum, 2011). In this study, chronic fatigue was the dominant fatigue type among new nurses, and might further lead to increased ITL.

Previous studies have shown that health status is associated with ITL (Brewer et al., 2012). In the preliminary analysis of this study, SRHS also had a significant negative relationship with ITL. However, in the final model, SRHS was not a significant determinant of ITL. This
might be the case because, for instance, in Brewer et al.’s (2012) study, health status was indicated by injuries or sprains. Nurses with more sprains and strains showed greater turnover. In our study, participants were very young and tended to be healthy. Their SRHS was mainly above the fair level. The sample seemed homogeneous, and so the variance might not have been sufficient for differentiation. Further, in the final model, work-related fatigue had a stronger influence on ITL, which might share SRHS’s contributions to the prediction of ITL, thereby producing a nonsignificant effect of SRHS on ITL. Moreover, the one-item measurement of overall health status may not be sensitive enough for healthy working individuals (Reineholm, Gustavsson, Liljegren, & Ekberg, 2012). The homogeneous sample issue might also explain why new nurses’ age and education were not significantly related to ITL.

Regarding work experience, in this study, we assumed that new nurses with more working experience should have better adaptation strategies, less fatigue, and less ITL. However, the results showed that work experience was not significantly correlated with ITL. As mentioned in the preliminary analysis, fatigue level and ITL showed no significant differences among four different working experience groups (1–3, > 3–6, > 6–9, and > 9–12 months). This might be because new nurses at different time periods had different tasks for adaptation. In the first 3 to 6 months, they need to adapt to the work routines. Then, they need to take some core courses, get involved in case analysis, and go through the clinical nursing ladder system (Chen, Hwang, & Huang, 2014). For example, from nursing ladder N0 to N1, new nurses need to write a reading report and pass an examination. Hence, new nurses with more experience might perceive the workload to be similar in quantity, even though they are more familiar with routines.

There were several limitations in this study. First, this was a cross-sectional study. Fatigue level was measured at only one time point. It was impossible to determine how fatigue level changed and what the causes might be. Although SEM was used to test the model, it could not confirm directional causality. A longitudinal study is recommended for future research. Second, this study did not apply a random sampling method, and thus, the generalizability of the results might be limited. Third, the one-item SRHS scale might not be sensitive enough for healthy workers. Future research might consider increasing the sample size to improve power or choosing another health status instrument for healthy people. Finally, this study did not include certain organizational factors, such as co-worker support, leadership style, and so forth, which might further increase the amount of explained variance of ITL.

Conclusions and Implications

This study has extended the current knowledge in two ways. First, this model suggested that only work conditions and work-related fatigue affected new nurses’ ITL. Personal characteristics did not affect new nurses’ ITL. Second, the mediating effect of work-related fatigue was confirmed. Work conditions only affected new nurses’ ITL through work-related fatigue. Work-related fatigue was a major determinant of ITL. Suggestions were made as follows. Nurse Managers should pay more attention to new nurses with long overtime hours or working hours. The level of workload and work-related fatigue should be evaluated regularly, especially for new nurses working more than 10 hr per day. The overall workload scale could be used as a quick screening tool. Then, new nurses’ fatigue level, work-related difficulties, and adaptation strategies should be assessed by mentors. Strategies for fatigue reduction should be implemented for new nurses to enhance their intention to stay, such as increasing the number of breaks and support from mentors. Moreover, mentors could reevaluate the effect of the new nurses’ training program on new nurses’ fatigue level and make adjustments accordingly to fit individual needs. Future studies should focus on the longitudinal change of work-related fatigue so that a trend of fatigue changes can be observed and intervention strategies can be developed.

Acknowledgments

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Clinical Resources

- Medscape Nurses: http://search.medscape.com/search/?q=nurse%20turnover

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