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Pre-employment health lifestyle profiles and actual turnover among newly graduated nurses: A descriptive and prospective longitudinal study

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ABSTRACT

Background: Newly graduated nurses' pre-employment health lifestyles play particularly important roles in their smooth adaptation to and retention in clinical nursing; however, the longitudinal relationship between pre-employment health lifestyles and work outcomes, such as turnover, remains under-examined. To identify the health lifestyle profiles of specific populations of interest, recent studies have employed multifaceted approaches using health behaviors and/or statuses.
Objectives: To identify the pre-employment health lifestyle profiles of newly graduated nurses, and to examine the longitudinal relationships between health lifestyle profiles and actual turnover.
Design: Descriptive and prospective longitudinal study design.
Settings: One tertiary hospital in Seoul, South Korea.
Participants: A total of 464 newly graduated nurses who started work between September 2014 and December 2015.
Methods: The outcome was actual turnover—whether participants had resigned from the organization and the days they worked up to December 31, 2017. We measured eight health lifestyle variables on the first day of orientation before ward placement (i.e., at baseline): quantity and quality of sleep, eating three meals a day, having a regular diet, alcohol consumption, moderate exercise, depression, and self-rated health. We employed latent class analysis to identify the health lifestyle profiles of new nurses, and used Cox proportional hazards regression to examine the longitudinal relationships between health lifestyle profiles and actual turnover.
Results: We classified newly graduated nurses' pre-employment health lifestyle profiles into two groups: unhealthy lifestyle (15.6%) and discordant (84.4%). Compared with the new nurses in the discordant group, those in the unhealthy lifestyle group had significantly higher probabilities of resigning (HR = 2.38, 95% CIs of HR = 1.62–3.50); this relationship remained significant after adjusting for perceived job stress at six weeks of work (HR = 2.26, 95% CIs of HR = 1.50–3.39).
Conclusions: This study identified significant differences in the patterns of newly graduated nurses' pre-employment health lifestyles; our analysis showed that classification in the unhealthy lifestyle group was a turnover risk factor. Given that new nurses' health lifestyles affect work outcomes, hospitals should implement organizational and educational initiatives to encourage healthy lifestyles. In considering pre-employment health lifestyle profiles, hospitals should also monitor novice nurses' adaptation and wellness. Nursing education should include strategies to enhance nursing students' own health. Further extensive longitudinal studies should seek to identify the health lifestyle profiles of heterogeneous nurse populations.

What is already known about the topic?

- Newly graduated nurses' pre-employment health lifestyles play particularly important roles in their smooth adaptation to and retention in clinical nursing.

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- Researchers have employed multifaceted approaches that take into consideration various health-related characteristics to identify meaningful health lifestyle profiles.

What this paper adds

- We classified newly graduated nurses' pre-employment health lifestyles into two groups: unhealthy lifestyle and discordant.
- Compared with the new nurses in the discordant group (15.6%), those in the unhealthy lifestyle group (84.4%) had significantly higher probabilities of resigning.

1. Introduction

High nurse turnover leads to considerable health care costs and adverse patient outcomes (Duffield et al., 2014; Kim and Han, 2018). In South Korea, turnover rates for new nurses were 18% within the first year and 47% within the first three years, rates that are comparable to those in the United States (15% within the first year and 43% with the first three years) (Brewer et al., 2012; Cho et al., 2012). For new nurses working in Korean hospitals, the first year turnover rate was 33.9% in 2015, twice as high as the average turnover rate of all hospital nurses (Korean Hospital Nurses Association, 2016), and significantly higher than the 17% turnover rate of new nurses in the United States (Blegen et al., 2017). Because nurses who leave their first jobs at hospitals are unlikely to continue working in hospital settings, the factors that cause novice nurse turnover should be thoroughly explored to bolster nurse retention and improve the quality of nursing care (Korean Hospital Nurses Association, 2016).

Newly graduated nurses experience various job strains and health risks. Most hospital settings require nurses to fulfill physically and psychologically demanding roles—from lifting heavy patients to completing heavy workloads with inadequate time (Ketelaar et al., 2015). Nurses in South Korea reportedly care for around 11 patients per shift—twice the number of patients cared for by nurses in the United States and European countries; moreover, South Korean nurses work in poor work environments with the minimal staffing levels (Cho et al., 2015). New nurses, in particular, struggle as a result of their underdeveloped nursing skills and adaptation strategies (Della Ratta, 2016). Furthermore, novice nurses are particularly susceptible to workplace adversities, including bullying, violence, and safety issues, which are contributing factors to newly licensed nurses' turnover (Brewer et al., 2012; Choi and Lee, 2017).

Research has indicated that the nurses who survive in such environments tend to have good physical and psychological health (Boamah and Laschinger, 2016; Perry et al., 2016). Nurses who have healthy lifestyle habits, such as sleeping well and actively participating in health-promoting behaviors, can effectively manage occupational stress and work productively (Katz et al., 2014; Kim, 2014). Indeed, while research has shown that nurses who exhibit depressive symptoms are unlikely to cultivate the social support necessary to withstand negative circumstances (Porr et al., 2010), new nurses with healthy lifestyles are willing to resolve complex situations with coworkers, and ultimately become trained nurses who can provide quality care. In other words, healthy pre-employment lifestyle could play an important role in the retention of quality nurses. However, the role of nurses' pre-employment health lifestyles in actual turnover requires further investigation (Chan et al., 2013).

Healthy lifestyles are broad orientations that promote beneficial behaviors and positive perceptions regarding health (Saint Onge & Kruger, 2017). Recent studies have taken multifaceted approaches to identify healthy lifestyle profiles by considering a combination of health behaviors and/or statuses (Moon, 2014; Ng et al., 2014). Focusing on single health-related characteristics limits the scope of health interventions and the potential for creating enduring change (Institute of Medicine, 2001; Saint Onge & Kruger, 2017). From an occupational health standpoint, advancements in existing research should be applied to examinations of nurses' health lifestyles via consideration of various health behaviors and outcomes. Furthermore, health problems among young adults are not simply outcomes of unhealthy behaviors; research has indicated that inactive participation in health behaviors stems from impaired psychological and emotional functioning and subjective health status (Wong et al., 2018; Hogan et al., 2015; Tan et al., 2018). Several studies have identified depression and self-rated health as important predictors of daily life and work functioning, recommending that organizations actively attempt to mitigate these factors along with unhealthy behaviors (Iancu et al., 2014; WHO, 2018; Øyeflaten et al., 2016; Wong et al., 2018; Hogan et al., 2015; Cho and Han, 2018). Therefore, we considered health behaviors (e.g., sleep, diet, physical activity, drinking) and health-related perceptions (e.g., depressive symptoms, self-rated health) in our efforts to identify health lifestyle profiles of newly graduated nurses.

Previous studies have not classified newly graduated nurses' health lifestyle profiles using multiple health variables; furthermore, the longitudinal relationships of nurses' health lifestyle profiles with work outcomes and sustainability at work have not been studied. Therefore, we aimed to identify the pre-employment health lifestyle profiles of new nurses using health behavior and status measures, and to examine the longitudinal relationships between health lifestyle profiles and actual turnover.

2. Methods

2.1. Design

This study employed a descriptive and prospective longitudinal design using nurse survey data from the NOvice Nurses 2 year follow-UP study project (NON2UP study) (Han et al., 2019) linked to hospital administrative data on nurses' actual turnover.

2.2. Data sources and sampling

For the NON2UP study, we invited newly graduated nurses who had no experience as registered nurses and had started work between September 2014 and December 2015 at a tertiary hospital in Seoul, South Korea, to participate on the first day of orientation before ward placement. All new nurses voluntarily agreed to participate in the study. We asked the nurse participants to complete self-reported questionnaires six times during their first two years of work: the first day of orientation before ward placement (baseline, T0), six weeks after starting work (T1), and during the 6th, 12th, 18th, and 24th months of work (T 2–5). The baseline survey (T0) collected demographic and health-related information, whereas the succeeding surveys (T 1–5) included health- and job- related items. The nurses returned the completed questionnaires in sealed envelopes to designated mailboxes located on each hospital floor. When nurses did not return questionnaires, a member of the research staff re-sent the questionnaire packages within 2 weeks of data collection. The research staff distributed and collected all questionnaire packages. To maximize voluntary participation, ensure anonymity, and protect confidentiality, no hospital-associated researchers took part in the data collection process. To increase follow-up rates, we communicated changes in study variables following baseline collection through postcards, which were delivered during the

12th and 24th months along with coffee coupons. The follow-up rates ranged from 72% to 99% across the six measures. The majority of the nurses who participated in the study were 24 years old at baseline and female (95%) with bachelor's degrees in nursing. All nurses had started working in eight-hour rotating shifts. Our final analysis included data on 464 nurses; we excluded one nurse who did not provide baseline survey responses and 28 nurses who transferred to other units during the study period.

To assess pre-employment health lifestyles, we obtained health-related information (i.e., sleep, diet behaviors, physical activity, alcohol consumption, depressive symptoms, and self-rated health) from the baseline data. To account for a potential confounding variable, we measured perceived job stress at the 6th week of work. For turnover data, we retrieved hospital administrative data regarding whether the nurse participants had stayed on as of December 31, 2017, as well as the dates of departure of those who had left.

2.3. Measures

We measured quantity and quality of sleep using two open questions: "In the last month, how many hours did you actually sleep?" and "Overall, how was the quality of your sleep in the past month?" Based on the recommendation of the National Sleep Foundation (Hirshkowitz et al., 2015), we coded six to eight hours of sleep (i.e., quantity) as normal and durations below and above this range as abnormal. For overall sleep quality, we dichotomized responses ranging from 1 (very poor) to 4 (very good) into very poor and poor (representing poor sleep) vs. good and very good (representing good sleep).

Regarding diet behaviors, we asked nurses to report whether or not they had eaten meals three times a day (yes vs. no) and had regular diets (yes vs. no) in the past week.

We gauged physical activity using items adopted from the Korean International Physical Activity Questionnaire Short Form (Booth, 2000; Oh et al., 2007). We defined moderate exercise as participation in moderate-level physical activities (e.g., carrying light loads, cycling at a regular pace, and playing doubles tennis in leisure time or as part of work) at least two days in the preceding week (yes vs. no).

We assessed alcohol consumption based on consumption frequency during the preceding month. We defined drinking less than two to four times per month as normal, and drinking more than two to three times per week as abnormal (Korea Centers for Disease Control and Prevention, 2008).

We used the Korean Center for Epidemiologic Studies-Depression scale (Chon and Rhee, 1992; Radloff, 1977) to assess depressive symptoms. This scale measured the frequency at which participants had experienced depressive symptoms during the preceding week using 20 items with response options ranging from 0 (extremely rare, less than 1 day) to 3 (almost all, 5 to 7 days). Participants with sums for the 20 items exceeding 21 were defined as depressed (Cho et al., 2007; Cho and Kim, 1998). Previous researchers recommended a more stringent cutoff point than the standard cutoff point of 16 because it is more contextually relevant in Korea (Cho and Kim, 1998).

We measured self-rated health using the item "How would you rate your usual health status in the past month?" We dichotomized responses into very poor/poor/fair to represent poor health and good/very good for good health (Elliott et al., 2015).

For turnover, we assessed two variables; whether the nurse participants had stayed on or resigned by December 31, 2017, and the days they had worked up to December 31, 2017, which we calculated from their first days of work.

One potential confounder of the relationship between health lifestyle class membership and actual turnover was job stress (Han et al., 2015) perceived during the 6th week of work (T1), which research has shown to be most severe during the first two years of work (Han et al., 2019). Following the Karasek model of job strain (Karasek, 1994), we assessed three elements of job stress—demands, control, and support. We adapted all items related to job stress from the Nurses' Work Life and Health Study 3 survey, which studies have shown to provide valid assessments of nurses' perceptions of occupational stress (Han et al., 2011; Trinkoff et al., 2006). We measured psychological and physical demands using 7 and 12 items, respectively. We used five items to assess levels of decision-making authority and autonomy (job control) and assessed job support using four and two items related to supervisor and peer support, respectively. All items had four-point Likert-type responses, ranging from strongly disagree (1) to strongly agree (4), or from never (1) to often (4). We calculated the average scores for each domain item; lower scores in job demands and higher scores in job control and support reflected better working conditions.

2.4. Statistical analyses

To identify the pre-employment health lifestyle profiles of novice nurses, we performed latent class analysis (LCA) using Mplus, version 8 (Muthén and Muthén, 1998–2017Muthén and Muthén, 1998Muthén and Muthén, 1998–2017). LCA identifies smaller groups of individuals using categorical latent variables (Muthén and Muthén, 2000). LCA involves a person-centered approach to classifying heterogeneous groups of cases (i.e., clusters) based on the probabilities that individuals report regarding each health lifestyle characteristic. We utilized dichotomized health-related variables to facilitate LCA despite the risk of losing sensitivity (Norton et al., 2012). This dichotomization approach is commonly used in existing studies because it does not depend on the distribution and can be easily interpreted (McCutcheon, 1987). Although the dichotomization procedure was based on existing recommendations, we performed sensitivity analyses using different cutoff points: $>$ vs $\leq$1 per month for alcohol consumption, $>$ vs $\leq$ 16 of CESD scores for depressive symptoms, and very poor/poor vs fair/good/very good for self-rated health. Relying on a step-wise approach, we repeatedly performed LCAs using the eight health lifestyle characteristics with increasing numbers of classes until no improvement was observed. To determine the best model, we considered the combinations of model fit indexes, such as entropy, the Lo–Mendell–Rubin likelihood ratio test (LMR-LRT), Akaike Information Criteria (AIC), and Bayesian Information Criteria (BIC) values, along with the research question and interpretability (Jung and Wickrama, 2008; Muthén, 2003). Entropy assesses how well the model predicts class membership with the baseline health lifestyle characteristics. Entropy ranges from 0 to 1, and higher values are preferred (Ng et al., 2014), whereas LMR-LRT compares the model fit improvement between models with k and k-1 clusters ("k" means any natural number) and indicates that values higher than 0.05 do not represent significant improvement for the increased number of classes. AIC and BIC combine goodness of fit and parsimony, and smaller values are preferred (Jung and Wickrama, 2008).

To estimate the survival curves of new graduates and to examine the longitudinal relationship of each latent class to actual turnover of novice nurses, we conducted survival analysis using SPSS Statistics version 23.0 for Windows (Armonk, NY: IBM Corp. Released 2015). Survival analysis models the probability of turnover over the course of time (work duration). More concretely, it models the conditional probability that a nurse will still be in a job at a specific point in time given that the nurse was still in the job previously. Survival analysis has the special feature of

Table 1
Model fit statistics for 2- to 4-class models (n = 464).

	Number of Classes		
	2	3	4
Entropy	0.812	0.734	0.712
Lo–Mendell–Rubin Adjusted Likelihood Ratio Test	0.011	0.017	0.113
Akaike information criterion	4012.388	3979.423	3981.601
Bayesian information criterion	4082.766	4087.06	4126.497

introducing censored cases—those who remained in their jobs until the end of the study. In our study, censored cases were the novice nurses who stayed in their jobs until December 31, 2017, when the study ended.

We used the Kaplan–Meier method to estimate and compare the survival curves, a log-rank test to examine the differences in survival curves, and Cox proportional hazards regression to examine the associations between the health lifestyle profiles and actual turnover. Model 1 examined the crude association between baseline health lifestyle classifications and actual turnover among all new nurses (n = 464). To adjust for job stress as worst status during the first two years of work (i.e., at six weeks of work, T1), Model 2 included data for 448 nurses, excluding 17 nurses who had resigned within the first six weeks of work. We tested the proportional hazard assumptions for the Cox regression models using the slope of partial residuals and determined that they were not violated.

We conducted additional analyses including and excluding male nurses (n = 30) and generated similar results. Therefore, to improve the generalizability of our findings, this paper reports results that include data for both male and female nurses.

3. Results

3.1. Baseline health lifestyle characteristic profiles

Table 1 presents the model fit statistics for LCA models of two- to four-class solutions. The Lo-Mendel-Rubin Adjusted Likelihood Ratio Test for the four-class model was not significant, indicating that the four-class model did not outperform the three-class model. Although the three-class model showed the lowest AIC and a statistically significant LMR-LRT p-value, the highest entropy value and the best BIC performance suggested that the parsimonious identification of two latent classes in the baseline health lifestyle characteristics provided the best overall model fit (Jung and Wickrama, 2008; Nylund et al., 2007).

Fig. 1 provides a graphical representation of the two latent classes. The x-axis represents the baseline health lifestyle characteristics and the y-axis shows the probability of having negative/poor health lifestyle indicators within each class. These probabilities reflect within-class individual characteristics different from those in other classes. We assigned labels to each class based on health lifestyle probabilities (λ), and identified two health lifestyle profiles (Table 2). The first profile was the unhealthy lifestyle group (Fig. 1, dotted line), comprising about 16% of the population. The unhealthy lifestyle group was marked by disproportionately high levels of poor sleep quality (λ = 1.00), not eating 3 meals a day (λ = 0.67), irregular diet (λ = 0.75), depression (λ = 0.45), and poor self-rated health (λ = 0.57). The second profile was the discordant group (Fig. 1, solid line), comprising about 84% of the population. Relatively few nurse graduates in the discordant group reported abnormal sleep duration (λ = 0.17), poor sleep quality (λ = 0.13), depression (λ = 0.08) and poor self-rated health (λ = 0.17). However, members of this group did report some poor lifestyles: not participating in moderate exercise (λ = 0.66), not eating 3 meals a day (λ = 0.55), and irregular diet (λ = 0.45).

3.2. Longitudinal relationship of each latent class with actual turnover

Fig. 2, part A shows the survival curve for all novice nurses. The estimated survival probabilities for novice nurses were 0.866 for one year, 0.769 for two years, and 0.648 for three years. The survival curves of the unhealthy lifestyle group were significantly different than those of the discordant group (log-rank test p-value <0.001; Fig. 2, part B). The survival probabilities for participants in the unhealthy lifestyle group were lower than those of participants in the discordant group: 0.688 vs 0.895 for one year, 0.578 vs 0.800

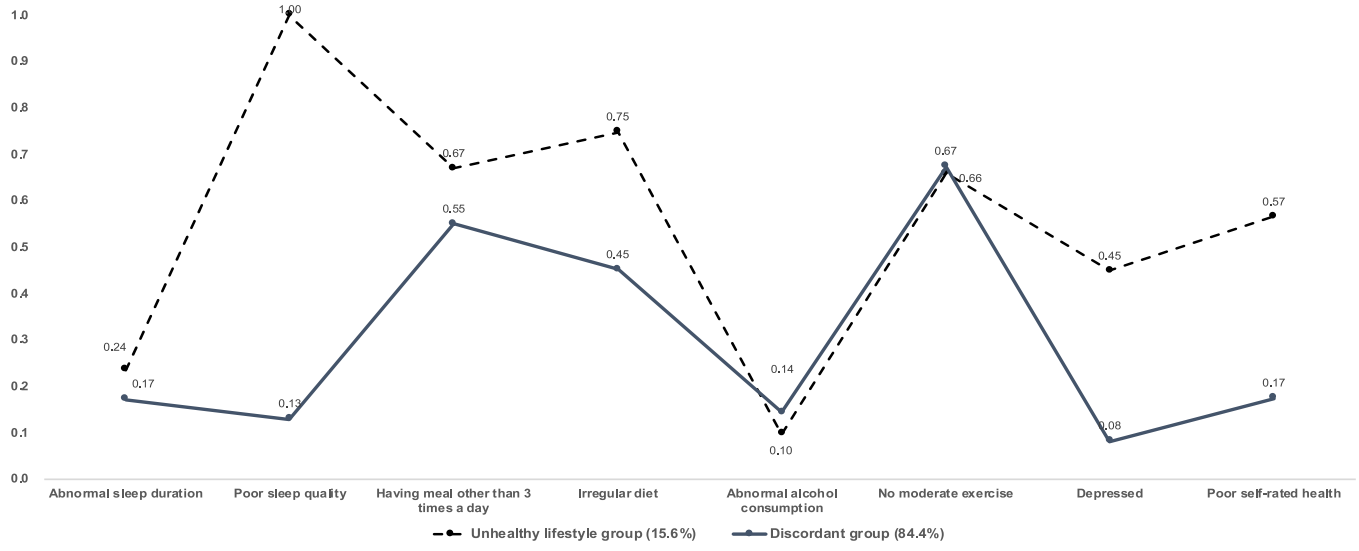

Fig. 1. Pre-employment health lifestyles for each latent class: Unhealthy lifestyle group vs discordant group.

Table 2
Probabilities of health lifestyle indicators by the health lifestyle classes.

	Unhealthy lifestyle group (15.6%)	Discordant group (84.4%)
Abnormal sleep duration	0.24	0.17
Poor sleep quality	1.00	0.13
Having meal other than 3 times a day	0.67	0.55
Irregular diet	0.75	0.45
Abnormal alcohol consumption	0.10	0.14
No moderate exercise	0.66	0.67
Depressed	0.45	0.08
Poor self-rated health	0.57	0.17

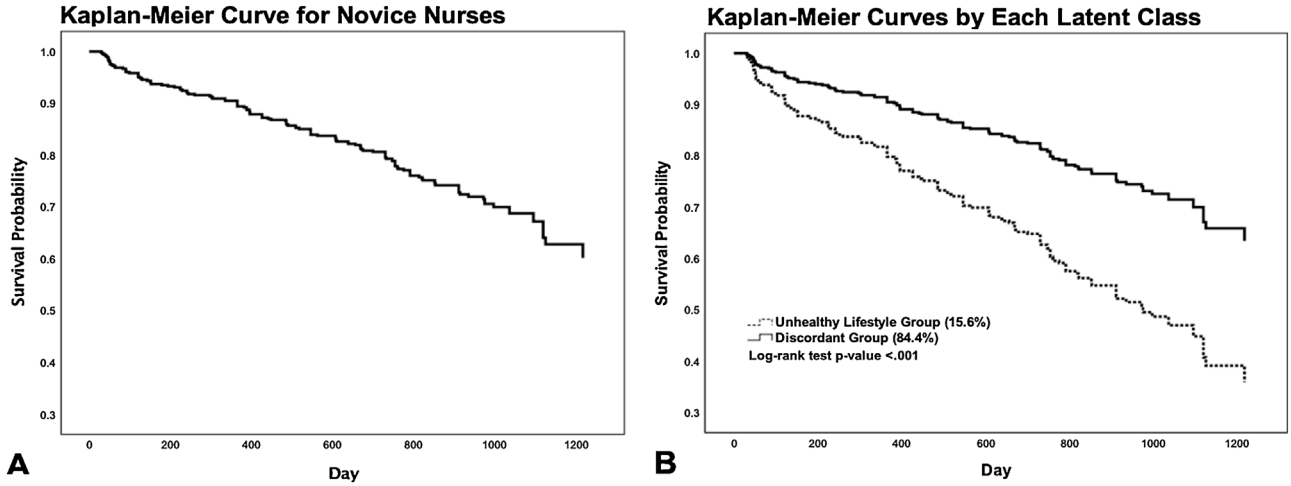

Fig. 2. Survival curves; A: Survival curve of new nurses. B: Survival curves of the unhealthy lifestyle group and the discordant group.

Table 3
Longitudinal relationship between each latent class and actual turnover.

	all new nurses (n = 464)		new nurses who had survived till 6th week (n = 447)	
	Hazard Ratio	95% confidence intervals of hazard ratio	Hazard Ratio	95% confidence intervals of hazard ratio
Baseline health lifestyle classification				
Unhealthy lifestyle group vs. discordant group	2.38	1.62–3.49	2.25	1.50–3.38
Job Stress during the 6th week of work				
Psychological Demand			1.21	0.77–1.90
Physical Demand			1.04	0.73–1.50
Control			0.93	0.59–1.47
Boss Support			0.92	0.64–1.31
Peer Support			0.73	0.51–1.04

for two years, and 0.459 vs 0.679 for three years. Notably, more than half of nurses in the unhealthy group left the hospital during the first three years of work, while only 32% of nurses in the discordant group had resigned. During the study period, the risk of job turnover in the unhealthy lifestyle group was more than twice as high as in the discordant group (HR = 2.38, 95% CIs of HR = 1.62–3.50). This relationship remained significant after adjusting for job stress reported during the 6th week of work (HR = 2.25, 95% CIs of HR = 1.50–3.38) (Table 3).

The results of the sensitivity analyses, which repeated the LCAs with different cutoff points for the dichotomized health lifestyle variables, revealed similar patterns for the two latent class solutions, though with worse model fit indexes (Supplementary File 1). Relative to the findings of our original analysis, the sensitivity analysis showed some differences in alcohol consumption but none in depression and self-rated health between the two groups. The risk of job turnover during the study period was 1.60 times as high in the unhealthy lifestyle group as in the discordant group, lower than in the original analysis results.

4. Discussion

Health is a multidimensional concept, and a cumulative health measure should be studied to relate with further work and health outcomes (Chang et al., 2013). However, most previous research has focused on single-dimension health-related characteristics. Our study contributes by identifying multidimensional pre-employment health lifestyle profiles of newly graduated Korean nurses. In our preliminary analysis, we used a multivariable model to examine associations between eight health lifestyle indicators and actual turnover, revealing that only one of the eight (poor self-rated health) was significant (data not shown). As cumulative health measures, our health lifestyle profiles provide valuable information for nursing workforce management. Our study also contributes by investigating the longitudinal effects of different health lifestyle profiles on actual turnover.

Our survival analysis results showed a significant longitudinal relationship between pre-employment health lifestyle profiles and

actual turnover among nurses. This significant relationship remained even after adjusting for job stress, which could reflect unit-level characteristics. Most previous research has utilized occupational health perspectives to examine workers' health characteristics during employment in relation to work productivity and outcomes (Baxter et al., 2015; Goetzel et al., 2012). As far as we know, our study is the first to investigate pre-employment health lifestyle characteristics and their longitudinal relationships with actual turnover. Through exposure to new organizational cultures and work environments in clinical settings, new nurses learn and perform complex nursing tasks simultaneously. The baseline healthy lifestyles of novice nurses might play pivotal roles in their vitality at work, their motivation to adapt to clinical nursing (Neville and Cole, 2013), and their willingness to become further invested in their jobs (Kurnat-Thoma et al., 2017; Wright, 2014). Novice nurses with healthy pre-employment lifestyles might be more likely to effectively confront obstacles and stress at work (Deuster and Silverman, 2013).

New nurses in Korea are reportedly at risk of exposure to excessive workloads and workplace bullying within hierarchical nursing cultures (Choi and Lee, 2017). Nurses with unhealthy baseline lifestyles may be vulnerable to such negative experiences within clinical settings, and retaining them therefore requires special attention. Nurse managers should monitor novice nurses with unhealthy lifestyles during pre-employment and strive to alleviate the difficulties they encounter in adapting to work. Research has shown links between the factors that our study identified as distinguishing the two health lifestyle profiles (i.e., poor sleep quality, depression, and poor self-rated health) and negative cognitive bias toward environmental stimulants (Gobin et al., 2015). With this in mind, managers should create countermeasures focused on at-risk groups to foster favorable work environments. Novice nurses should have regular opportunities to communicate their experiences, and hospitals should provide consulting experts to at risk novice nurses and offer timely interventions to address specific problems at work. In addition, nursing schools should encourage students to take care of their health to properly adapt to nursing work and growth. Moreover, nursing curricula should include strategies for self-care behaviors and maintaining good health statuses.

Using latent class modeling to examine the clustering effects of health lifestyle variables among nurses, we identified two classes—the unhealthy lifestyle and discordant groups. We differentiated these groups based on sleep quality, diet behaviors, depression, and self-rated health—factors that have been shown to be important for female health outcomes (Kurnat-Thoma et al., 2017; Mokdad et al., 2018; Office of the Surgeon, 2010; Robaina and Martin, 2013; Wright, 2014). Our nurse participants reported low physical activity levels, which are generally prevalent in the young population (Calamidas and Crowell, 2018; Perry et al., 2018). The social support networks, busy schedules, and habitual behaviors of young adults may reinforce such sedentary behaviors and therefore these behaviors cannot be used to distinguish between healthy and unhealthy individuals (Calamidas and Crowell, 2018). Furthermore, we expected that the participants in our study would have high health-related knowledge, and therefore might not engage in risk-taking health behaviors such as alcohol consumption (Kardakis et al., 2018). Although maladaptive, alcohol consumption can be an effective strategy for stress relief and social networking among young adults (Holton et al., 2016; Lyons et al., 2015).

The two distinct health lifestyle profiles we identified could reflect the underlying health status of the sample in which the majority of new nurses (84%) had discordant health lifestyles with low levels of sleep disturbance, depression, and poor self-rated health but relatively high levels of poor diet and physical inactivity behaviors. Since few studies have focused on the clustering of general young adults' health (Kim et al., 2017), previous research cannot fully explain our findings. The dichotomy in the health lifestyle profiles may stem from the low number of health lifestyle variables included in this study (Ng et al., 2014). More diverse profiles could be created by including other relevant health lifestyle items, such as smoking, healthy eating, and weight and stress management, which we did not measure in this study. Previous studies have considered various chronic health conditions and/or health service accessibility issues for elderly populations (Chang et al., 2013; Kim et al., 2017) as well as diverse intentions toward health like influenza vaccinations and doctor visits (Saint Onge and Krueger, 2017). The young nurses in our study reported few health disorders (e.g., only <5% experienced menstrual pain and digestive discomfort); therefore, we could not identify diverse health conditions. However, many studies have generated dominant proportions of relatively healthy profiles (44%–82%) versus some variations of relatively unhealthy profiles (Kim et al., 2017; Ng et al., 2014; Saint Onge and Krueger, 2017).

Our study is innovative in that it identified the health lifestyle patterns of novice nurses. The prospective longitudinal design minimized bias in recall and enabled us to support the causal relationship between health lifestyle patterns and actual turnover. Nonetheless, our findings should be interpreted with caution and keeping the following limitations in mind. First, despite the temporal precedence of the explanatory variable (i.e., pre-employment health profile) to the outcome variable (i.e., actual turnover), we cannot fully confirm a causal relationship between the two. Existing literature has identified many occupational factors as significant (e.g., psychosocial work environment and workload) for nurse turnover, whereas our study only included job stress during the 6th week of work as a potential confounder (Hayes et al., 2012). Future studies should consider additional contributing factors to turnover. Second, although we recruited almost all new nurses during the study period, the nurse participants had only worked in one organization. Thus, because the study hospital is one of the largest and most advanced in South Korea, our study findings may not be generalizable to all Korean hospital nurses. Moreover, our nurses had homogeneous personal characteristics; therefore, we could not use the health lifestyle profiles to compare personal characteristics or traits. Lastly, the baseline health-related information was self-reported, meaning it could have been affected by problems such as denial and social desirability bias. Finally, for turnover data, we used the hospital's administrative database, and did not collect information about whether the participants who had resigned had quit nursing. Thus, our study did not distinguish those who had quit nursing from among the turnover cases.

5. Conclusion

This study demonstrated significant differences in pre-employment health lifestyle profiles among new nurses; we showed that the unhealthy lifestyle group was a turnover risk factor. Given that nurses' health affects not only them but also their work outcomes, including quality of nursing care and turnover (Cho and Han, 2018), hospitals should implement related organizational and educational initiatives. Based on our findings regarding the pre-employment health lifestyles of nurses, hospitals should monitor novice nurses' adaptation and wellness. In addition, nursing education should include strategies nursing students can use to enhance their health and smoothly adapt to nursing work early on (Han et al., 2016). Identifying the health profiles of heterogeneous nurse populations will require more extensive longitudinal studies. Futures study should include larger sample sizes from multiple sites so that researchers can investigate the pre-existing personal characteristics or traits that contribute to health lifestyle profile membership.

Conflict of interest

No conflict of interest to be declared.

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Ethical approval

The Asan Medical Center Institutional Review Board approved this study (IRB protocol number: No S2014-0393).

Appendix A. Supplementary data

Supplementary material related to this article can be found, in the online version, at doi:https://doi.org/10.1016/j.ijnurstu.2019.05.014.

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