



Multicenter study of nursing role complexity on environmental stressors and emotional exhaustion



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ABSTRACT

Among nurses, work and cognitive complexity patterns of care were previously associated with environmental stressors, but it is unknown if complexity patterns are also associated with emotional exhaustion. A multicenter sample of hospital nurses (N = 281) completed valid, reliable questionnaires. Data were analyzed using multi-variable modeling. Registered nurse characteristics did not vary by work setting. Overall mean (standard deviation [SD]) standardized complexity of care score was 45.82 (13.73), reflecting moderate complexity during 3-hour work periods. Nurses experienced greater cognitive complexity patterns than work complexity patterns ($p < 0.001$). In multivariable analyses, overall complexity of care and work and cognitive complexity patterns were not associated with high emotional exhaustion. Higher work complexity pattern score was associated with more environmental stressors ($p = 0.009$), but there was no association between overall complexity of care or cognitive complexity pattern and environmental stressors. Interventions that reduce environmental stressors might reduce work complexity of care.

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In acute care settings, nurses routinely make critical timely decisions about patient care that are based on their knowledge, ability to derive a plan of care, and shift in priorities in care as patients' conditions change. Complexity in timely decision making and subsequent actions are compounded by competing priorities of multiple patients simultaneously. Complexity of care is a term used to describe the level of difficulty nurses typically experience to successfully manage the unpredictable nature of work (Fairchild, 2010). Based on work from Ebright, Patterson, Chalko, and Render (2003), complexity of care may be viewed based on two distinct patterns. The first is technical skills, work demands and resources associated with delivery of patient care (also known as work complexity), and the second pattern is individual nurse expertise, knowledge and ability to manage patients' goals (also known as cognitive complexity). There is limited knowledge about the level of complexity of care patterns experienced by nurses working in clinical hospital environments.

Nursing work can be exhaustive. In one report, exhaustion was associated with greater use of work-around actions during medication administration. Emotionally exhausted employees did not have the

resources to complete tasks, duties and functions on the job (Halbesleben, Rathert, & Williams, 2013). Leiter and Maslach (2009) use the term burnout to describe emotional exhaustion and described it as a psychological syndrome involving a prolonged response to chronic interpersonal stressors on the job. Burnout had significant negative outcomes for nurses; for example, it was a predictor of turnover intent (Leiter & Maslach, 2009).

Complexity of care patterns may also be related to environmental factors. In a single-unit study of complexity of care on a medical-surgical unit, four environmental factors were experienced by over 25% of nurse participants that included coordinating tasks to complete work on time, multiple stimuli affecting concentration, lack of space for work and multiple interruptions (Solomon, Albert, Sun, Bowers, & Molnar, 2011). Further, nurses functioning in roles with increased responsibilities (such as charge nurse or coach to new hires) were more likely to have higher work complexity scores during a 3-hour work period (Solomon et al., 2011).

Work and cognitive complexity of care patterns and the themes within each pattern need to be better understood. The purposes of this study were to determine if overall complexity of care, and work and cognitive complexity patterns were associated with emotional exhaustion, number of environmental stressors of the nurse and work characteristics. Three questions guided this research study:

1. Among work and cognitive complexity patterns, what are the prevalent complexity themes during a 3-hour work period?

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2. Are work and cognitive complexity patterns associated with emotional exhaustion and environmental stressors?
3. Are nurse and work characteristics (including role responsibilities) associated with work and cognitive complexity patterns?

1. Methods

This study used a prospective, correlational, cross-sectional design and questionnaires to answer research questions. The health care system institutional review board approved the study.

1.1. Settings and sample

Registered nurses working in six hospitals of one health care system in Northeast Ohio were recruited. Hospitals consisted of a 1400 bed quaternary care medical center and five community hospitals of under 200 beds to over 500 beds. The target nurse populations were those who worked in intensive care, telemetry and non-telemetry medical-surgical units with 24-hour per day, 7-day per week capacity. Inclusion criteria were licensure as a registered nurse, post orientation, and worked a minimum of 3 hours before completing the questionnaire. Exclusion criteria were nurses in formal management positions and those who had floated from a non-study unit to a study unit. Convenience sampling was used, and nurses remained anonymous. Sample size varied by work site, due to workforce size. Among the three small and two moderate sized hospitals, a minimum of 40 participants per site or 200 participants were recruited to provide diversity. In the quaternary-care site, the minimum sample was 80 participants. Sample sizes were based on results of previous research. In the pilot study of 38 nurses, after controlling for nurse and work characteristics, more environmental stressors were associated with work complexity ($p = .024$). In this study, a sample size of 281 participants had power greater than 0.999 to detect associations between complexity of care and outcomes.

1.2. Outcomes and outcomes measurement

Work and cognitive complexity of care patterns were measured using a 48-item investigator-developed scale, *Exploring the Complexity of Nurses' Role*. Each item of work complexity (seven themes) and cognitive complexity (three themes) measured the frequency of occurrence during the previous 3-hour work period, and assumed that nurses were caring for multiple patients during that time. The response options ranged from zero, *never happened in the last three hours* to four, *always happened in the last three hours*, and included a not applicable option. The scale was developed based on findings from Ebright et al.'s (2003) qualitative research on role complexity. Items were grouped by each complexity pattern and the 10 themes; scores were summed, and standardized on a scale of zero to 100. Standardized sum scores were categorized as low (≤ 20), normal (21–40), moderate (41–60), high (61–80) and very high complexity (> 80) during a 3 hour work shift. The scale was previously assessed for content validity and internal reliability (Solomon et al., 2011). In this sample, the Cronbach's alpha was 0.91.

Emotional exhaustion was assessed by a 9-item subscale of *Maslach's Burnout Inventory* (Maslach, Jackson, & Leiter, 1996) that used a Likert-type, seven-option, response set from zero, *never* to six, *everyday*. The tool was previously tested for validity and reliability; and sum scores were categorized into low (≤ 16), average (17–26) and high (≥ 27) emotional exhaustion (Maslach et al., 1996). This inventory has been frequently used in healthcare worker research (Doolittle, Windish, & Seelig, 2013; Hayes, Douglas, & Bonner, 2013). In this study, the Cronbach's alpha was 0.91.

Environmental stressors were measured using an investigator-developed 12-item tool that was based on results from qualitative research on complexity compression (Krichbaum et al., 2007). It contained five themes; space (four items), competing demands (two

items), non-professionalism (two items), coordinating tasks (three items) and monitoring personnel (one item). Participants checked all items that applied during the previous 3 hours of work. Environmental stressors were summed, and higher scores reflected more distressing factors. This tool was used in previous research on complexity of care (Solomon et al., 2011), but was shortened from 25 to 12 items due to a low level or no responses on items that were removed.

Nurse and work characteristics were measured on a case report form that used check mark or fill-in-the-blank formats. Information was obtained on age, gender, hospital, work setting, nursing degree and length of time as an RN in general, on the current unit and in the current hospital. The form also included three questions derived from Krichbaum et al. (2007) research on complexity compression: role responsibilities (*assistant nurse manager, charge nurse/higher step in clinical nurse ladder, preceptor/skin care nurse or no special role*), busyness of the unit (*typical, busier than most days and quieter than most days*), and nurse energy level on the day of data collection (*fatigued/low energy level, usual energy level, hyper alert/high energy level*). Mean (standard deviation [SD]) scores were assigned to each item.

1.3. Data collection procedure

Investigators, who were not direct care providers on study units, introduced the study via announcements and staff meetings. Nurses understood to wait until they had worked 3 hours of their shift before participating. Completed questionnaires were anonymously returned to investigators in pre-addressed envelopes. To meet anonymity and confidentiality requirements, the number of questionnaires delivered but not returned was not maintained. To meet enrollment minimums per hospital, data collection took 6 months and included two investigator recruitment and in-service periods.

1.4. Data analysis

For univariate analyses, associations between overall, work and cognitive complexity pattern scores were assessed using Wilcoxon rank sum test for categorical factors and Spearman rank correlation for continuous factors. Multivariable linear regression was used to assess if overall, work and cognitive complexity patterns were associated with sum scores of emotional exhaustion and environmental stressor scales. Nurse characteristics that were associated with overall, work and cognitive complexity patterns on univariate analysis were included in multivariable analyses. A p value < 0.05 was considered statistically significant. All analyses were performed using SAS 9.2 and 9.3 (SAS Institute, Cary, NC).

2. Results

In total, 281 nurses participated. Nurses were predominantly female (96.7%), most worked on the same unit for over 2 years, and over one half worked as a nurse for < 10 years. Mean (SD) nurse age was 38.2 (11.3) years; see Table 1 for other characteristics.

The overall mean standardized (SD) complexity of care score was 45.8 (13.7), reflecting moderate complexity (nearing the border of high complexity) in care delivery (Fig. 1). Minimum and maximum standardized overall complexity of care scores had a wide range of 4.17 to 79.3, reflecting variability among participants. Of seven work complexity themes, interruptions in tasks were most common (mean [SD] complexity score, 69.8 ± 23.9), and faulty equipment and supplies were least common (24.1 ± 18.1). Of the three cognitive complexity themes, being a patient care manager had the highest complexity score (standardized mean score [SD], 79.5 ± 18.0), reflecting high complexity requirements for nurse expertise, knowledge and ability to manage patients' goals during work periods. The work complexity pattern mean (standard deviation) standardized score reflected normal shift complexity ($36.6 [\pm 15.3]$), and the cognitive complexity pattern

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