Examining the Needs-Based Time Use of Chinese Nursing Assistants: A Time–Motion Study

Xinxia WANG¹  •  Jun SHEN²∗  •  Qiu CHEN¹

ABSTRACT

Background: In light of the worldwide shortage of nurses and to maximize the effectiveness of the nursing care available, it is important to investigate the components of the care regularly provided by nursing assistants (NAs) to older adults. Well-organized allocation of NA care activities is directly linked to the quality of care provided to nursing home (NH) residents and their quality of life. However, relevant knowledge about the actual time allocation of NAs in this context is lacking, as previous related studies have focused only on the duration necessary for NAs to complete nursing activities.

Purpose: This study was designed to investigate the time allocation of NAs in completing job tasks necessary to meet the needs of residents in nursing care units at an NH in China.

Methods: A time–motion method and nonparticipatory observations were used to collect data. Two postgraduate students observed 15 NAs’ time expenditure and nursing content simultaneously during day shifts for 3 weeks as the NAs provided care to residents in four different nursing care levels. Data on nursing time and activity frequency were collected using a worklist based on the Zuluaga–Raysmith model.

Results: The 119.6 hours of observation included 8,907 discrete observed activities. In terms of the care provided to meet the needs of residents, the most time-consuming activities were physical health care (26.8%) and communication care (18.3%), followed by mental, emotional, social, and spiritual health care (14.1%) and protection and security care (12.6%). The higher the level of care, the higher the proportion of somatic nursing time and nursing activity frequency. However, the time and frequency of psychological and spiritual care showed an opposite trend.

Conclusions: Because of their lack of formal nursing training and skills, NAs pay more attention to meeting the physiological needs of residents while ignoring their mental needs. Moreover, their effectiveness in providing spiritual care tends to be quite low. Furthermore, the NA nursing activity classification system based on the Zuluaga–Raysmith model developed in this study is applicable for designing nursing work tasks, organizing NH units, and improving the quality of life of residents, as this model accurately reflects the essence of NA work.

KEY WORDS: activity, nursing home, nursing assistants, observation, time and motion.

Introduction

As a country with a large population, China’s aging rate ranks first in the world because of the continuous decline in the fertility rate and growing numbers of older adults (R. Chen et al., 2019). It is estimated that, by 2050, China’s population aged years 65 and above will reach 400 million, accounting for one third of the total population (Ge et al., 2020). Pension problems caused by the surge in the aging population presents a compelling need to establish aged care facilities. A study has shown that among the older adults living in nursing homes (NHs), 90% have one or more chronic diseases and more than 60% are semidisabled or disabled (Z. Wang et al., 2020). Subsequently, nursing staff in NHs attend to people with an increasing number of severe limitations and complex long-term care needs.

Nursing assistants (NAs) are the main care providers in NHs. Adequate allocation of NAs is closely related to older adults’ satisfaction with care services and their standard of living (Shin et al., 2018). Although China requires 13 million NAs to provide adequate care to current residents, the actual number of practitioners is less than 300,000 (Zhao, 2018). In general, these NAs are not well educated, lack professional nursing knowledge, and have a high rate of turnover. Shortages of both nursing labor and nursing skills have created a considerable challenge for the delivery of high-quality, safe, and efficient aged care services (Drennan & Ross, 2019). Meanwhile, because of low social–economic status, it is difficult to attract potential applicants to work as NAs (Chao & Lu, 2020). Reallocation and process management based on investigations of NAs’ actual workloads may be useful in developing solutions to tackle the related challenges.

Three main approaches are currently used to determine NA workloads, including professional judgment (Telford,
1979), benchmarking approaches (Audit Commission, 2001), and the time–motion technique (Hurst, 2003). The former two rely heavily on the experience and judgment of experts to determine the number of NAs to employ and to arrange daily staffing plans (Hurst, 2003). Thus, these two approaches are relatively subjective and unreliable. In contrast, the time–motion technique, which calculates the time required by NAs to complete each task, is more objective and may better reflect the actual needs of older adults (Griffiths et al., 2020).

The time–motion technique allows researchers and nursing managers to obtain a deeper understanding of NA nursing time distributions and workloads. Researchers in Australia using this technique found that oral communication was the most time-consuming activity and that NAs frequently switched within or among oral communication, direct care, and indirect care activities (Qian et al., 2012). Meanwhile, Dutch researchers found unit type to be more significantly associated with time spent on interventions in domains than NA type (Tuinman et al., 2016). Canadian researchers found that older adults who needed only supervision and verbal motivation required as much time as those who were physically dependent on NAs for eating (Simmons & Schnelle, 2006).

Although time-motion studies have been conducted in many countries, NA workloads have consistently been measured as the time needed to complete nursing tasks (Munyisia et al., 2011; L. Wang et al., 2016; Xing, 2015), and studies have concentrated on nursing time required in specific areas (e.g., administration; E. Y. H. Chen et al., 2021) rather than the actual time required to meet the various needs of older adults. Although studies have suggested that focusing on investigations into meeting the varying needs of older adults may contribute to improved quality of life and have a positive impact on reducing existing problems (Fahy & Livingston, 2001; Liu & Yao, 2014; Wise, 2020), as far as the authors are aware, no study on the time expended by NAs on meeting the needs of NH residents has been published in the literature. Thus, it remains unclear how much time NAs spend on meeting these needs, which may vary and influence the type of nursing activities and amount of time spent on each (Tuinman et al., 2016). Exploring the workloads of NAs based on residents’ needs is vital to enriching and advancing the field of international nursing management and leadership, enhancing the optimal use of resources, and providing insight into the contributions of NAs to improving the quality of care (Matsumoto et al., 2020).

Therefore, the aim of this study was to empirically investigate the time spent by NAs on various activities to meet the needs of older adult residents of an NH in China using the time–motion observation method.

Methods
Data were collected for this study at the Qinggang Senior Care Center (QSCC) from April to October 2020. Study Setting
In 2020, China’s Ministry of Civil Affairs announced the need to grade elderly care institutions. It is expected that the initial national unified rating system of pension institutions will be established by 2022 (Xinhua Net, 2020). In the absence of evaluation criteria and on the basis of previous research (Cai et al., 2017), the most common pension institutions in China may be divided into three types: welfare homes, traditional NHs, and hospital-affiliated NHs. Welfare homes and traditional NHs focus on daily life care, and their physical facilities and NA skills are always poor. Hospital-affiliated NHs typically provide the highest quality of services available in the country and offer strong medical support systems. In these facilities, older adults have access to medical treatment, nursing care, pension, and rehabilitation services. To maximize the value of this study in terms of providing insight and exemplary outcomes to assist other NHs in the same and lower grades to learn and improve their management, a hospital-affiliated NH was chosen as the target institution.

The QSCC has ranked first among NHs in China for 4 consecutive years from 2017 to 2019 (QSCC, the First Affiliated Hospital of Chongqing Medical University, 2020). QSCC, located in Bishan in Chongqing Province, is an NH offering a combination of medical and nursing care services based on its affiliation with Chongqing Medical University. It has a self-care area, a nursing care area, and a mental disorder area as well as 3,000 nursing beds and 1,000 medical beds. QSCC has specialized outpatient services for geriatrics and is equipped with a full set of medical and technical departments. In addition to logistics staff, the center has 221 qualified staff, including 21 managers, three doctors, 33 nurses, 150 NAs, three rehabilitation specialists, three psychological consultants, three nutritionists, and five social workers.

The scores of residents for activities of daily living, Mini-Mental Status Examination, depression, pressure risk, falling risk, and cognitive impairment are used to divide nursing care provided by this center into four grades: self-care, assistance, nursing, and full care. Assistance means that residents are able to use assistive devices independently to complete daily life activities. Nursing care means that residents are able to express their needs correctly but require help from NAs to complete daily life activities. According to the degree of help provided by NAs (from less to more), nursing care is divided into Levels I to IV. Level I means that residents need a small amount of supervision and a few instructions in their daily life. Level II residents are able to complete daily activities alone with or without assistive devices but need supervision and instructions throughout the entire process and assistance in the use of living necessities. Residents who require assistance from NAs to complete daily activities are categorized in Level III. Level IV residents are heavily dependent on NA care services in their daily life. The older adults categorized at the self-care and assistance grades live in the self-care area. Full care means that residents rely entirely on caregivers for living. The service relationship between NAs
and residents at the full-care grade is one-way. The older adults at the nursing or full-care grades who are free of mental disorders live in the nursing care area. At the time of this study, the ratio of NAs to nursing care residents was 1:7–1:6, and the ratio of NAs to full-care or mentally disordered residents was 1:3–1:2.5. These ratios are considered quite reasonable and sufficient (Harrington et al., 2020).

The observation was conducted in the three units of the nursing care area because NAs have the most opportunities to interact with residents, and residents can express their needs correctly in this area. Each unit has 40 residents who each had their own room. All units in the nursing care area had a shared living room where residents could have their meals together. There was no significant difference in the nursing care grades of the residents among the three observed units ($\chi^2 = 1.82, p = .95$; Table 1).

### Staffing and Sample

NAs are not legally registered as nurses in China. They generally receive training on practical skills such as basic bedside care, taking vital signs, rehabilitation care, and psychological care. They will also provide care in support of basic activities of daily living such as bathing and food preparation. In the QSSC, NAs are not generally responsible for cleaning, with the exception of residents’ bed units, and they are not allowed to perform invasive operations.

Six NAs served on the day shift and two NAs served on the night shift in each of the three units targeted in this study. For the day shift, three NAs worked from 6 a.m. to 4:30 p.m., and another three worked from 11:30 a.m. to 8:30 p.m. NAs on the night shift worked from 8:30 p.m. to 6 a.m.

Under the national vocational skill standard for NAs (2019 edition), the “general education level” of employees was adjusted from “junior high school graduation” to “no education requirements.” People with no educational background may be employed as NAs after being under probation for more than 2 years (Song et al., 2014). Because qualification varies widely within NAs, we recruited NAs who met the following inclusion criteria to enhance comparability: (a) 3 years of work experience in the nursing care units, (b) holding an NA qualification certificate, (c) ability to read and write, and (d) having volunteered to participate in this study. We selected the 8-hour day shift of 8 a.m. to 4 p.m., as a high volume of nursing activities is typical during this period. Fifteen of the 18 NAs in these three targeted units participated in this study. No significant differences in demographic characteristics were found among the participants (Table 2).

Although the number of participants was relatively small, the unit of analysis was individual activity rather than participant. On the basis of the results from the powerful calculation formula for the time-motion study (Sittig, 2005) and data collected from the pilot study, the minimum number of observed activities was 819 for the Zuluaga–Rayshmith (Z-R) model. In this study, data were collected on 8,523 observed activities and recorded for the Z-R model, which is significantly more than the minimum sample size.

### Ethical Consideration

The ethical review board of Chongqing Medical University and the managers of the senior care center approved this study (approval number: 2020-032). To ensure that NA participation in this study was entirely voluntary, the researchers informed the NAs about the purpose, significance, and methods of the study and told them they could withdraw from the study at any time without any adverse effects. Moreover, they were informed that the collected research data would be stored securely and accessible only to the researchers. Only after explicit written consent was acquired from each participant were observations of that person’s activities begun. Residents were also asked to provide written informed consent to permit observers to enter residents’ homes.

### Measurement Instruments

A three-step process was followed to develop the observation list: (a) field observation to identify nursing activities specific

### Table 1

**The Nursing Care Levels of the Observed Units (N = 120)**

| Unit No. | Level I | Level II | Level III | Level IV | $\chi^2$ | $p$ |
|----------|---------|----------|-----------|----------|---------|-----|
| 1        | 15      | 14       | 9         | 2        |         |     |
| 2        | 17      | 12       | 8         | 3        |         |     |
| 3        | 20      | 11       | 7         | 2        |         |     |
| Total    | 52      | 37       | 24        | 7        | 1.82    | .95 |

### Table 2

**The Demographic Characteristics of Observed Nursing Assistants (N = 15)**

| Category                  | Unit 1 ($n = 5$) | Unit 2 ($n = 5$) | Unit 3 ($n = 5$) | $\chi^2$ | $p$ |
|---------------------------|------------------|------------------|------------------|---------|-----|
| Age (years)               |                  |                  |                  |         |     |
| 30–39                     | 1                | 2                | 2                |         |     |
| 40–49                     | 2                | 2                | 1                |         |     |
| 50–59                     | 2                | 1                | 2                |         |     |
| Gender                    |                  |                  |                  | 4.29    | .12 |
| Female                    | 5                | 4                | 5                |         |     |
| Male                      | 0                | 1                | 0                |         |     |
| Working experience (years)|                  |                  |                  | 1.36    | .51 |
| 3–6                       | 4                | 3                | 4                |         |     |
| 7–10                      | 1                | 2                | 1                |         |     |
| Educational level         |                  |                  |                  | 4.16    | .13 |
| Junior high school        | 3                | 2                | 4                |         |     |
| Senior high school        | 2                | 3                | 1                |         |     |
to the study setting, (b) Delphi panel to develop an observation list based on the Z-R model, and (c) field testing to confirm the validity of the observation list.

In the first step, two observers who were nursing postgraduate students observed four NAs from 8 a.m. to 4 p.m. on 4 separate days. The nursing background and clinical experience of the observers helped them recognize and distinguish various nursing activities. They recorded all of the activities conducted by each NA over the course of the entire shift. During the observation, the observers communicated with the NA if necessary to determine the nature of the nursing activities.

In the next step, using two series of structured questionnaires, a Delphi panel of eight experts, including six nursing management specialists and two senior managers in the care center, reached consensus on 43 nursing activities (Table 3). The experts synthesized nursing activities identified from the literature and those directly observed in the field. The finalized comprehensive list of activities was included in the observation list and represented 10 domains of the Z-R model. The Z-R model is based on Maslow’s theory of basic human needs, which includes 10 basic human needs: physical health; mental, emotional, social, and spiritual health (MESSH); income; accommodation; protection and security; knowledge; mobility; communication; self-development; and need to make contributions. The Z-R model facilitates holistic assessment of entities and recognizes the validity and importance of self-perceiving needs deficits. Thus, this model fits well with person-oriented care. The nature of the 10 domains of the Z-R model was determined from the literature (Zuluaga, 2000). In addition, researchers investigated the contents and annotations of the needs of participants in a previous study who also lived in the same nursing care area of this center (Zhang & Shen, 2019). These preliminary surveys can help experts better match the needs domains of residents to NA nursing activities. In addition to these activities, nonresident-related items such as breaks, transit activities (time between activities, e.g., walking in the corridor), and private activities (e.g., toileting) were added (Tuinman et al., 2016).

In the last step, the observation list was validated in a 2-day observation by two observers who had conducted observations in Step 1. After independently observing the same activities, the two discussed the similarities and differences in their records, which helped them better understand the meaning of each category and improve the internal consistency among raters in formal observation.

**Data Collection**

Data collection was conducted from August to September 2020. Structured observations were made using the time-motion technique. The two observers involved in the construction of measurement instruments served as observers in the data collection phase. Before the formal observation, the two observers attended trial observations for 2 days. They were also required to conduct a six-round interobserver reliability assessment to ensure data consistency before beginning data collection. The formal observation lasted 15 working days (Monday to Friday) over a 3-week period. This schedule was chosen because family members and friends were permitted to visit the residents on weekends and residents could go out of the center with their family. Five NAs evenly distributed among the three units were observed by both observers during each of the 3 weeks. Each NA was observed once based on their shift schedule to capture their activities adequately. A stopwatch was used to record the start and end times of each performed activity that was listed on the observation sheet. The observers also noted in the records the nursing care level of each resident receiving nursing care. Observers stood at a suitable distance from the NAs under observation and were not allowed to interact with them to capture accurate time durations and contents.

**Analyses**

The registered time of observed activities was entered into IBM SPSS Statistics 22.0 (IBM Inc., Armonk, NY, USA) to analyze activity time and frequency. Interrater reliability was calculated using an intraclass correlation coefficient (ICC) based on a two-way random model with absolute agreement (single measures) with 95% confidence intervals (CIs). Values < .40 are considered poor, those between .40 and .59 are considered fair, those between .60 and .74 are considered good, and those ≥ .75 are considered excellent (Cicchetti, 1994). Pearson’s chi-square test was used to compare the percentage of time spent on each domain of activities and the proportion of the activity frequency in each domain at each of the four nursing care levels. After determining the normal distribution and variance homogeneity of the activity frequencies for each nursing care level, one-way analysis of variance was used to examine the differences in activity frequency among the four nursing care levels for each domain. A statistically significant difference was defined as p ≤ .05. Post hoc pairwise comparisons were performed using Bonferroni correction.

**Results**

The observations resulted in 119.6 hours (7,176 minutes) of time registered for 43 nursing activities categorized in 11 domains. Of this time, 5,928 (82.6%) minutes were assigned among 10 Z-R domains and 1,248 (17.4%) minutes were designated as “other activities.” Fifteen NAs were observed for a period of 15 days. Furthermore, 8,907 activities were recorded, 8,523 (95.7%) for the 10 Z-R domains and 384 activities as “other activities.” Interrater agreement of the observations was identified as excellent for the domains of physical health (ICC = .95, 95% CI [0.83, 0.97]), MESSH (ICC = .84, 95% CI [0.75, 0.92]), income (ICC = .83, 95% CI [0.77, 0.86]), accommodation (ICC = .93, 95% CI [0.89, 0.95]), protection and security (ICC = .89, 95% CI [0.79, 0.94]).
knowledge (ICC = .78, 95% CI [0.75, 0.82]), mobility (ICC = .94, 95% CI [0.89, 0.95]), communication (ICC = .76, 95% CI [0.71, 0.82]), self-development (ICC = .86, 95% CI [0.83, 0.91]), and contributions (ICC = .78, 95% CI [0.75, 0.81]). The “other activities” domain showed fair agreement (ICC = .47, 95% CI [0.44, 0.58]). Because the focus of this study was on time allocation in the context of meeting the needs of older adults at different care levels, the focus of analysis was primarily on the allocation of nursing activities’ time and frequency in the Z-R model.

Table 3
Observation List of Nursing Work Activities

| Care Domain            | Nursing Activities                                                                                                                                                        |
|------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Physical health care   | Basic care (e.g., oral care, perineal care, skin care)  
Activities of daily living (e.g., toileting, dressing, bathing)  
Changing diapers for a resident  
Washing clothes for a resident  
Tube feeding (e.g., diet, drinking)  
Measuring a resident’s vital signs (e.g., temperature, blood pressure, oxygen saturation)  
Administering oral medications  
Administering medications through a gastric tube  
Noninvasive treatment (e.g., inhaling oxygen, physical hypothermia)  
Assisting a resident to get tests or the clinic of the care center (e.g., transferring a patient from a bed to a wheelchair)  
Observing a resident’s conditions (e.g., sleeping, eating, fluid management)  
| MESSH care             | Leading a resident to participate in activities of the unit (e.g., finger exercise, singing)  
Leading a resident to participate in activities of the center (e.g., birthday party, festival party)  
Assisting a resident in shopping (e.g., buying clothes, daily articles)  
Assisting a resident to receive express delivery  
Psychological consultant  
Helping older adults participate in religious activities (e.g., going to the church, supplies preparation)  
| Income care            | Helping a resident withdraw money from banks  
Accommodation care      | Home maintenance assistance (e.g., changing sheets)  
Protection and security care | Disinfecting a resident’s bed unit  
Helping a resident disinfect their hands  
Regular inspection  
Checking the safety of a resident’s living articles (e.g., walker, electrical appliances)  
Safety protection measures (e.g., bedside fence, restraint band)  
Knowledge care         | Health education (e.g., chronic disease self-care, falling protection)  
Assisting a resident to attend the lecture of the care center (e.g., health, policy, philosophy)  
Mobility care           | Rehabilitation training for a resident (e.g., standing, turning, climbing stairs)  
Assisting a resident to walk (e.g., using a walker)  
Helping a bedridden resident move their limbs  
Recovery massage for a bedridden resident  
Communication care     | Communication with a resident  
Assisting a resident to communicate with other residents (e.g., reconciling conflicts)  
Helping a resident communicate with family or friends  
Self-development care   | Assisting a resident to buy supplies for hobbies  
Helping a resident to read and write  
Make contributions care | Helping a resident to make contributions to the center (e.g., gardening, feeding fish, making handicrafts)  
Others                 | Documentation (e.g., paper-based nursing care tables, shift records)  
Shift reports          | Communication with staffs (e.g., nursing assistants, nurses, doctors)  
Teaching new nursing assistants  
Break (e.g., meal break, personal telephone calls, noon break)  
Transit (e.g., standing or walking in the corridor between activities)  
Preparing the units’ or care centers’ activities (e.g., furnishing, decorating)  

Note. MESSH = mental, emotional, social, and spiritual health.
Activity Time

Nursing time spent on each category of the Z-R model and time by activity category for each level of nursing care are shown in Table 4. In this study, NAs spent 26.8% of their time on physical health care, followed by communication care (18.3%), MESSH care (14.1%), protection and security care (12.6%), accommodation care (8.4%), knowledge care (6.2%), mobility care (5.3%), income care (4.8%), self-development care (2.3%), and making contributions care (1.2%).

In the domains of physical health care, accommodation care, and protection and security care, NAs spent a significantly higher proportion of time on Level IV residents than on those at other levels, with no significant difference in the percentage of nursing time found among residents in Levels I, II, and III. In the domains of income care and mobility care, NAs spent a significantly higher proportion of time on residents in Levels III and IV than on the other levels, with no significant differences found between Levels III and IV residents or Levels I and II residents.

In the domains of MESSH care, knowledge care, and communication care, NAs spent a significantly higher proportion of time on Level IV residents than on other resident levels, with no significant difference in the percentage of nursing time found among residents in Levels I, II, and III. In the domain of self-development care, NAs spent a significantly higher proportion of time on Level I residents than other resident levels, with no significant difference found among residents in Levels II, III, and IV. In the domain of making contributions care, using the Fisher’s exact test, NAs were shown to spend a significantly lower proportion of time on residents in Level IV than those in Levels I and II, with no significant difference found among Levels I, II, and III or between Levels III and IV.

Activity Frequency

The proportion of nursing activities in each domain of the Z-R model and the frequency by activity category for each level of nursing care is presented in Table 5. Similar to the distribution of nursing time, the most frequently conducted activity was physical health care (27.9%), followed by communication care (18.1%), MESSH care (13.3%), and protection and security care (10.1%).

Resident nursing care level was shown to relate positively to the frequency of nursing activities provided by NAs in the domains of physical health care, income care, accommodation care, protection and security care, and mobility care. Conversely, a higher nursing care level was associated with a lower frequency of nursing activities provided by NAs in the domains of MESSH care, communication care, and knowledge care. No significant difference in the frequency of activities provided by NAs was found among the four groups of residents in the domains of self-development care and contributions care. In addition, no significant differences in activity frequency were found among the four groups of residents in the domains of self-development care and making contributions care.

Discussion

This was the first study to investigate the time allocation of nurses in meeting the care needs of older adults in an NH setting in China. It included an investigation of the actual nursing time spent on activities and the frequencies of activities based on the Z-R model over an 8-hour shift.

Nursing Assistants Need Resident-Oriented Nursing Classification Systems

No nursing classification system for NAs (analogous to the Nursing Intervention Classification system) has been established.

### Table 4

| Z-R Model               | Percentage of Nursing Time | 95% CI | Level I | Level II | Level III | Level IV | χ²  |
|-------------------------|----------------------------|--------|---------|----------|-----------|----------|-----|
| Physical health care    | 26.8                       | [24.6, 32.6] | 27.2  | 24.6  | 25.0  | 32.6  | 21.4** |
| MESSH care              | 14.1                       | [11.0, 15.6] | 15.6  | 14.6  | 13.0  | 11.0  | 12.8** |
| Income care             | 4.8                        | [3.3, 7.0] | 3.3   | 4.9   | 5.5   | 7.0   | 21.8** |
| Accommodation care      | 8.4                        | [7.2, 10.3] | 7.2   | 8.2   | 9.2   | 10.3  | 9.3*   |
| Protection and security care | 12.6                  | [11.2, 14.8] | 11.2  | 12.9  | 12.7  | 14.8  | 8.0*   |
| Knowledge care          | 6.2                        | [3.3, 7.5] | 6.6   | 6.5   | 7.5   | 3.3   | 17.2*  |
| Mobility care           | 5.3                        | [3.9, 7.3] | 3.9   | 5.6   | 6.0   | 7.3   | 16.7** |
| Communication care      | 18.3                       | [12.0, 19.8] | 19.8  | 19.3  | 19.0  | 12.0  | 28.6** |
| Self-development care   | 2.3                        | [1.2, 3.8] | 3.8   | 1.9   | 1.2   | 1.2   | 34.0** |
| Make contributions care | 1.2                        | [0.5, 1.6] | 1.4   | 1.5   | 0.9   | 0.5   | 8.4*   |

Note: Z-R model = Zuluaga–Raysmith model; CI = confidence interval; MESSH = mental, emotional, social, and spiritual health.

*p < .05. **p < .01.
in China. Because NAs focus on providing comprehensive life care to older adult patients, the nature, skills, and contents of their work differ significantly from nurses. With the gradual development of institutional pensions and the expansion of NA work content, it is necessary to establish a classification system for nursing interventions performed by NAs (Han & Shi, 2016). The nursing activity classification system for NAs developed in this study includes 43 distinct activities based on the Z-R model. This system not only reflects the work characteristics of NAs, which are person-oriented and emphasize meeting the overall needs of older adults, but also facilitates the accurate identification and recording of nursing activities using field observations. It is expected to be useful in designing nursing work tasks, organizing NH units, and comprehensively improving the quality of life of residents.

**Nursing Assistants Invest More Time and Energy in Physiological Rather Than Psychological Care**

Differences were found to exist in the time distribution of NAs caring for older adult patients at different levels of nursing care, which echoes the findings of Yen et al. (2018). Compared with residents in Levels I and II, NAs allocated higher proportions of nursing time on caring for residents in Levels III and IV in terms of physical care, income care, accommodation care, protection and security care, and mobility care. Meanwhile, the frequency of nursing activities was also found to be higher at greater levels of nursing care. This may be because higher nursing care levels are negatively associated with the ability of residents to live independently, making them more reliant on NAs to provide life services to ensure survival and safety. Other researchers have similarly found evidence that nursing staff spent more time on providing basic life services to residents with higher dependency levels than on providing mental and psychological care (Paquay et al., 2007). Previous studies (Donoghue et al., 2005; Munyisia et al., 2011) indicate that communication tasks may be the most time-consuming nursing activities, possibly because of the different classifications of nursing activities. In those studies, communication tasks refer to communication activities initiated by NAs and include communication with residents, other nursing staff, and doctors. However, communication in this study refers to meeting the communication needs of older adults such as helping residents communicate with their peers and family.

However, NAs spent relatively less time on and engaged less frequently in MESSH care, knowledge care, and communication care domain activities with Level IV residents than with residents at lower care levels. This may be attributable to the shortage of nursing human resources and the lack of professional attainment of NAs (Ludlow et al., 2021). NAs often ignore or have no time to meet residents’ spiritual or emotional needs or to help them pursue knowledge or realize their self-worth (Campagna et al., 2021; Rodriguez-Pereira et al., 2020). Meanwhile, because somatic problems such as falls, pressure sores, and choking are related to the wage performance of NAs, they are more inclined to focus on physical and safety care for residents in Level IV (who have significantly higher rates of limb weakness and physical dysfunction) to the detriment of psychological and spiritual care activities, which are typically not considered in performance scores. However, demand for spiritual support and psychological comfort increases with the decline in independent living ability, as elderly individuals who are highly dependent

| Z-R Model                          | Percentage of Activity Frequency | 95% CI Activities Frequency (Counts) | F     |
|------------------------------------|----------------------------------|-------------------------------------|-------|
|                                    |                                 | Level I                              | Level II | Level III | Level IV |       |
|                                    |                                 | Mean      | SD   | Mean      | SD   | Mean      | SD   | Mean      | SD   |       |
| Physical health care               | 27.9                            | [27.0, 34.4] | 17.8 | 15.8      | 8.2  | 19.0      | 10.0 | 43.6      | 14.1 | 22.8**  |
| MESSH care                         | 13.5                            | [9.8, 14.0] | 9.2  | 16.7      | 9.3  | 14.3      | 9.5  | 23.0      | 8.9  | 9.5**   |
| Income care                        | 4.5                             | [4.2, 4.7]  | 3.0  | 14.8      | 13.2 | 3.3       | 11.1 | 6.0       | 13.4 | 30.9**  |
| Accommodation care                 | 7.0                             | [6.7, 7.1]  | 4.6  | 3.4       | 4.6  | 7.9       | 5.2  | 10.9      | 9.6  | 16.1    | 85.6** |
| Protection and security care       | 10.1                            | [9.9, 10.7] | 6.5  | 2.3       | 6.6  | 5.2       | 7.4  | 6.6       | 13.6 | 10.3    | 17.1** |
| Knowledge care                     | 6.1                             | [5.1, 6.4]  | 6.4  | 4.8       | 5.6  | 8.7       | 5.1  | 7.4       | 3.1  | 9.2     | 33.3** |
| Mobility care                      | 4.8                             | [3.6, 5.0]  | 3.2  | 1.4       | 3.3  | 3.8       | 3.7  | 5.2       | 4.6  | 7.0     | 65.3** |
| Communication care                 | 18.1                            | [15.7, 18.5] | 19.8 | 16.8      | 13.3 | 10.3      | 12.5 | 7.4       | 12.1 | 6.7     | 30.1** |
| Self-development care              | 7.2                             | [6.7, 8.0]  | 4.4  | 2.5       | 5.0  | 8.6       | 5.5  | 11.2      | 5.4  | 9.7     | 10.2   |
| Make contributions care            | 0.8                             | [0.3, 0.9]  | 0.6  | 4.9       | 0.6  | 2.1       | 0.7  | 1.3       | 0.4  | 1.9     | 2.3    |

Note. Z-R Model = Zuluaga–Raysmith model; MESSH = mental, emotional, social, and spiritual health. **p < .01.
on NAs are more likely to be depressed, anxious, and lonely (Trybusińska & Saracen, 2019). It has been proven that care dependency and depression are closely related to residents' quality of life (Chang et al., 2020).

From a holistic perspective, communication care and MESSH care require significant time, collectively accounting for more than a third of the nursing time in this study and ranking as the second (18.3%) and third (14.1%) largest demands on NA work time, respectively. In a previous survey on the long-term care needs of older adults in this care center, we found the residents to be very satisfied with the physical and basic life care received but dissatisfied with the spiritual and psychological care received (Zhang & Shen, 2019). The low efficiency of NAs in providing corresponding care services for nursing care Level IV residents is quite low and may be attributable to the lack of knowledge and skills necessary to meet these care needs (Campagna et al., 2021). Separation from family and familiar environments puts NH residents at a higher risk of mental disorders such as loneliness, depression, and anxiousness. Therefore, it is very important to provide spiritual support education and training to NAs, as they are primary care providers who are responsible for the mental health of NH residents (Ludlow et al., 2020).

It is interesting to note that, although no significant differences were found in the frequency of activities in the self-development and contributions care domains among the four groups, the proportions of nursing time spent on these two domains decreased with increasing nursing care level. This may be because the participants in the four nursing care levels perceived the level of care provided in these two domains to be consistent despite the reductions in activity duration provided to those at Levels III and IV because of poorer health status.

**Limitations**

The findings of several previous studies indicate NA qualifications such as educational level, skill level, professional training level, and hours of on-the-job education impact the time allocation of nursing activities and quality of care provided (Karakosny et al., 2019; Yen et al., 2018). In this study, we aimed to provide a broad overview of how NAs allocated their time in meeting residents' needs in NH settings. Thus, details of activities, including the skills required to perform each task, were not considered. Because no significant differences in demographic characteristics were found among the 15 NAs, we assumed that qualifications would not significantly influence the results. However, future studies may be designed to compare differences in nursing time allocations among NAs with varying qualifications to improve the generalizability of the results.

The degree of interrater agreement was not consistent in all observation domains. However, the focus of this study was on the allocation of nursing time to meet the complex needs of residents. As the consistency among raters was excellent in the 10 domains of the Z-R model, interrater agreement variability did not affect the results.

Best efforts were made to minimize the Hawthorne effect (Goodwin et al., 2017). These included maintaining adequate distance from the participants and not talking to NAs during the formal observation period. Moreover, during the 8-day preobservation period, NAs were fully informed regarding the purpose and significance of this study and were assured that the study had no relationship to the NH or its affiliated hospitals. In formal observation, they quickly became comfortable with the presence of the observer. Moreover, it would have been difficult for them to alter certain work behaviors because of their intensive workloads.

**Conclusions**

This study investigated the frequencies of and time expenditures on nursing activities in nursing care units of a hospital-affiliated NH in China. Physical health care, communication care, MESSH care, and protection and security care were found to consume most of the NAs’ work time. More nursing time and frequencies were associated with physical and safety care, whereas less was associated with spiritual and psychological care, indicating that NAs pay more attention to meeting the physiological needs of residents than meeting their spiritual or psychological needs. Finally, higher nursing care levels were associated with higher proportions of somatic care.

**Acknowledgments**

This study was funded by the Technology Innovation and Application Development special general project of Chongqing Grant (cstc2019jcsx-mssxm0259).

**Author Contributions**

Study conception and design: XW, JS  
Data collection: XW, QC  
Data analysis and interpretation: XW  
Drafting of the article: XW  
Critical revision of the article: JS

Received: January 15, 2021; Accepted: October 27, 2021

*Address correspondence to: Jun SHEN, MSN, RN, School of Nursing, Chongqing Medical University, No.1, Medical College Road, Yuzhong District, Chongqing 400016, People’s Republic of China. Tel: +86-15-22334566; E-mail: 2822604350@qq.com

The authors declare no conflicts of interest.

Cite this article as:  
Wang, X., Shen, J., & Chen, Q. (2022). Examining the needs-based time use of Chinese nursing assistants: A time–motion study. The Journal of Nursing Research, 30(6), Article e246. https://doi.org/10.1097/JNR.0000000000000525

**References**

Audit Commission. (2001). Acute hospital portfolio review: Ward staffing. Author.

Cai, E., Liu, Y., Jing, Y., Zhang, L., Li, J., & Yin, C. (2017). Assessing...
spatial accessibility of public and private residential aged care facilities: A case study in Wuhan, Central China. ISPRS International Journal of Geo-Information, 8(10), Article 304. https://www.mdpi.com/2220-9964/8/10/304/htm

Campagna, S., Conti, A., Clari, M., Basso, I., Sciannameo, V., Di Giulio, P., & Dimonte, V. (2021). Factors associated with missed nursing care in nursing homes: A multicentre cross-sectional study. International Journal of Health Policy and Management, Advance online publication. https://doi.org/10.34172/IJHPM.2021.23

Chang, H. K., Gil, C. R., Kim, H. J., & Bea, H. J. (2020). Factors affecting quality of life among the elderly in long-term care hospitals. The Journal of Nursing Research, 29(1), Article e134. https://doi.org/10.1097/jnr.0000000000000413

Chao, S. F., & Lu, P. C. (2020). Differences in determinants of intention to stay and retention between younger and older nursing assistants in long-term care facilities: A longitudinal perspective. Journal of Nursing Management, 28(3), 522–531. (Original work published in Chinese)

Chen, E. Y. H., Bell, J. S., Ilomäki, J., Corlis, M., Hogan, M. E., Caporale, T., Van Emden, J., Westbrook, J. I., Hilimer, S. N., & Slugggett, J. K. (2021). Medication administration in Australian residential aged care: A time-and-motion study. Journal of Evaluation in Clinical Practice, 27(1), 103–110. https://doi.org/10.1111/jep.13393

Chen, R., Xu, P., Song, P., Wang, M., & He, J. (2019). China has faster pace than Japan in population aging in next 25 years. Bioscience Trends, 13(4), 287–291. https://doi.org/10.5582/bst.2019.01213

Cicchetti, D. V. (1994). Guidelines, criteria, and rules of thumb for evaluating normed and standardized assessment instruments in psychology. Psychological Assessment, 6, 284–290. https://doi.org/10.1037/1040-3590.6.4.284

Donoghue, J., Pelletier, D., & Duffield, C. (2005). Documentation and the transfer of clinical information in two aged care settings. The Australian Journal of Advanced Nursing, 22(4), 40–45.

Drennan, V. M., & Ross, F. (2019). Global nurse shortages—The facts, the impact and action for change. British Medical Bulletin, 130(1), 25–37. https://pubmed.ncbi.nlm.nih.gov/31086957/

Fahy, M. A., & Livingston, G. A. (2001). The needs and mental health of older people in 24-hour care residential placements. Aging & Mental Health, 5(3), 253–257. https://doi.org/10.1080/13607860120065050

Ge, H., Yang, Z., Li, X., Liu, D., Li, Y., Pan, Y., Luo, D., & Wu, X. (2020). The prevalence and associated factors of metabolic syndrome in Chinese aging population. Scientific Reports, 10 (1), Article 20034. https://doi.org/10.1038/s41598-020-77184-x

Goodwin, M. A., Stange, K. C., Zyzanski, S. J., Crabtree, B. F., Borawski, E. A., & Flocke, S. A. (2017). The Hawthorne effect in direct observation research with physicians and patients. Journal of Evaluation in Clinical Practice, 23(6), 1322–1328. https://onlinelibrary.wiley.com/doi/pdf/10.1111/jep.12781

Griffiths, P., Saville, C., Ball, J., Jones, J., Pattison, N., & Monks, T., Safer Nursing Care Study Group. (2020). Nursing workload, nurse staffing methodologies and tools: A systematic scoping review and discussion. International Journal of Nursing Studies, 103, Article 103487. https://doi.org/10.1016/j.ijnurstu.2019.103487

Han, Q., & Shi, X. (2016). Investigation on job content of aged nurses in Shenzhen City. Chinese Nursing Research, 30(12), 1478–1480. https://doi.org/10.3969/j.issn.1009-6493.2016.12.023 (Original work published in Chinese)

Harrington, C., Dellefield, M. E., Halifax, E., Fleming, M. L., & Bakerjian, D. (2020). Appropriate nurse staffing levels for U.S. nursing homes. Health Services Insights, 13, Article 1178632920934785. https://doi.org/10.1177/1178632920934785

Hurst, K. (2003). Selecting and applying methods for estimating the size and mix of nursing teams: A systematic review of the literature commissioned by the Department of Health. Nuffield Institute for Health.

Karacsony, S., Good, A., Chang, E., Johnson, A., & Edenborough, M. (2019). An instrument to assess the education needs of nursing assistants within a palliative approach in residential aged care facilities. BMC Palliative Care, 18(1), Article 61. https://doi.org/10.1186/s12904-019-0447-0

Liu, L. F., & Yao, H. P. (2014). Examining the need assessment process by identifying the need profiles of elderly care recipients in the Ten-year Long-Term Care Project (TLTCP) of Taiwan. Journal of the American Medical Directors Association, 15(12), 946–954. https://doi.org/10.1016/j.jamda.2014.07.007

Ludlow, K., Churrucu, K., Ellis, L. A., Mumford, V., & Braithwaite, J. (2021). Decisions and dilemmas: The context of prioritization dilemmas and influences on staff members’ prioritization decisions in residential aged care. Qualitative Health Research, 31(7), 1306–1318. https://doi.org/10.1177/1049732321989294

Ludlow, K., Churrucu, K., Mumford, V., Ellis, L. A., & Braithwaite, J. (2020). Staff members’ prioritisation of care in residential aged care facilities: A Q methodology study. BMC Health Services Research, 20(1), Article No. 423. https://doi.org/10.1186/s12913-020-05127-3

Matsumoto, R., Yamada, T., & Takonokura, M. (2020). Staff scheduling and work allocation considering physical workload in senior daytime care facilities. Journal of Japanese Industrial Management Association, 71(2E), 99–110. https://doi.org/10.11221/jima.71.99

Munyisia, E. N., Yu, P., & Hailey, D. (2011). How nursing staff spend their time on activities in a nursing home: An observational study. Journal of Advanced Nursing, 67(9), 1908–1917. https://doi.org/10.1111/j.1365-2648.2011.05633.x

Paquay, L., De Lepeleire, J., Milsen, K., Ylieff, M., Fontaine, O., & Buntinx, F. (2007). Tasks performance by registered nurses and care assistants in nursing homes: A quantitative comparison of survey data. International Journal of Nursing Studies, 44(8), 1459–1467. https://doi.org/10.1016/j.ijnurstu.2007.02.003

Qian, S. Y., Yu, P., Zhang, Z. Y., Hailey, D. M., Davy, P. J., & Nelson, M. I. (2012). The work pattern of personal care workers in two Australian nursing homes: A time–motion study. BMC Health Services Research, 12(1), Article No. 305. https://doi.org/10.1186/1472-6963-12-305

Qinggang Senior Care Center, the First Affiliated Hospital of Chongqing Medical University. (2020). Top 100 list of combination of medical care and nursing in 2019 released: Qinggang elderly care center ranked first for four consecutive years. http://www.yanglaotiandi.com/press/7683

Rodriguez-Pereira, J., de Armas, J., Garbujo, L., & Ramalhinho, H. (2020). Health care needs and services for elder and disabled population: Findings from a Barcelona study. International Journal of Environmental Research and Public Health, 17(21), Article 8071. https://doi.org/10.3390/ijerph17218071
Shin, S., Park, J.-H., & Bae, S.-H. (2018). Nurse staffing and nurse outcomes: A systematic review and meta-analysis. *Nursing Outlook, 66*(3), 273–282. https://doi.org/10.1016/j.outlook.2017.12.002

Simmons, S. F., & Schnelle, J. F. (2006). Feeding assistance needs of long-stay nursing home residents and staff time to provide care. *Journal of the American Geriatrics Society, 54*(6), 919–924. https://doi.org/10.1111/j.1532-5415.2006.00812.x

Sittig, D. F. (2005). Work-sampling: A statistical approach to evaluation of the effect of computers on work patterns in health care. In J. G. Anderson & C. E. Aydin (Eds.), *Evaluating the organizational impact of healthcare information systems* (2nd ed., pp. 174–188). Springer. https://link.springer.com/chapter/10.1007/0-387-30329-4_7

Song, Y., Anderson, R. A., Corazzini, K. N., & Wu, B. (2014). Staff characteristics and care in Chinese nursing homes: A systematic literature review. *International Journal of Nursing Sciences, 1*(4), 423–436. https://doi.org/10.1016/j.ijnss.2014.10.003

Telford, W. (1979). Determining nursing establishments. *Health Services Manpower Review, 5*(4), 11–17. https://pubmed.ncbi.nlm.nih.gov/10294956/

Trybusińska, D., & Saracen, A. (2019). Loneliness in the context of quality of life of nursing home residents. *Open Medicine, 14*(1), 354–361. https://doi.org/10.1515/med-2019-0035

Tuinman, A., de Greef, M. H., Krijnen, W. P., Nieweg, R. M., & Roodbol, P. F. (2016). Examining time use of dutch nursing staff in long-term institutional care: A time-motion study. *The Journal of Post-Acute and Long-Term Care Medicine, 17*(2), 148–154. https://doi.org/10.1016/j.jamda.2015.09.002

Wang, L., Sun, Z., Yin, L., & Xie, H. (2016). Research on the allocation standards of nursing human resources in skilled nursing unit in long-term care facilities. *Chinese Journal of Nursing, 57*(1), 15–20. (Original work published in Chinese)

Wang, Z., Yang, X., & Chen, M. (2020). Inequality and associated factors in utilization of long-term care among Chinese older people: Evidence from the Chinese longitudinal healthy longevity survey. *Social Indicators Research, 160*, 467–486. https://doi.org/10.1007/s11205-020-02279-x

Wise, S. (2020). Staffing policy in aged care must look beyond the numbers. *Australian Health Review, 44*(6), 829–830. https://doi.org/10.1071/AH20312

Xing, L. (2015). A study on theoretical nurse staffing in general wards based on measurement of nursing working hours. *Chinese Nursing Management, 15*(1), 61–64. (Original work published in Chinese)

Xinhua Net. (2020, January 9). Rating pension institutions according to national standards this year. http://www.xinhuanet.com/health/2020-01/09/c_1125438015.htm (Original work published in Chinese)

Yen, P. Y., Kellye, M., Lopetegui, M., Saha, A., Loversidge, J., Chipps, E. M., Gallagher-Ford, L., & Buck, J. (2018). Nurses’ time allocation and multitasking of nursing activities: A time motion study. *AMIA Annual Symposium Proceedings, 2018*, 1137–1146. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6371290/

Zhang, H., & Shen, J. (2019). Long term care needs and satisfaction of disabled elderly in medical and nursing institutions. *Chongqing Medicine, 48*, 3777–3780. (Original work published in Chinese)

Zhao, X. (2018, July 9). The demand for elderly care workers is 13 million, but the number of employees is less than 300,000. *China Daily*. https://baijiahao.baidu.com/s?id=1605501637761496052&wfr=spider&for=pc

Zuluaga, B. H. (2000). Implementation of the Zuluaga–Raysmith (Z-R) model for assessment of perceived basic human needs in home health clients and caregivers. *Public Health Nursing, 17*(5), 317–324. https://doi.org/10.1046/j.1525-1446.2000.00317.x