Journal of Acute Medicine 9(4): 161-171, 2019
DOI:10.6705/j.jacme.201912_9(4).0002
Original Article

Do Emergency Nurses Spend Enough Time on Nursing Activities? The Relationship Between Actual and Expected Patient Care Nursing Time

Wen-Chih Fann[1], Bih-O Lee[2,3], Cheng-Ting Hsiao[1,4], Yu-Shan Chuan[2], Chiu-Ya Kuo[2,3,*]

[1]Department of Emergency Medicine, Chiayi Chang Gung Memorial Hospital, Chiayi, Taiwan
[2]Department of Nursing, Chiayi Chang Gung Memorial Hospital, Chiayi, Taiwan
[3]Chang Gung University of Science and Technology, Taoyuan, Taiwan
[4]School of Traditional Chinese Medicine, Chang Gung University, Taoyuan, Taiwan

Background: The overcrowded environments of emergency departments (EDs) lead to increased clinical workloads for nurses and influences the quality of patient care. This study aimed to evaluate whether the quality of patient care meets the expectations of emergency nurses in Taiwan by measuring the amount of time nurses spend on patient care activities.
Methods: The direct observation study was conducted in one suburban academic hospital with approximately 80,000 annual ED visits. This study observed emergency nurses and the time they spent on their nursing activities. The directly measured times and nurse expected patient care nursing times were compared.
Results: For all 88 types of nursing activities recorded, each measured nursing time was less than the expected nursing time. On average, the measured nursing time was 82% less than the expected nursing time (2.0 ± 0.3 minutes vs. 11.6 ± 1.5 minutes, $p < 0.01$). Among the 88 types of nursing activities recorded, the average measured time spent on 76 types (86%) was less than 3 minutes. The nursing activity on which the longest time was spent was cerebrospinal fluid study nursing (7 minutes). The most frequent nursing activity was documentation.
Conclusion: The nursing time spent on patient-care activities in EDs was much less than the nurses expected. The results may provide a basis for nursing quality measurements and manpower calculations for EDs.

Key words: *emergency nursing, nursing activity, nursing care quality, patient care nursing time*

Introduction

Emergency department (ED) overcrowding is a global phenomenon and has become a severe public health issue.[1,2] The situation for EDs in Taiwan is no exception, with crowded ED environments having been found to increase the length of stay and boarding for patients.[3,4] Overtime, frequent callbacks on days off, and heavy workloads have been found to occur commonly among emergency nurses in Taiwan.[5] The overcrowded environments of EDs lead to increased clinical workloads for nurses and further compromise the quality of nursing care.[6,7]

The quality of a given nursing activity is difficult to define and measure. Many quantitative instruments for determining nursing care quality are available.[8]

Received: November 23, 2018; Revised: February 23 (2nd), 2019; Accepted: March 8, 2019.
*Corresponding author: Chiu-Ya Kuo, RN, MSN, Department of Nursing, Chiayi Chang Gung Memorial Hospital, No. 6, Sec. W., Jiapu Rd., Puzi City, Chiayi County 613, Taiwan. E-mail: choya@cgmh.org.tw

However, because these quantitative instruments were developed in different settings based on the differing perceptions of nurses and patients, there is no consensus about how to measure nursing care quality. In the field of emergency nursing, some quantitative instruments based on the perspectives of patients have been used to identify the quality of emergency nursing activity.[9,10] On the other hand, emergency nurses in England developed 10 ED nursing quality indicators based on the perspectives of emergency nurses themselves.[11] These quantitative instruments or indicators could be used to measure ED nursing quality, but which method is better is still unknown. Qualitative methods provide another way to explore nursing care quality. One qualitative study from the perspective of nurses found that insufficient time was the main reason for nurses' inability to consistently provide quality nursing care to all patients.[12] Thus, nursing care quality could be better if emergency nurses were able to spend sufficient time on nursing activities.

Previous research has shown how emergency nurses distribute their time over various nursing activities performed in the ED.[13-15] In those studies, emergency nurses were found to spend 70–90% of their nursing time on patient care nursing activities. If emergency patients can receive more nursing time from emergency nurses, the satisfaction of patients and nurses, as well as disease outcomes and the quality of care, may be improved. Little literature exists, however, on how much time emergency nurses spend on individual nursing activities and how the amount of time spent relates to nursing care quality in the ED. Therefore, the aims of this study were as follows: to quantify the amount of time emergency nurses spend on individual nursing activities in the ED and to evaluate if the quality of the patient care provided meets the expectations of emergency nurses by comparing the nursing time actually spent on patient care activities in the ED with the amounts of time nurses expected to spend on said activities.

Methods

This was a prospective direct observational study conducted in one suburban academic hospital in Taiwan with 1,000 beds and approximately 65,000 annual ED visits.

Participants

The study participants were all registered nurses in the ED of the study hospital. In Taiwan, the clinical nursing ladder was based on the period of clinical experience and competence, with less than 12 months as level 0 nurses (N0s), greater than 12 months as level 1 nurses (N1s), 2 years or more as level 2 nurses (N2s), 3 years or more as level 3 nurses (N3s), 4 years or more as level 4 nurses (N4s).[16] The strategies used to encourage nurses to participate included the full administrative support from the head of nurses and the director of ED, and the research briefing meeting to answer the doubts about the study.

Measurements

To determine the nursing time for each individual nursing activity, five senior emergency nurses with ED working experience of at least 10 years served as a team which identified all the patient care nursing activities performed for patients in the ED and developed a nursing time evaluation sheet accordingly. If there was disgreement among the team members, they discussed the issues in question until a consensus was achieved. Initially, 118 different types of nursing activities were identified based on the nurses' clinical experience and the previous literature.[13,14,17] These 118 nursing activities included direct and indirect patient care nursing activities. Direct patient care nursing activities were defined as all nursing activities performed at the bedside requiring the presence of a licensed registered nurses; for example, physical assessment, venous blood sample, wound care, etc. Indirect patient care nursing activities were defined as all nursing activities performed away from the bedside requiring the expertise of a licensed registered nurses; for example, documentation, patient transfer, incident reporting, etc. Unit-related activities or personal activities were excluded. Then, an item-level content validity index (I-CVI) for the scale was determined by experienced experts.[18] The nursing time evaluation sheet with 118 nursing activities was reviewed by six external experts, including two heads of emergency nurses from other hospitals, two nursing supervisors from the department of nursing in the hospital, one nursing professor from a nursing school, and the director of the ED. The 118 nursing activities in the nursing time evaluation sheet were modified to 114 nursing activities based on the opinions of these experts. The four nursing activities that were deleted were removed due to being repetitive or ambiguously named. The CVI of the nursing time evaluation sheet

was from 0.85 to 1.00. The Emergency Nursing Association has defined "best practice" staffing as that which provides timely and effective patient care with professional nursing satisfaction in a safe environment.[19] The 42 participating emergency nurses were requested to fill out a nursing time evaluation sheet to determine the expected "best practice" nursing time for each nursing activity. The expected "best practice" nursing time for each nursing activity (expected nursing time) is defined as the nursing time emergency nurses expect to spend on their patients for each nursing activity, in order to provide timely and effective patient care with professional nursing satisfaction in a safe environment. The average nursing time thus indicated for each activity was regarded as the expected "best practice" nursing time for the given activity.

Data Collection

This study used direct observation to measure the actual patient care nursing time for each activity (measured nursing time) with a convenience sampling of day, night, and midnight 8-hour nurse shifts for 6 months from April to September 2013. The measured nursing time for each nursing activity is defined as the nursing time emergency nurses actually spend on their patients for each nursing activity. The four observers were senior nursing students in the last year of a 2-year Bachelor of Science program. To ensure similarity in their observations, the four observers attended a 20-hour training program together before collecting the data. The training included definitions and codes for specific nursing activities, guidance regarding the observation process, and guidance on how to record measurements using paper or a computer. To test the interrater reliability, the observers simultaneously rated 40 selected nursing activities performed by emergency nurses. The interrater reliability was 90%. When engaging in observation, the observers stood as far away from the nurses as possible to decrease contact with the emergency nurses. Two observers worked as a team at the same time. One observed the nurse in charge and the other was responsible for other allocated nurses if there were two or more nursing activities being performed on one patient simultaneously. All the nursing activities engaged in for non-trauma, trauma, and pediatrics patients from triage to disposition in the ED within 6 hours were observed, with data recorded accordingly. All nursing activities of at least 1,000 patients would be included in this study. The proportion of patient amount was based on the patient amounts classified by shifts and triage levels in the hospital in 2012.

Ethical Considerations

Institutional review board approval was received from the boards of the study hospital. Before the observations were made, the purposes of the study were explained to the emergency nurses, and spoken and written consents were obtained from each emergency nurse who participated.

Data Analysis

The actual measured patient care nursing time (measured nursing time) was compared to emergency nurse expected ursing time) to the emergen (expected nursing time) for each nursing activity. We used the Mann-Whitney U test (IBM SPSS 22, IBM Corp., Armonk, NY, USA) to compare the means of the expected nursing times and the measured nursing times.

Results

All 42 (100%) emergency nurses agreed to be observed while performing their patient care nursing activities. The clinical ladder and working experience levels of the emergency nurses are listed in Table 1. The most common nurse level among the ED nurses was N2, and the average working experience was 5.4 years.

The total 16,210 nursing activities performed for 1,025 ED patients were observed. N2s performed a majority of the nursing activities. Emergency nurses with clinical working experience of 5–10 years were responsible for half of the nursing activities. Table 2 shows the frequency of the nursing activities in terms of the clinical ladder and the clinical working experience of the participating emergency nurses.

Table 1. Clinical nursing ladder and working experience of emergency nurses

Clinical ladder	Nurses	Working years	Nurses
N0	4	< 1	4
N1	5	≥ 1 to < 3	5
N2	27	≥ 3 to < 5	9
N3	2	≥ 5 to < 10	16
N4	4	≥ 10	8
Total	42	Total	42

N: clinical nursing ladder.

Table 2. Frequency of nursing activities based on clinical nursing ladder and working experience of emergency nurses

Clinical ladder	Nursing activities	Working years	Nursing activities
N0	627	< 1	627
N1	1,251	≥ 1 to < 3	1,251
N2	12,540	≥ 3 to < 5	3,572
N3	1,311	≥ 5 to < 10	8,107
N4	481	≥ 10	2,653
Total	16,210	Total	16,210

N: clinical nursing ladder.

Of the previously identified 114 different types of nursing activities, 88 types were observed (Supplement Table 1). For all 88 types of observed nursing activities, the average measured nursing time was less than the expected nursing time. The means of the measured nursing times and expected nursing times were not equal (2.0 ± 0.3 minutes vs. 11.6 ± 1.5 minutes, $p < 0.001$). On average, the measured nursing time 82% less than the expected nursing time. Among the 88 types of observed nursing activities, the mean measured nursing time for 76 types (86%) was less than 3 minutes.

Table 3 shows the top 10 ED nursing activities ranked by duration. The longest nursing activity was lumbar puncture (6.9 minutes). For lumbar puncture and central venous catheterization, the measured nursing times were similar to the expected nursing times. In contrast, for the other nursing activities, the measured nursing times were only one-third to one-twelfth of the expected nursing times.

Table 4 shows the top 10 ED nursing patient care activities ranked by frequency. The most frequent nursing activities were documentation, order transcription, and communication with patients and families. On average, emergency nurses performed an act of documentation at least twice for each patient. Order transcription, communication with patients and families, and triage were performed for almost every patient. For these frequent nursing activities, the measured nursing times were one-fourth to one-sixteenth of the expected nursing times.

Discussion

To the best of our knowledge, this was the first time that the nursing time spent on patient care activities was measured in the ED in Taiwan. This study successfully quantified the amount of time sent on 88 nursing activities performed in the ED and found that the quality of patient care did not meet the expectations of the emergency nurses by comparing the measured and expected nursing times for the various patient care activities. According to the study results, the measured nursing time was, on average, 80% less than the emergency nurse expected "best practice" nursing time. Thus, the nursing time spent on the patient care activities was much less than the nurses expected would be spent. The results suggested that the emergency nurses could complete the various patient

Table 3. Top 10 emergency department nursing activities by duration

Nursing activities	Measured nursing time M ± SD (minutes)	Expected nursing time M ± SD (minutes)	*p*-value
Lumbar puncture	6.9 ± 5.2	7.6 ± 4.5	0.613
Central venous catheterization	6.8 ± 4.3	7.7 ± 4.4	0.095
Airway insertion and stabilization	6.7 ± 5.9	28.1 ± 21.3	0.002
Incident reporting	6.2 ± 4.2	27.3 ± 12.3	0.007
Foley insertion-female	5.7 ± 4.9	16.2 ± 8.4	< 0.001
Wound care	3.7 ± 3.1	17.7 ± 11.7	< 0.001
Wound irrigation	3.7 ± 2.0	13.3 ± 6.3	0.001
Transport to ICU	3.5 ± 2.8	18.5 ± 11.2	< 0.001
Abuse protection support	3.5 ± 1.5	41.8 ± 31.2	0.002
Cardiopulmonary resuscitation	3.4 ± 1.5	40.1 ± 14.3	< 0.001

ICU: intensive care unit; M ± SD: mean ± standard deviation.

Table 4. Top 10 emergency department nursing activities by frequency

Nursing activities	Frequency	Measured nursing time M ± SD (minutes)	Expected nursing time M ± SD (minutes)	*p*-value
Documentation	2,321	1.0 ± 0.7	16.0 ± 15.3	< 0.001
Order transcription	1,475	0.7 ± 0.6	5.4 ± 3.8	< 0.001
Communication with patients and families	1,108	0.8 ± 0.7	11.9 ± 7.5	< 0.001
Triage	1,025	2.0 ± 1.0	9.0 ± 4.0	< 0.001
Transfer from triage to treatment area	953	0.9 ± 0.9	5.0 ± 2.6	< 0.001
Health education	807	1.0 ± 0.5	7.5 ± 4.4	< 0.001
Physical assessment	708	0.8 ± 0.3	6.2 ± 3.7	< 0.001
Venous blood sample	671	1.7 ± 1.3	7.1 ± 5.2	< 0.001
Discharge planning	650	1.1 ± 0.5	7.9 ± 5.8	< 0.001
Intravenous insertion	631	2.5 ± 0.5	10.5 ± 7.0	< 0.001

M ± SD: mean ± standard deviation.

care nursing activities in time, but could not spend more time on the activities in order to ensure the "best practice." In other words, the quality of the patient care provided did not meet the expectations of the emergency nurses. The emergency nurses expected to spend more time on the various nursing activities so as to improve the quality of patient care.

In this study, most of the ED nursing activities were of very short duration, with the average time for 86% of the nursing activities being less than 3 minutes. The results that the time of ED nursing activities was short and emergency nurses could not spend more time on the nursing activities in order to reach the "best practice" may imply that the emergency nurses had work overload, which forced them to perform the nursing activities hurriedly, thereby indirectly shortening the nursing time devoted to patient care, which may further hinder the nursing care quality.

Previous research has revealed that overtime, frequent callbacks on days off, and heavy workloads commonly occurred among emergency nurses in Taiwan.[5] The nurse-to-patient ratio has been found to be a useful index by which to measure the workloads of emergency nurses.[14] A statement from medical staffing of National Taiwan University Hospital ED in 2015 revealed that the nurse-to patient was 1:14.[20] The high patient-to-nurse ratio reflected the work overloads of emergency nurses in Taiwan.

Several contributing factors have been found to cause work overload. The first is patient overcrowding in EDs. The overcrowded environments of EDs lead to increased clinical workloads for nurses and further compromise the quality of nursing care.[6,7] The Taiwan government has not really executed the health care referral system, leading to the strange phenomenon that any patient can easily and directly visit any ED of any size hospital, even if the patient only has a common cold. Additionally, the Taiwan national health insurance system provides quite cheap health care, such that patients abuse health resources, especially EDs. The more patient visits an ED has, the greater the workload an emergency nurse working there has. Second, a shortage of nurses has also worsened the ED work overloads.[21] Under the Taiwan national health insurance system, the reimbursement for nursing care is low due to the hospital global budget payment system, which has caused hospitals to be unable to employ additional emergency nurses to cope with the heavy clinical workloads.[22] With understaffing, overtime work has become a common phenomenon in EDs.[5] The more and more fatigued emergency nurses seek to escape, while the nurses who choose to stay will have work overloads. It is a vicious cycle. Finally, stressful and chaotic ED working environments also play important roles in causing work overloads. Emergency nurses have previously reported feeling considerable stress because they often encounter all kinds of verbal and physical violence from patients, the family members of patients, and other healthcare providers.[23,24] In such stressful working environments, they have to perform nursing activities correctly within limited amounts of time. As such, it is hardly surprising that the nursing times for patient care activities found in this study were extremely low, or that the quality of patient care did not meet the expectations of the participating emergency nurses. The huge

differences between the measured and expected nursing times may also reflect to a considerable extent the stress felt by the emergency nurses.

This study reminds the government officials and hospital managers or stakeholders that it is the time to take actions to increase the nursing time allowed for nursing activities and thereby improve the quality of nursing care. Taiwan government could improve ED overcrowding in order to decrease unnecessary ED visits, while also increasing the reimbursements for nursing care in order to improve nurse-to-patient ratios. Hospitals could in turn invest in improvements to the ED environment and in the nursing staff. A safer ED environment without violence may make emergency nurses less stressed and less likely to be interrupted in their duties. Emergency nurses could then expend more effort and time on patient care. On the other hand, hospitals could exempt emergency nurses from un-professional, extending works or hire certified nurse aides with skill mixed model[25] to share the clinical workloads of emergency registered nurses so that emergency nurses can spend more time on individual nursing activities.

For the top 10 ED nursing activities in terms of the length of time spent, all the mean nursing times were actually very short. The longest mean time for a nursing activity was the 6.9 minutes for lumbar punctures, while the mean time for cardiopulmonary resuscitation was 3.4 minutes. The short nursing times were probably caused by assistance from emergency physicians or nurse practitioners. Take the lumbar puncture and central venous catheterization activities, for example, emergency physicians usually helped the emergency nurses to prepare for these procedures, because the doctors knew the nurses were very busy. During resuscitation activities, nurse practitioners always worked together with the emergency nurses as a team to perform cardiopulmonary resuscitation. Nurse practitioners may help emergency nurses to prepare and perform cardiopulmonary resuscitation, and thus shorten the nursing time performed by emergency nurses for cardiopulmonary resuscitation. Therefore, mutual support from other healthcare providers may worsen nursing care. Fragmented nursing care is dangerous, and may be harmful to the safety of patients and healthcare providers. Adequate valuing of nursing care, proper reimbursement and staffing are essential in developed countries.

In terms of the top 10 ED nursing activities by frequency, the emergency nurses performed triage, communication with patients and families, order transcription, and documentation for every patient just as they should regularly do. The most frequent nursing activity was documentation. On average, emergency nurses performed an act of documentation at least twice for each patient. Therefore, emergency nurses spent 2 or 3 minutes on documentation for each patient within the patient's first 6 hours in the ED. However, the expected nursing time for documentation was 16 minutes. This may reflect the possibility that the emergency nurses desired to spend more time on documentation in order to make the documentation detailed and clear. Although handwritten medical records have been replaced by electronic medical records for a number of years, it is clear that what the emergency nurses needed was "more time" to record what they did for the patients, no matter which type of record they used. Easy access to nursing information system may save more time for emergency nurses on documentation. Mobile computerized nursing carts with user friendly interfaces may allow emregency nurses to perform instant data inputs and real-time data reviews.

This study revealed the fact that although the emergency nurses in Taiwan worked very hard in order to achieve the expected best practices, there is still a huge gap between the reality and the ideal. Besides nursing care quality, the huge differences between the measured and expected nursing times may reflect that the nursing staffing of EDs does not meet the expectations of emergency nurses. The calculation of nursing staffing of ED in Taiwan is based on the hospital accreditation, which states that "for medical centers, there should be one nurse for every 10 daily patient visits in the treatment area of ED (12 daily patient visits for regional hospitals) and one nurse for every one ED observation beds."[26] The nursing staffing calculation of current regulation in Taiwan underestimated the nursing staffing in the ED.[27] This study may help the Taiwan government officials and hospital managers or stakeholders to develop new nursing staffing calculations, similar to emergency nursing workforce tool in United States and Australia.[19,28]

This study may provide a simple method for nursing leaders and hospital administrators to evaluate the nursing care quality in an ED and further to develop strategies to ensure adequate workloads. More resources should be used in addressing patient overcrowding and nurse shortages in order to create a healthy work environment for emergency nurses and

to improve the quality of emergency nursing care in the future.

Limitations

This study has three limitations. First, this study was conducted in one suburban academic hospital. Thus, its findings may not apply to other hospitals of different sizes, locations, or hospital systems. Consider, for example, that the nursing activities and nursing times for an urban community ED with a predominantly pediatric patient population may differ from those of our hospital. Second, using convenient sampling inevitably brings the problem of selection bias. Some of the nursing activities may have been sampled with low frequency, which may have influenced the accuracy of the measured nursing times. Finally, only 88 of 114 nursing activities were observed in the study, and the lack of observation for the other 26 nursing activities may have influenced the study results. The reason for this lack of observation may simply be that these unrecorded nursing activities are rarely performed, leading to these nursing activities not being sampled in the study.

Conclusion

This was the first study in which the nursing times spent on patient care activities were measured in an ED in Taiwan. Compared to the emergency nurse expected "best practice" nursing times, the actual nursing times spent on patient care activities were extremely low. These results suggested that the quality of patient care did not meet the expectations of the emergency nurses. The emergency nurses expected to spend more time on the various nursing activities in order to improve the quality of patient care. However, the work overloads caused by patient overcrowding, nurse shortages, and stressful working environments may have been the reasons the nurses' expectations were not generally met. This study may provide the basis for nursing quality measurements and manpower calculations for EDs in the future.

References

1. Pines JM, Hilton JA, Weber EJ, et al. International perspectives on emergency department crowding. *Acad Emerg Med* 2011;18:1358-1370. doi:10.1111/j.1553-2712.2011.01235.x
2. Di Somma S, Paladino L, Vaughan L, Lalle I, Magrini L, Magnanti M. Overcrowding in emergency department: an international issue. *Intern Emerg Med* 2015;10:171-175. doi:10.1007/s11739-014-1154-8
3. Huang YC, Hsiao CT, Hsueh CC. Suffering and expectation of patients waiting for ward boarding in the emergency department when hospitals are at full capacity. *J Emerg Med (Taiwan)* 2009;11:109-116.
4. Han CY, Lin CC, Goopy S, Hsiao YC, Barnard A, Wang LH. Waiting and hoping: a phenomenographic study of the experiences of boarded patients in the emergency department. *J Clin Nurs* 2017;26:840-848. doi:10.1111/jocn.13621
5. Hu YC, Chen JC, Chiu HT, Shen HC, Chang WY. Nurses' perception of nursing workforce and its impact on the managerial outcomes in emergency departments. *J Clin Nurs* 2010;19:1645-1653. doi:10.1111/j.1365-2702.2009.02999.x
6. Kilcoyne M, Dowling M. Working in an overcrowded accident and emergency department: nurses' narratives. *Aust J Adv Nurs* 2007;25:21-27.
7. Pines JM, Garson C, Baxt WG, Rhodes KV, Shofer FS, Hollander JE. ED crowding is associated with variable perceptions of care compromise. *Acad Emerg Med* 2007;14:1176-1181. doi:10.1197/j.aem.2007.06.043
8. Koy V, Yunibhand J, Angsuroch Y. The quantitative measurement of nursing care quality: a systematic review of available instruments. *Int Nurs Rev* 2016;63:490-498. doi:10.1111/inr.12269
9. Muntlin Å, Gunningberg L, Carlsson M. Patients' perceptions of quality of care at an emergency department and identification of areas for quality improvement. *J Clin Nurs* 2006;15:1045-1056. doi:10.1111/j.1365-2702.2006.01368.x
10. Messina G, Vencia F, Mecheroni S, Dionisi S, Baragatti L, Nante N. Factors affecting patient satisfaction with emergency department care: an Italian rural hospital. *Glob J Health Sci* 2015;7:30-39. doi:10.5539/gjhs.v7n4p30
11. Bennett P. Nursing quality indicators: the next step in enhancing quality in emergency care. *Int Emerg Nurs* 2012;20:179-186. doi:10.1016/j.ienj.2012.04.001
12. Williams AM. The delivery of quality nursing care: a grounded theory study of the nurse's perspective. *J Adv Nurs* 1998;27:808-816. doi:10.1046/j.1365-2648.1998.00590.x
13. Hollingsworth JC, Chisholm CD, Giles BK, Cordell WH, Nelson DR. How do physicians and nurses spend their time in the emergency department? *Ann Emerg Med* 1998;31:87-91. doi:10.1016/S0196-0644(98)70287-2
14. Hobgood C, Villani J, Quattlebaum R. Impact of emergency department volume on registered nurse time at the bedside. *Ann Emerg Med* 2005;46:481-489. doi:10.1016/j.annemergmed.2005.07.014

15. Gholizadeh M, Janati A, Nadimi B, Kabiri N, Abri S. How do nurses spend their time in the hospital? *J Clin Res Gov* 2014;3:27-33. doi:10.13183/jcrg.v3i1.52
16. Taiwan Nurses Association. The clnical nursing ladder guidline for nursing personnel. Available at: http://www.twna.org.tw/frontend/un10_open/welcome.asp#. Accessed November 3, 2018.
17. Bulechek GM, Butcher HK, Dochterman JM, Wagner CM. Nursing Interventions Classification (*NIC*). 6th ed. St. Louis, MO: Mosby; 2012.
18. Polit DF, Beck CT. *Essentials of Nursing Research: Methods, Appraisal, and Utilization*. 8th ed. Philadelphia, PA: Lippincott Williams & Wilkins; 2014.
19. Ray CE, Jagim M, Agnew J, McKay JI, Sheehy S. ENA's new guidelines for determining emergency department nurse staffing. *J Emerg Nurs* 2003;29:245-253. doi:10.1067/men.2003.92
20. Huang HL. A letter to hospital—a joint statement form medical staffing of NTUH emergency department [in Chinese]. *CommonWealth Magazine* 2015. Available at: https://www.cw.com.tw/article/article.action?id=5066353. Accessed November 3, 2018.
21. Li T. *Nursing Working Conditions and Nursing Shortage* [master's thesis]. Taipei : National Chengchi University; 2013.
22. Liang YW, Chen WY, Lee JL, Huang LC. Nurse staffing, direct nursing care hours and patient mortality in Taiwan: the longitudinal analysis of hospital nurse staffing and patient outcome study. *BMC Health Serv Res* 2012;12:44. doi:10.1186/1472-6963-12-44
23. Yang CK, Yang CH, Lin LF, Lin KY. Violence in the workplace: experiences of emergency department nurses. *Cheng Ching Med J* 2015;11:22-31.
24. Ming JL, Huang HM, Hong SP, et al. A systematic review of workplace violence in nursing. *Taiwan J Public Health* 2016;35:116-135. doi:10.6288/TJPH201635104045
25. Huang LC, Lee JL, Liang YW, Hsu MY, Cheng JF, Mei TT. The skill mix model: a preliminary study of changing nurse role functions in Taiwan. *J Nurs Res* 2011;19:220-229. doi:10.1097/JNR.0b013e318228cd5d
26. Joint Commission of Taiwan. Hospital accreditation standard. Available at: https://www.jct.org.tw/lp-147-1.html. Accessed November 3,2018.
27. Chang YM, Li CH. A study of nurse staffing requirements in the emergency departments. *J Health Architecture* 2014;1:75-80. doi:10.6299/JHA.2014.1.4.R8.75
28. Williams G, Souter J, Smith C. The queensland emergency nursing workforce tool: a prototype for informing and standardising nursing workforce projections. *Australas Emerg Nurs J* 2010;13:89-96. doi:10.1016/j.aenj.2010.05.003

Supplement Table 1. Types of nursing activities

	Nursing activity
Observed nursing activities	Triage
	Vital signs measurement
	Glasgow coma scale
	Body weight measurement
	Physical assessment
	Health education
	Airway suctioning
	Intravenous insertion
	Dressing
	Change bed sheets
	Change diaper
	Self-care assistance: bathing/hygiene
	Medication administration: oral
	Medication administration: intravenous
	Medication administration: intramuscular
	Medication administration: eye
	Medication administration: enteral
	Medication administration: subcutaneous
	Medication administration: rectal
	Medication administration: skin
	Wound care
	Ice pillow use
	Ice packing
	Nasogasrtic tube care
	Tracheostomy care
	Foley care
	Surgical preparation
	Equipment use and management
	Transport to observation room
	Transport to ward
	Transport to intensive care unit
	Discharge planning—may be discharged
	Discharge planning—against advise discharge
	Postmortem care
	Transport to consultation unit
	Referral to other hospital

Supplement Table 1. Types of nursing activities (continued)

	Nursing activity
Observed nursing activities	Transport from triage into emergency room
	Venous blood sample for blood exams
	Venous blood sample for biochemistry exams
	Venous blood sample for bacteria culture
	Urinalysis
	Arterial blood gas
	Finger sugar
	Pregnancy test
	Plain radiography including transport
	Computerized tomography including transport
	Magnetic resonance imaging including transport
	Endoscopy including transport
	Electrocardiography
	Resuscitation
	Endotracheal tube insertion and stabilization
	Splinting
	Suturing
	Wound bleeding compression
	Foley insertion—male
	Foley insertion—female
	Urinary catheterization
	Blood transfusion
	Fluid resuscitation
	Intravenous therapy
	Oxygen therapy
	Central venous catheterization
	Check central venous catheterization level
	Lumbar puncture
	Ascites tapping
	Vital signs monitoring
	Physical restraint
	Bowel irrigation
	On neck collar
	Domestic partner abuse protection support
	Oral or nasal airway
	Documentation
	Communication with patients and family

Supplement Table 1. Types of nursing activities (continued)

	Nursing activity
Observed nursing activities	Photography
	Chest physiotherapy
	Hand over
	Enteral tube feeding
	Contact family
	Incident reporting
	Laboratory data interpretation
	Medication reconciliation
	Order transcription
	Self-care assistance: toileting
	Supply management
	Wound irrigation
	Patient rounds
	Communication between departments
	Filling in the consent form
Unobserved nursing activities	Positioning
	Monitor input and output
	Eye irrigation
	Medication administration: ear
	Pressure ulcer care
	Heating light
	Chest tube care
	Endotracheal tube care
	central venous catheterization/intravenous line Care
	Percutaneous nephrostomy/cystofix care
	Gastrostomy/colonstomy care
	Discharge planning—critical discharge
	Angiography including transport
	Defibrillation
	Chest tube insertion
	Hemodialysis therapy
	Menthal packing
	Child abuse protection support
	Code management
	Conflict mediation
	Rape-trauma treatment
	Birthing
	Emergency cart checking
	Team resource management
	Suicide prevention
	Infection isolation protection measures