Direct versus Indirect Nursing Care in Intensive Care Units during COVID-19 (An Observational Study)

Abstract

Background: Nurses play a crucial role in providing care in Intensive Care Units (ICUs). This study aimed to compare the time spent and types of direct and indirect nursing care provided to patients during COVID-19 pandemic. **Materials and Methods:** This observational study was conducted in the ICU of Hafthome-Tir Hospital, Tehran, in 2022. The activities of 42 randomly selected nurses were continuously observed and recorded, focusing on direct and indirect care as per the revised International Classification for Nursing Practice checklist. Data were analyzed using dependent t-test ($p > 0.05$). **Results:** The data showed that the highest average time for direct care spent on cardiopulmonary resuscitation was 27.30 (6.10) minutes, while the least time for deltoid injections was 4.8 (2.9) minutes. In indirect care, the most time was spent writing reports, 34.90 (10.50) minutes, and the least time spent removing personal protective equipment was 6.11 (3.19) minutes. During data collection, 19 procedures were added to the nursing care checklist due to COVID-19. A dependent t-test showed a significant difference between direct and indirect ICU nursing care (t= -6.62, df = 41, $p < 0.001$), indicating more time was spent on indirect care. **Conclusions:** The findings showed indirect care was provided more frequently than direct care, highlighting the need to reassess nursing care delivery methods. The increased demand for indirect care is attributed to time and staffing shortages, along with a rise in patient numbers and hospitalizations compared to pre-COVID conditions.

Keywords: *COVID-19, intensive care units, nursing care, task performance, time-motion study*

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Introduction

The COVID-19 pandemic has significant impact on the healthcare industry, particularly intensive care nursing care. Studies have shown that COVID-19 patients require increasing level of intensive care, placing extraordinary physical and mental demands on nurses.[1] At the beginning of the pandemic, nurses worked under intense psychological pressure and were involved in chaotic situation. As the largest healthcare workforce globally, nurses were on the front lines of care for hospitalized COVID-19 patients,[2] particularly Intensive Care Units (ICUs). The surge in COVID-19 cases resulted in an overwhelming number of patients requiring care, often in high-acuity settings. Reports indicated that nurses were frequently required to work longer hours, manage more patients than usual, and adapt to rapidly changing protocols and procedures.[3-6] Studies in Iran have also shown that the workload of nurses increased substantially due to the surge in COVID-19 cases, leading to longer shifts and a higher number of patients-to-nurse ratio. This increase in workload was compounded by the emotional and physical demands of caring for patients with a novel virus, often accompanied by staffing shortages.[7]

Nursing care activities during the pandemic have been divided into direct and indirect care categories, with additional elements. Studies have shown that a better nursing workplace is associated with improved job outcomes and quality of care.[8] However, the lack of adequate capacity to serve the surging patient volume has been one of the significant challenges during the COVID-19 pandemic. For instance, Uppal and other researchers concluded that the number of ICU patients treated at New York hospitals during the peak was over three times the system's ICU capacity.[9]

As a result of these challenges, the time available for direct nursing care has been reduced as a significant portion of a nurse's day is spent documenting patient care and

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empirical evidence suggests a concerning trend within the healthcare landscape: The allocation of healthcare professionals' time increasingly favors documentation activities over direct patient care.[10] To manage capacity, economic loss, and care redesign, healthcare managers have opted to reduce the workforce or shift many employees to remote work, including clinicians working with telehealth technologies. However, retraining staffs during the pandemic is a difficult task, especially when changes need to be implemented quickly.[11]

The COVID-19 pandemic has led to a significant increase in the nursing workload in ICUs. According to early data, the ideal nurse-to-patient ratio for these patients should be around 1:1.5. However, due to the need to provide an enormous amount of new ICU beds, it is often impossible to guarantee this ratio in many hospitals.[12] Time and motion studies are crucial tools that can help nurses manage their workload, especially during the pandemic. These studies help in identifying inefficiencies in nursing workflows and can streamline processes, reduce wasted time, and enhance patient care. Previous studies have shown that nurses spend less time on direct patient care than on indirect care.[13] This study aimed to observe nurses to determine the type and frequency of each of the direct and indirect care activities performed by nurses working in ICUs during COVID-19 in 2022.

Materials and Methods

This descriptive, cross-sectional observational study was conducted in the ICUs of Havthame-Tir Hospital, affiliated to Iran University of Medical Sciences in Tehran (2022), and received ethical approval from the ethics committee. By accepting a Type I error rate of 5% ($Z_{(\alpha/2)}$ = 1.96) and using the results of a study by Heydari and Tabari,[14] which reported the mean and standard deviation of direct care time as 22 (1.10), the sample size was estimated to be approximately 42 individuals. Nurses observed during each work shift (14 in the day, 14 in the evening, and 14 in the night shift) over 3 months. The nurses were randomly selected and provided direct and indirect care to COVID-19 patients in ICU. The study's objectives were explained to the participants, and written consent was obtained. Nurses with at least 6 months work experience were included, and those who transferred to another ward during observation were excluded.

The nurses were continuously observed by an external observer, a registered nurse and not working in the same ward, to eliminate Hawthorn bias. One nurse per shift was followed and observed from the start of the shift to the end of the shift. The observer used a stopwatch to record the start and end time of each activity. The data collection tool was the International Classification for Nursing Practice (ICNP) checklist,[15] which was translated into Persian using forward-backward translation. All variables were clear and did not require any changes.

The questionnaire also included some plain boxes to record unexpected activities. Descriptive statistics (mean, standard deviation, frequency, and percentage) were used to describe the sample characteristics, and a dependent *t*-test was employed to compare and examine the relationships between the variables ($p > 0.001$). The checklist's content validity was assessed by five faculty members in nursing management and 10 nurses with at least 2 years of experience (CVR = 0.63). To ensure inter-rater reliability, only one researcher was chosen for observation. IBM SPSS 16. was used for data analysis.

Ethical considerations

The study was conducted with the approval of the ethics committee of the University of Sciences of Iran, with the code (IR.IUMS.REC.1399.1316). Written consent was obtained from all participants., who were assured that their information would remain anonymous and confidential. The participants were also informed that their participation was voluntary and they could withdraw from the study at any time.

Results

This study evaluated nursing activities during COVID-19 in the ICU among 42 nurses. The majority of nurses were women (85%) and married (80%). Over half of subjects (60%) were aged (30–39) years, and over two-third (72%) had (11–20) years' experience [Table 1].

According to Table 2, nurses performed a total of 68 nursing activities in the ICU during COVID-19, including 45 direct care and 23 indirect care activities. The study also found that 12 direct care and 10 indirect care activities on the ICNP list were not performed in the ICU during COVID-19. However, 19 direct care activities were added compared to the ICNP list [Table 2]. The results showed that the average direct care time in morning, evening, and night shifts was 180—210—330 minutes, respectively. The highest average direct care time across all shifts was related to assisting cardiopulmonary resuscitation (CPR), 27.3 (16.10) minutes, while the least average direct care

Table 1: Demographic characteristics of nurses in Intensive Care Unit (ICU) (*n*=42)

Groups		*n* (%)
Age group	>30	9 (%20)
	30-40	29 (%70)
	<40	4 (%10)
Years of work	>10	12 (%28)
	10-20	30 (%72)
	<20	0
Marital status	Single	8 (%20)
	Married	34 (%80)
Sex group	Female	36 (%86)
	Male	6 (%14)
	Total	42 (%100)

Table 2: Direct nursing care in Intensive Care Unit (ICU) during COVID-19

	Observed Care Items	Frequency	Mean (time) SD
1.	Administering intravenous medication	37	16.3 (5.81)
2.	Administering inhalant medication	10	7 (4.30)
3.	Administering medication	29	6.96 (3.74)
4.	Administering subcutaneous medication	54	4.20 (1.30)
5.	Blood therapy	4	16.20 (3.50)
6.	Checking patient identity	-	-
7.	Discontinuing intravenous therapy	19	14.60 (6.40)
8.	Maintaining intravenous therapy	27	9.40 (4.40)
9.	Shift to shift handovers	27	1.40 (3.12)
10.	Transfer handovers	27	10.44 (3.12)
11.	Accompanying patient	7	21 (7.30)
12.	Transporting patient	7	21.14 (7.58)
13.	Bathing the patient	-	-
14.	Assisting with eating or drinking	-	-
15.	Assisting with hygiene	-	-
16.	Assisting with mobility	-	-
17.	Assisting with mobility in bed	-	-
18.	Assisting with self-care	-	-
19.	Assisting with toileting	-	-
20.	Dressing patient	-	-
21.	Implementing parenteral feeding	34	12.80 (4.40)
22.	Positioning patient	38	16.20 (5.70)
23.	Providing food	26	20 (9.15)
24.	Transferring patient	18	15.50 (6.25)
25.	Measuring blood glucose	6	10.80 (8.10)
26.	Measuring body temperature	39	26.02 (15.01)
27.	Collecting specimen	29	8.80 (4.07)
28.	Assessing wound and evaluating wound healing	12	9.67 (3.80)
29.	Irrigating urostomy	-	-
30.	Removing suture	8	7.50 (4. 50)
31.	Stoma care	2	5 (0)
32.	Wound care	12	9.67 (3.80)
33.	Wound dressing change	10	13.20 (5.30)
34.	Discontinuing wound drain	-	
35.	Admission assessment	16	22 (9.40)
36.	Applying physical restraint		
37.	Inserting vascular access device	27	9.40 (4.40)
38.	Maintaining isolation techniques	-	
39.	Assisting tracheal intubation	14	15.50 (6.50)
40.	Assisting chest tube	8	14.50 (2.30)
41.	Assisting cv line catheterization	10	13.90 (50)
42.	Suctioning airway	37	13.80 (5.20)
43.	ECG recording	4	13.50 (6.70)
44.	Maintain and changing tracheal tube's dressing	15	13.50 (2.70)
45.	Permeant checking patient's airway in covid 19	35	12.70 (6.39)
46.	Tracheostomy care	6	11.50 (5.24)
47.	Nasogastric intubation	22	11.10 (4.80)
48.	Removal gastric tube	14	10.90 (5.10)
49.	Controlling the level of consciousness	39	10.20 (4.20)
50.	Providing COVID-19 test	9	10 (4.80)
51.	Applying airway	12	6.58 (4.30)
52.	Introducing yourself to the patient	21	6.23 (4.50)
53.	Deltoid injection	8	4.80 (2.80)

Contd...

	Observed Care Items	Frequency	Mean (time) SD
	Table 2: Contd...		
54.	Recheck physician orders	8	18.20 (13.40)
55.	Doing administrative affairs of admission	23	15.80 (7.18)
56.	Assisting Cardiopulmonary Resuscitation (CPR)	10	27.30 (16.10)
57.	Inserting Foley catheter	23	12.30 (4.60)
	Total		176 (63.70)

time was related to Deltoid injections, 4.8 (2.90) minutes. Frequent airway management in COVID-19 patients during the pandemic was added to the checklist. Table 2 also shows that some nursing procedures were not performed during COVID-19, including checking patient identity, bathing the patient, assisting with eating or drinking, assisting with hygiene, assisting with mobility, assisting with mobility in bed, assisting with self-care, assisting with toileting, dressing the patient, irrigating ureterostomy, discontinuing wound drain, and maintaining isolation techniques.

On the other hand, some additional direct nursing care procedures were performed during COVID-19, including assisting with tracheal intubation, assisting with a chest tube, assisting central venous line catheterization, suctioning the airway, ECG recording, maintaining and changing tracheal tube dressing, continuously checking of the patient's airway in COVID-19, tracheostomy care, nasogastric intubation, removal of gastric tube, controlling the level of consciousness, providing COVID-19 tests, applying airway management, introducing oneself to the patient, administration of deltoid injection, rechecking physician orders, doing administrative affairs of admission, assisting CPR, and inserting a Foley catheter.

Also, Table 3 shows that some indirect cares were added to the checklist due to COVID-19, such as safety protocols (handwashing and changing protective equipment) and filling out additional documentation and forms [Table 3]. In addition, up to the COVID-19, some indirect cares were added to the checklist, such as safety protocols (hand wash and hand rub, protective equipment changing) and filling more documentation and forms.

As Table 4 shows, the further analysis using paired t-tests to compare the direct and indirect nursing care in ICU during COVID-19 showed a significant difference between the two types of care ($p < 0.001$), indicating that direct care time was not the same as indirect care time.

Discussion

The results of this study showed that, according to the existing standards in the ICPN checklist, both direct and indirect activities increased during the COVID-19 pandemic, leading to an added workload. Furthermore, the volume of indirect care was greater than that of direct care during this period.

Nurses have been at the forefront of the COVID-19 pandemic. However, it is important to evaluate the time spent on providing nursing care as a key indicator of healthcare quality. The ICNP checklist is a standardized tool that can be used to plan and manage nursing care, serving as a global communication system for nurses.[16] As other studies have found, the COVID-19 pandemic has led to changes in the type and timing of nursing care provided.[17,18]

This study also revealed that more than two-thirds of activities were direct care, but overall, indirect nursing cares took up more time for ICU nurses during the pandemic. Some direct and indirect nursing care tasks were not performed by nurses due to the high workload and the need for nurse assistants. For example, bathing the patient, assisting with eating or drinking, assisting with hygiene, assisting with mobility, assisting with mobility in bed, assisting with self-care, assisting with toileting, and dressing the patient were often omitted.

According to the studies conducted several years ago, the nurse-to-patient ratio in ICU was 1:4, which is the same as that in the present study during COVID-19.[19-21] Despite an increase in patient volume, staffing levels have not kept up with demand, which may lead to poorer patient outcomes. Additionally, others have noted that the nurse-to-patient ratio during the COVID-19 pandemic has been less than the minimum standards recommended by healthcare organizations.

During the COVID-19 pandemic, nurses have been at the forefront of providing care to patients. However, their workload has been significantly increased due to the pandemic, with indirect care and hospitalization time for patients in ICU departments also increasing. As a result, Internet usage has become necessary for caring patients during COVID-19, such as sending patient information via WhatsApp or email. A recent study suggested that the use of the Internet can lead to creativity, flexibility, and a better learning environment for nurses.[22]

In conclusion, the analysis of direct nursing care times reveals that assisting with CPR required the highest average direct care time, with an average duration of 27.3 minutes. In contrast, the administration of deltoid injections was the least direct care time, averaging only 4.8 minutes. A few studies have been conducted on the timing of direct care separately. Ahmadi-Shad's findings showed that the most direct nursing care time was related to CPR, but the least direct care time was not mentioned in

Table 3: Indirect nursing care in Intensive Care Unit (ICU) during COVID-19

	Observed Care Items	Frequency	Mean (time) SD
1.	Assisting health care provider	10	9.11 (7.13)
2.	Taking orders	12	16.5 (16)
3.	Discharge planning	-	-
4.	Arranging transport of device	-	-
5.	Scheduling follow up appointment	-	-
6.	Referring to community services	-	-
7.	Referring to support group therapy	-	-
8.	Communicating with superiors and physician	5	7.26 (4.47)
9.	Consulting healthcare provider	16	7.7 (3.55)
10.	Consulting pharmacist about generic medications	-	-
11.	Reporting arterial blood gas results	12	10.7 (4.10)
12.	Reporting status to family	19	7.47 (4.01)
13.	Reporting status to interprofessional team	26	16.92 (16.8)
14.	Reporting status to patient	-	
15.	Teaching of junior nurse or nurse student	13	11.23 (7.76)
16.	Answering or making phone calls	24	5.63 (3.43)
17.	Preparing of requisites for procedures	31	15.22 (6.58)
18.	Clearing of requisites for procedures	31	15.22 (6.58)
19.	Teaching patient	-	-
20.	Teaching caregiver	22	10.40 (4.44)
21.	Transporting patient	18	15.50 (6.25)
22.	Documentation	34	34.90 (10.5)
23.	Maintenance of patient environment	-	-
24.	Handwashing	38	10.20 (3.95)
25.	Adjusting the infusion pump and nebulizer	13	9.56 (3.07)
26.	Wear protective clothes	35	7 (3.55)
27.	Removing protective equipment	36	6.11 (3.19)
28.	Sending patient information via Whatsapp or …	5	7 (4.47)
29.	Managing device	11	11.50 (3.32)
30.	Providing instructional materials	-	-
31.	Providing supportive device	27	9.50 (4.40)
32.	Applying safety device	26	7.22 (3.61)
33.	Checking device safety	15	9.33 (3.91)
	Total Indirect care		310 (117)

Table 4: Comparison of mean direct and indirect nursing care time in ICU during COVID-19

	Paired Differences					t	df	p value (2-tailed)
	Mean	SD	SD Error Mean	%95 Confidence Interval of Difference				
				Lower	Upper			
Direct/Indirect nursing care	-134.73	131.84	20.34	-175.82	-93.65	-6.62	41	$p<0.001$

As Table 4, there was a significant difference between the two types of care ($p<0.001$)

his study.[3] On the other hand, Lim and Ang's study found that administering medication accounted for the largest portion of direct nursing care time at 18%.[15] Meanwhile, Hendrich's study found that the lowest average direct care time was related to assessing vital signs (7.2%), and the maximum time was related to administering medication to the patient (17.9%).[23]

There are several possible explanations for these results. It could be due to the importance of continuous assessment of COVID-19 patients and sudden changes in their physical conditions. Control of vital signs was closely related to

the time required to perform CPR. Additionally, some nurses' activities such as recurrent airway management in COVID-19 patients have been added to the list of direct care, which could account for the differences in the results.

Nevertheless, some other studies indicated that direct nursing care consumes more time than indirect care in various healthcare settings. A time and motion study conducted in general wards revealed that direct patient care, which includes tasks such as patient assessment and medication administration, occupies a significant portion of a nurse's shift compared to indirect care activities like

documentation and coordination of care.[24] Moreover, other studies have shown that, particularly in emergency and psychiatric settings, the demand for direct patient care was high, and nurses may struggle to balance these responsibilities with necessary indirect tasks, but actual nursing times spent on patient care activities were extremely low.[25]

In conclusion, the findings of this study revealed a significant disparity in how nurses allocate their time, with a predominant focus on indirect care activities, particularly documentation and report writing. The average of 34.9 minutes spent on these tasks starkly contrasts with the limited 6.11 minutes devoted to direct patient care, such as removing personal protective equipment. This trend highlighted a critical challenge in nursing practice as excessive time spent on documentation may hinder the essential communication and direct care that nurses provide to patients. To improve patient outcomes and enhance the quality of nursing care, it is imperative to address this imbalance, streamline documentation processes, and prioritize direct patient interactions. Moreover, other studies have also highlighted similar findings, indicating that nurses spend more time on documentation.[26] However, some studies conducted before the COVID-19 pandemic showed that nurses spent a significant amount of their indirect care time on activities such as answering phones (33.3%) and responding to patients' requests (37.56%).[27] This indicated that the need to document care and chart reports in detail has significantly increased in recent times.

In comparing the time spent on direct and indirect care, the results showed that the time spent on indirect care is greater than direct care. However, the number of direct care activities is higher, according to the INCP list and the present study. Hosseinpour and other researchers reported that nurses in emergency units and general wards spent around 30.03% of their time on direct patient care. Although there are differences in the standard time of direct and indirect care in different wards, many studies have not observed a significant difference in the time spent in these wards.[28] Furthermore, some studies have shown that the time spent on direct care is sometimes more than indirect care, which could be related to the nature of COVID-19 and the patients' conditions.[3,29,30]

Observing nurses constantly faced with challenging issues. It was difficult to observe and differentiate their care practices. To overcome this challenge, a more precise and patient observation was necessary, which was conducted. Additionally, to prevent changes in nurses' behavior in the presence of an observer, a familiarization method was employed, whereby the researcher was present in the unit for repeated days and throughout all shifts, allowing the staff to become accustomed to them and not perceive them as a stranger.

Conclusion

This study provides valuable insights into the practices of nurses caring for COVID-19 patients in an ICU setting, supported by ethical approval and a robust methodology. Overall, this research contributes significantly to our understanding of nursing activities in high-pressure environments. Also, the results showed nurses need to be provided with adequate resources and support to carry out their duties effectively. Managers need to implement policies that prioritize direct nursing care and reduce the burden of administrative tasks. This can be achieved by delegating tasks to non-nursing staff or using technology to streamline documentation.

Conflicts of interest

Nothing to declare.

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