Mental Workload Analysis Using NASA TLX on Healthcare Workers in the Emergency Room of Sariningsih Hospital Class IV, Bandung City

Bheta Silfana Ulul Azmi*, Zulmansyah, Nirmala Kesuma

Universitas Islam Bandung

Correspondence Email: bhetasilfana@yahoo.com*

Abstract

Human resources (HR) are an integrated expertise that comes from the mental and physical power possessed by each individual and is something that is very important for the activities carried out. Emergency Room (IGD) is one of the most important work units in a hospital. The purpose of this study was to describe the Mental Demand (MD), Physical Demand (PD), Temporal Demand Frustration (FR), Effort (EF) and Performance (PE) of doctors, nurses and midwives in the Emergency Room of the Sariningsih Level IV Army Hospital, Bandung City. The research method used in this study was quantitative descriptive with a sample size of 39 health workers. Based on the research results obtained by the author, it is known that the majority of health workers in this study who experience a very high mental workload, namely doctors were found in the physical demand aspect with a total of 6 people and temporal demand was found with a total of 5 people. While for nurses, it was found in the mental demand aspect with a total of 9 people, performance with a total of 7 people, frustration with a total of 7 people, and effort with a total of 5 people. And for midwives, it was found in all aspects at a high level. So based on the total Nasa TLX score, the overall mental workload of health workers in the RST Level IV Emergency Room. IV 03.07.03 Sariningsih Bandung City is classified as moderate.

Keywords: mental workload, emergency room (IGD), NASA TLX, health workers.

INTRODUCTION

Human resources (HR) are integrated skills derived from the intellectual and physical abilities possessed by each individual. Human resources are crucial to all activities. Although technology is increasingly sophisticated, without quality human resources, technology is meaningless. Intellectual capital is the basic capital. Therefore, human resources are assets that must be properly managed to meet the needs of an organization. Good resource management depends on how leaders or managers manage these resources (Raziansyah et al., 2021). Health human resources are the most important asset a health organization must possess and are a key element of other health subsystems that support health development efforts. The 2011-2025 Health Workforce Development Plan states that health human resources contribute 80% to the success of health development (Mugisha & Namaganda, 2014). Success in providing comprehensive services involves human resources. Among the human resources directly involved in providing patient care are health workers in the Emergency Department.

Based on Law No. Law No. 17 of 2023 concerning Health states that a hospital is a health care facility that provides promotive, preventive, curative, rehabilitative, and/or palliative health services, providing inpatient, outpatient, and emergency care. Furthermore, hospitals require human resources with sound knowledge as healthcare workers who are expected to be able to handle various problems encountered. In addition to modern equipment, hospitals, as public service facilities serving the community, should also be supported by the availability of qualified healthcare workers.

Proper planning for healthcare workforce needs is a crucial component of human resource management to ensure excellent service delivery in hospitals, including the Emergency Department (IGD) at the Sariningsih Level IV Army Hospital. The Sariningsih Level IV Army Hospital in Bandung City is a Technical Implementation Unit (UPT) within the Ministry of Defense of the Republic of Indonesia and the Indonesian National Armed Forces. Technically, operationally and administratively, the Sariningsih Level IV Army Hospital in Bandung is under the Army Health Center, which is under the auspices of the Health Command III/Siliwangi, led by the Chief of Health of Kodam III/Siliwangi (Kakesdam III/Siliwangi). The Sariningsih Level IV Army Hospital in Bandung is led by a Hospital Chief. This hospital's primary duty is to provide support and healthcare services to TNI soldiers, civil servants, and their families, as well as to the general public. This is in line with the hospital's motto, "PRIMA," which stands for Caring, Responsive, Sincere, Independent, and Enthusiastic (Sariningsih Hospital, 2023).

One of the hospital's most crucial work units is the Emergency Room, or IGD. According to Regulation of the Minister of Health of the Republic of Indonesia Number 47 of 2018 concerning Emergency Services, the IGD is a facility for emergency patients requiring immediate medical attention to save lives or prevent disability. The healthcare workers in the Emergency Room (ER) include general practitioners, nurses, and midwives. They must be on call 24/7 to handle patients whose number and severity are unpredictable. Furthermore, the responsibilities of ER healthcare workers are significant, as they involve the safety of lives. Emergency services include the handling of emergencies within healthcare facilities. Emergency services are provided to patients within healthcare facilities that meet standards. Healthcare facilities include facilities, infrastructure, medicines, consumable medical supplies, medical equipment, and, most importantly, human resources. Emergency care within healthcare facilities is handled in hospitals, with several levels. The level of emergency care in hospitals is classified based on standards set by the Ministry of Health, with the highest-level being Class A (Level IV), followed by Class B (Level III), Class C (Level II), and Class D (Level I).

Based on the Decree of the Indonesian National Armed Forces Commander No. Kep/972/XII/2017, a Level IV Hospital provides general medical services consisting of basic medical services, dental and oral health services, and maternal and child health/family planning services. Emergency services must be available 24/7, with the ability to perform initial examinations for emergency cases, perform resuscitation, and stabilize patients according to standards. In accordance with Minister of Health Regulation No. 47 of 2018, Sariningsih Army Hospital is a Class D hospital with a Level 1 Emergency Room that handles airway problems, breathing problems, and circulation disorders, performs basic resuscitation, and stabilizes patients for evacuation.

Each month, various types of patients arrive at the Emergency Department (ER) including those with a threat of death (red label), those with a threat of disability (yellow label), and those with non-urgent and non-emergency conditions (green label). The ER is divided into emergency and non-emergency patients. In 2024, from January to December, a higher number of patients with red and yellow labels (emergency patients) were found.

Emergency patients require more time to handle than non-emergency patients. Therefore, procedures performed in the emergency room require more attention and time than those performed by healthcare workers outside the emergency room. Meanwhile, the total number of healthcare workers in the emergency room is 40. The number of emergency room patients at Sariningsih IV Army Hospital on 03.07.03, Bandung City, in 2024 can be seen in the following table:

Table 1. Number of Emergency and Non-Emergency Patients from January 2024 to December 2024

Month	Patient Type		Total
	Emergency Patient	Non-Emergency Patients	
I	823	197	1020
II	926	210	1136
III	1203	265	1468
IV	1100	238	1338
V	957	220	1177
VI	846	182	1028
VII	655	170	825
VIII	729	178	907
IX	649	200	849
X	644	249	893
XI	576	228	804
XII	706	278	984
Total	**9814**	**2615**	**12429**

Source: Emergency Room, Sariningsih Army Hospital, 03.07.03, Bandung City

Based on Table 1, it can be seen that the majority of emergency patients at Sariningsih Level IV Army Hospital, Bandung City, were emergency patients, with a total of 9,814 patients in 2024, while non-emergency patients were 2,615 in 2024.

The number of doctors on duty at Sariningsih Level IV Army Hospital's emergency room is 16, consisting of 9 full-time doctors and 7 part-time doctors. Of the full-time doctors, 3 are male and 6 are female, while the part-time doctors are 3 are male and 4 are female. Working hours are divided into three shifts: the morning shift from 7:00 AM to 2:00 PM, the afternoon shift from 2:00 PM to 9:00 PM, and the night shift from 9:00 PM to 7:00 AM. The number of doctors per shift on weekdays (Monday-Friday) consists of two doctors, and on other days there is one doctor. Every doctor is required to hold an active ACLS (Advanced Cardiac Life Support) certificate. Three doctors already hold ATLS (Advanced Trauma Life Support) certificates, while none of the doctors in the emergency room have GELS (General Emergency Life Support) certificates. According to the Standard Operating Procedure (SOP) of Sariningsih Level IV Army Hospital, dated 03.07.03, Bandung City, general practitioners, acting as the patient-in-charge physicians (DPJP) in the emergency room, are responsible for managing the patient's medical care (diagnosis, therapy information, patient care, follow-up care plans, requests for other supporting examinations, referrals, and discharges), and ensuring patient safety and preventing adverse events (KTD).

The number of nurses on duty in the emergency room at Sariningsih Level IV Army Hospital is only 17: 8 male and 9 female, divided into three shifts, each with a nurse of 3 to 1. The working hours for each shift are the morning shift from 7:00 AM to 2:00 PM WIB, the afternoon shift from 2:00 PM to 7:00 AM WIB, and the 24-hour hospital shift. There is no

specific scheduled rest time for these nurses. Overtime shifts often occur when the number of patients in the ER is too high or when the patient's condition is critical and cannot be handled by just three nurses on that shift. Each nurse is required to have a BTCLS (Basic Trauma Cardiac Life Support) certificate to support their work in the ER. However, one nurse was found to not have this certificate. Meanwhile, the number of midwives on duty at the Sariningsih Level IV Army Hospital is only 7 people divided into two shifts. The working hours for each shift are the morning shift from 7:00 AM to 2:00 PM WIB, the afternoon and evening shifts from 2:00 PM to 7:00 AM WIB (Sariningsih Hospital, 2023). Every midwife is required to have a PPGDON (Obstetric and Neonatal Emergency Management Training) certificate to support their work in the emergency room. However, only two midwives were found to be certified. The increasing number of patients admitted to hospitals has placed a heavy burden on healthcare workers, including those in the emergency room.

Workload is the amount of work that must be completed by a department or work group within a given period (Gulo et al., 2020) According to Kasmir (2019), workload is the ratio of the total standard time to complete tasks and jobs to the total standard time (Kasmir, 2019) Workload includes physical workload and mental workload. Excessive workload or insufficient physical ability can cause a worker to suffer from occupational disorders or illnesses (Efendi & Makhfudli, 2009). Physical workload refers to the burden a worker experiences in a job related to their physiological condition, such as noise, vibration, and hygiene (Munandar, 2001). If such working conditions are sufficiently poor, it can cause work stress with physical symptoms such as high blood pressure, diarrhea, and constipation. The perception of a mismatch between work and the work environment that causes stress is an excessive mental workload (Rizqiansyah et al., 2017). Mental workload is closely related to errors. The higher a person's mental burden, the more errors they can make (Diniaty, 2018). Research conducted by Cucu et al. (2019) found that the workload of healthcare workers in the emergency room (ER) is quite heavy because patients rushed to the ER are generally emergency patients requiring immediate attention. The workload faced by ER healthcare workers fluctuates depending on the number and type of emergency patients admitted to the ER, which in turn impacts the length of medical treatment. This can be a stressor for healthcare workers working in the ER (Cucu et al., 2019). Research by Setiyawan (2020) stated that at Undata Regional Hospital, Central Sulawesi, the number of healthcare workers in the ER was 31, spread across three shifts. This was disproportionate to the average daily number of 60 patient visits (Setiyawan, 2020).

A study conducted at the Emergency Room of Semarang Regency Hospital by Haryanti et al. (2013) found that the workload of nurses was mostly very high, with 27 respondents (93.1%) reporting very high stress. Most nurses experienced moderate stress, with 24 respondents (82.8%). A relationship was found between workload and stress levels of nurses at Semarang Regency Hospital, with a p-value of 0.000 (α: 0.05). Effective and constructive self-management is needed to effectively manage high workloads and stress levels among nurses, preventing performance disruption and health problems for emergency department nurses (Haryanti et al., 2013).

In the emergency department of Sariningsih Level IV Army Hospital, the workload of healthcare workers is quite high. This is due to the average number of emergency patients being 30 and 7 non-emergency patients. Doctors also have dual roles in addition to their ER roles, such as home visits and ward visits. Nurses and midwives sometimes also conduct home visits alongside physicians. However, healthcare workers in outpatient and inpatient settings must be separated. A heavy workload reduces their capabilities, which ultimately affects the quality of care. A high workload in the emergency department can have negative impacts such as physical and mental fatigue, as well as emotional reactions such as headaches,

digestive disorders, and irritability. Conversely, too little workload can lead to boredom. Boredom in the work being done causes a lack of attention to the work, which can potentially endanger workers. Other negative impacts of workload include decreased work quality, customer complaints, and increased absenteeism (Krisdiana et al., 2022).

Thus, further analysis is needed regarding workload measurement. One of the methods used to measure mental workload is the NASA-TLX method. NASA TLX (National Aeronautics and Space Administration Task Load Index) was developed by Sandra G. Hart from NASA-Ames Research Center and Lowell E. Staveland from San Jose State University in 1981 (Hart & Staveland, 1998). NASA-TLX is one of the most widely used instruments to assess overall workload subjectively. In a recent review, it was estimated that NASA-TLX has been used in more than 300 studies. NASA-TLX is a multidimensional instrument consisting of 6 subscales: Mental Demand (MD), Physical Demand (PD) and Temporal Demand (TD), Frustration (FR), Effort (EF), and Performance (PE). In further developments, the NASA TLX instrument has been used in health care research. In a study conducted by Hoonakker (2011), the NASA TLX instrument was used to examine the workload of nurses in the ICU, with validity values between 0.73 and 0.79 and a reliability value of 0.77 (Hoonakker et al., 2011).

Excessive workload occurs due to a shortage of healthcare workers and long working hours, especially those working in the Emergency Department (ER). High workloads in healthcare workers impact the quality of human resources in hospitals. The higher the workload, the lower the quality of human resources in hospitals; conversely, the lower the workload, the higher the quality of human resources in hospitals (Saputra, 2016). Heavy workloads, especially in the Emergency Department, not only cause stress but also lead to work deviations, which ultimately lead to a decline in work skills. Heavy workloads or overtime affect the quality of service in hospitals. A shortage of human resources combined with a heavy workload can lead to stress in the medical workforce. Workload analysis can be seen from aspects such as the tasks performed based on the main and additional functions performed, the number of patients to be cared for, work capacity according to the education obtained, the working time spent on their duties according to the daily working hours, and the completeness of facilities that can help nurses complete their work well.

Some previous studies that used the NASA-TLX method to analyze mental workload are research conducted by Azhari & Suparno (2024) who analyzed the mental workload of employees in the Operations Maintenance and Network Division (OPJ) at a telecommunications company using NASA-TLX and RSME where the results of the study showed that the mental workload owned by employees was quite high due to continuous activities (Azhari & Suparno, 2024). Furthermore, in research conducted by Arasyandi & Bakhtiar (2016) which stated that the results of NASA-TLX calculations obtained mental workload values for all workers were at a moderate level with the largest mental workload indicators for PT DBM operators being the PD (Physical Demand) and MD (Mental Demand) scales (Arasyandi & Bakhtiar, 2016). Research conducted by Putri & Handayani (2017) stated that based on the results of workload analysis using NASA TLX, it was found that 38.10% of employees had a high mental workload, 57.14% had a moderate mental workload, and 4.76% had a light mental workload. In the above study, the focus of the research was to examine the mental workload of workers in companies, while in this study, the focus was to examine the mental workload of health workers in the Emergency Room of Sariningsih Hospital Class IV 03.07.03, Bandung City using the NASA-TLX method, as well as identifying the most dominant dimensions of mental workload in health service activities (Putri & Handayani, 2017).

Based on data and previous research results, it can be seen that mental burden is related to workload in healthcare services. Therefore, this study will descriptively analyze the mental workload of healthcare workers using the Nasa TLX study in the Emergency Room of RST Level IV 03.07.03 Sariningsih, Bandung City.

METHOD

This research was conducted at the Sariningsih Level IV Army Hospital in Bandung. The type of research used by the author in this study was descriptive analysis. A population is the totality of units of analysis that share certain specifications or characteristics. According to Sugiyono (2018), a population is a generalized area consisting of objects/subjects with certain qualities and characteristics determined by the researcher to be studied and from which conclusions can be drawn. Therefore, a population includes not only people but also objects and other natural objects. A population is also not simply the number of objects/subjects studied by the researcher to be studied and from which conclusions can be drawn (Sugiyono, 2018). The population in this study was all healthcare workers in the Emergency Department of the Sariningsih Level IV Army Hospital in Bandung City, totaling 39 individuals. The minimum sample size for quantitative research is 30 individuals (Sugiyono, 2015).

The sample size determination technique in this study was census sampling, where all members of the population are used as samples. Saturated sampling (total sampling) is a sampling technique where all members of the population are used as samples due to the relatively small population size and the research's goal of generalizing with minimal error (Sugiyono, 2009). Research conducted by Indiyaningsih (2020) and Persada et al. (2023) stated that census sampling is used when the sample size is less than 100 (Indiyaningsih et al., 2020; Indra Nara Persada et al., 2023).

However, in this study, the population size was less than 100, so a census sampling technique was used, which involved taking the entire population. The number of respondents from the emergency room healthcare workers was 39. The following table shows the sample sizes for each sample:

Table 2. Research Sample

No	Health Workers	Total
1	Doctor	15
2	Nurses	17
3	Midwives	7
Total		**39**

In this study, data collection was conducted through questionnaires, interviews, observation, and documentation. To calculate the final NASA TLX score, the total score for each mental workload aspect is calculated by multiplying the rating by the weight. The total of all mental workload aspect scores is then added to obtain the weighted workload (WWL) score. The final score is obtained by dividing the WWL score by 15. The score of 15 is obtained from the combination of the six pairs of mental workload aspects.

$$WWL = \frac{MD+PD+TD+P+FR+EF}{15}$$

MD = rating x weight   P = rating x weight
PD = rating x weight   FR = rating x weight
TD = rating x weight   EF = rating x weight

Nasa TLX Score = $\frac{WWL}{15}$

RESULT AND DISCUSSION
Respondents Descriptions

This study was conducted on doctors, nurses, and midwives in the Emergency Room of Sariningsih Hospital Level IV, Bandung City. A general description of the respondents was used to classify them based on their type of employment, age, gender, education level, and working hours. The general description of respondents by type of employment, age, gender, education level, and working hours is as follows:

Table 3. General Description of Respondents by Type of Employment, Age, Gender, Education Level, and Working Hours (n = 39)

Respondent Overview	Frequency	Percentage (%)
Occuoation Type		
Doctor	15	38,5
Nurse	17	43,6
Midwife	7	17,9
Total	39	100
Age		
< 25 years	5	12,8
25-35 years	23	59,0
>35 years	11	28,2
Total	39	100
Gender		
Male	13	33,3
Female	26	66,7
Total	39	100
Level of Education		
S1	18	46,2
Diploma	21	53,8
Total	39	100
Working Hours per Week		
<40 hours	13	33,3
40 hours	10	25,6
>40 hours	16	41,0
Total	39	100

Source: Processed Analysis Results (2025)

Table 3 shows that the majority of respondents were nurses (17 respondents) (43.6%), the majority were aged 25-35 years (59.0%), and the majority were female (26 respondents) (66.7%). The majority of respondents had a diploma (21 respondents) (53.8%), and the majority worked more than 40 hours per week (16 respondents) (41.0%).

Based on the results of the study on the mental workload of healthcare workers using NASA TLX in the Emergency Room of Sariningsih Hospital Level IV, Bandung City, 03/07/2013, the following results were obtained:

Table 4. Mental Workload of Healthcare Workers Using NASA TLX in the Emergency Room of Sariningsih Hospital Level IV, Bandung City

Healthcare Workers	Mental Demand (MD) (Persons)				
	Moderate	Somewhat high	High	Very high	Total
Doctor	1	2	9	3	15
Nurse	0	1	12	4	17
Midwife	0	0	5	2	7
Total	**1**	**3**	**26**	**9**	**39**
Healthcare Workers	**Phsychal Demand (PD)**				
	Moderate	Somewhat high	High	Very high	Total
Doctor	1	4	8	2	15
Nurse	0	2	8	7	17
Midwife	0	0	2	5	7
Total	**1**	**7**	**18**	**14**	**39**
Healthcare Workers	**Temporal Demand (MD)**				
	Moderate	Somewhat high	High	Very high	Total
Doctor	1	3	9	2	15
Nurse	0	2	10	5	17
Midwife	0	1	3	3	7
Total	**1**	**6**	**22**	**8**	**39**
Healthcare Workers	**Performance (P)**				
	Moderate	Somewhat high	High	Very high	Total
Doctor	0	2	10	3	15
Nurse	0	2	7	8	17
Midwife	0	0	5	2	7
Total	**0**	**4**	**22**	**13**	**39**
Healthcare Workers	**Frustration**				
	Moderate	Somewhat high	High	Very high	Total
Doctor	4	3	5	3	15
Nurse	0	2	6	9	17
Midwife	1	3	2	1	7
Total	**5**	**8**	**13**	**13**	**39**
Healthcare Workers	**Effort (EF)**				
	Moderate	Somewhat high	High	Very high	Total
Doctor	0	2	10	3	15
Nurse	2	1	9	5	17
Midwife	3	1	3	0	7
Total	**5**	**4**	**22**	**8**	**39**

Source: Processed Analysis Results (2025)

To calculate the final NASA TLX score, the total score for each mental workload aspect is calculated by multiplying the rating by the weight. Then, the total of all mental workload aspect scores is added together to obtain the weighted workload (WWL) score. The final score is obtained by dividing the WWL score by 15. A score of 15 is obtained from the combination of the six pairs of mental workload aspects.

$$WWL = \frac{MD+PD+TD+P+FR+EF}{15}$$

MD = rating x weight   P = rating x weight
PD = rating x weight   FR = rating x weight
TD = rating x weight   EF = rating x weight

Nasa TLX Score = $\frac{WWL}{15}$

Workload Classification Based on NASA TLX Score

< 50 = Light
50-80 = Moderate
>80 = High

The following are the results of the mental workload classification of healthcare workers in the Emergency Room of Level IV Hospital, 03.07.03 Sariningsih, Bandung City, using NASA TLX.

Table 5. Classification of Healthcare Workload Based on NASA – TLX Total Score

No	Healthcare Workers	Score	Mental Workload Classification
1	Doctor 1	68,00	Moderate
2	Nurse 1	58,00	Moderate
3	Doctor 2	64,00	Moderate
4	Nurse 2	66,66	Moderate
5	Midwife 1	59,33	Moderate
6	Doctor 3	68,00	Moderate
7	Nurse 3	58,00	Moderate
8	Nurse 4	82,00	High
9	Nurse 5	74,00	Moderate
10	Nurse 6	74,66	Moderate
11	Nurse 7	68,66	Moderate
12	Bidan 2	71,66	Moderate
13	Midwife 3	51,33	Moderate
14	Midwife 4	60,67	Moderate
15	Midwife 5	64,67	Moderate
16	Doctor 4	77,33	Moderate
17	Nurse 8	54,67	Moderate
18	Midwife 6	66,00	Moderate
19	Nurse 9	70,00	Moderate
20	Nurse 10	64,00	Moderate
21	Nurse 11	31,33	Light
22	Midwife 7	91,67	High

No	Healthcare Workers	Score	Mental Workload Classification
23	Nurse 12	56,67	Moderate
24	Doctor 5	34,33	Light
25	Doctor 6	50,00	Moderate
26	Doctor 7	43,67	Light
27	Doctor 8	33,33	Light
28	Nurse 13	72,33	Moderate
29	Nurse 14	79,67	Moderate
30	Nurse 15	72,00	Moderate
31	Nurse 16	72,67	Moderate
32	Doctor 9	62,00	Moderate
33	Doctor 10	59,33	Moderate
34	Doctor 11	76,67	Moderate
35	Nurse 17	54,67	Moderate
36	Doctor 12	61,33	Moderate
37	Doctor 13	57,67	Moderate
38	Doctor 14	58,00	Moderate
39	Doctor 15	54,33	Moderate

Source: Processed Analysis Results (2025)

Overall, the mental workload of healthcare workers in the Emergency Room of Sariningsih Hospital Level IV, Bandung City, was moderate. One nurse had a high mental workload, one nurse had a light mental workload, one midwife had a high mental workload, and three doctors had a light mental workload.

Mental Demand (MD) of Healthcare Workers Using NASA TLX in the Emergency Room of Sariningsih Hospital Level IV, Bandung City, 03/07/2020

Based on the research results, the majority of doctors, nurses, and midwives in the Emergency Room of Sariningsih Hospital Level IV, Bandung City, fell into the high and very high categories, with 35 individuals. It was found that healthcare workers experiencing mental demand were most likely in the high category (9 doctors), most in the high category (12 nurses), and most in the high category (5 midwives). Meanwhile, the highest number of healthcare workers was found in nurses, with a very high number of nurses, with 4 nurses. Mental demand refers to the amount of mental and perceptual activity required by doctors, nurses, and midwives to remember, see, and search.

The number of healthcare workers in the Emergency Room (ER) of Sariningsih Hospital Level IV, 03/07/03, Bandung City, consists of 15 doctors, 17 nurses, and 7 midwives. Based on interviews, the majority of respondents stated that this number was sufficient, but some stated that it was insufficient, particularly for nurses and midwives, as the responsibilities of nurses and midwives were sometimes unbalanced with the number of patients. If midwives were not receiving maternity patients, midwives assisted with nursing care. However, this was still insufficient due to the increasing number of patients seeking treatment in the ER each month, while the number of healthcare workers remained constant. Furthermore, home visits increased the need for additional nursing staff.

Mental demand refers to the amount of mental activity required by healthcare workers to perform their work. Healthcare workers in the ER were required to analyze and prepare daily, monthly, and annual reports related to the ER. This requires healthcare workers to be creative in providing the best possible care to patients in need. Healthcare workers working in critical care units often experience physical and mental fatigue. Meanwhile, patients treated in the emergency room (ER) in unstable conditions, such as struggling and throwing tantrums, make it difficult for healthcare workers to provide nursing care and can impact their emotional well-being (Purba, 2015). This can increase the workload experienced by healthcare workers in critical care units and the ER. The most significant workload experienced by nurses is mental workload.

In the emergency department, every healthcare worker is required to work with full motivation and responsibility in providing emergency care, from simple to complex cases. Therefore, every healthcare worker is required to continuously improve cooperation and coordination, collaborating with colleagues and other healthcare team members to find solutions and make decisions in patient situations in accordance with emergency principles. Furthermore, the requirement for emergency procedures in the emergency department to take less than five minutes requires nurses and midwives to be more agile and precise in carrying out the actions instructed by doctors in treating patients.

One factor that can influence the speed and accuracy of patient care is educational level. According to the results of research conducted by Mannasiah et al in 2023 with the title of the relationship between education and length of service with emergency patient handling at the UPT of Arifin Nu'mang Regional General Hospital, Sidrap Regency, that from a total sampling of 24 nurses in the emergency installation, it was found that there was a significant relationship between nurse education and emergency patient handling at the emergency installation of the UPT of Arifin Nu'mang Regional General Hospital, Sidrap Regency in 2023 with a calculated value of p = 0.017. This is also confirmed by the results of research from Patricia in 2019 regarding education levels, it was found that of a total of 36 respondents (100%) with a D3 Nursing education level, the most were 26 people (72.2%), then with a S1 Nursing education level of 9 people (25%) and a D4 Nursing education level of 1 person. Higher education can improve nurses' skills, also the higher a person's education, the more critical, logical, and systematic their thinking will be, and the higher the quality of their work. This was found in the study, which identified 21 individuals with diplomas or D3 degrees, including nurses and midwives in the emergency department of the Sariningsih Army Hospital Level IV, 03/07/03.

The study found that nurses experienced very high mental demands. These demands include thinking about how to complete a task, especially the need to remain highly alert for extended periods, carrying out doctor's instructions, memorizing learning materials and instructions through monotonous activities, and finding solutions to every problem. Mental demand is related to performance, and can lead to impaired work ethic, diminished knowledge, and impaired fitness and mental well-being. Research by Werdani (2016) found that high mental demands among nurses can significantly impact the nursing care provided to patients and their families, potentially leading to decreased patient satisfaction with nursing care. Patient satisfaction is an indicator of the quality of hospital services. Therefore, if many patients/families are dissatisfied with the nursing care provided, it will impact customer loyalty and, in the long term, will decrease the hospital's Bed Occupancy Rate (BOR). This research aligns with research conducted by Arasyandi & Bakhtiar (2016), which found that mental demand is the largest workload for PT DBM operators.

Physical Demand (PD) of Healthcare Workers Using NASA TLX in the Emergency Room of Sariningsih Hospital Level IV, Bandung City

Based on the results of the Physical Demand (PD) study, it was found that the majority of healthcare workers in the Emergency Room of Sariningsih Hospital Level IV, Bandung City, experienced high and very high PD, totaling 32 people. Doctors were the most likely to experience high physical demand (8 doctors), nurses the most likely to experience high physical demand (8 nurses), and midwives the most likely to experience very high physical demand (5 midwives). Of the total healthcare workers, nurses were the most likely to experience very high physical demand (7 nurses). Physical Demand (PD) is the physical activity required for work (e.g., pushing, pulling, turning, controlling, running, and so on). Healthcare workers must be able to complete their work accurately and quickly, often competing against the critical patient demands during the COVID-19 pandemic. Physical strength is required for healthcare workers, as they must wear hazmat suits for four consecutive hours. They cannot eat or drink.

Hospitals are service industries, and marketing is integrated with service delivery, requiring a special attitude and behavior when dealing with customers. As healthcare providers, hospitals operate 24 hours a day. Hospitals separate patient care services into emergency, non-emergency, and inpatient care. One part of the hospital is the emergency department, which is the initial point of entry for patients with emergencies. The primary purpose of the emergency department (ER) is to receive, triage, stabilize, and provide acute healthcare services to patients, including those requiring resuscitation and those with specific levels of emergency. Other ER duties include recording cases and actions taken in the ER, as well as transferring patients from the ER to inpatient care if more intensive care is needed.

ER personnel must be available at all times because patients requiring ER care come in at any time, especially at referral hospitals. The high workload of healthcare personnel significantly impacts the provision of ER care, as nurses have a high potential for errors that could jeopardize patient safety. And if healthcare workers choose or prioritize patients, they risk disability or even death.

Healthcare workers must be able to complete their work accurately and quickly, often racing against the odds in the face of emergencies faced by patients during the COVID-19 pandemic. Healthcare workers are physically challenged by having to wear hazmat suits for four consecutive hours, and are unable to eat or drink (Zeho et al., 2023).

Research findings indicate that doctors experience the highest levels of Physical Demand (PD). Research conducted by Pangestu (2024) found that workload significantly impacts physician performance. Excessive workloads can lead to decreased or suboptimal performance. Excessive workloads or limited physical capabilities can lead to health problems or occupational diseases. Fundamentally, in addition to other factors such as work capacity and the work environment, workload is one of the most important factors for feeling calm at work and getting things done (Pangestu et al., 2024). Research conducted by Seffia et al. (2017) shows that workload affects the performance of doctors and that workload can cause stress. Interviews found that doctors in the Emergency Room at Sariningsih Army Hospital IV Level 03.07.03, Bandung City, are also responsible for patients in the ward. Therefore, extra effort is needed to handle all patients throughout the hospital environment. Furthermore, it was also found that in addition to working at this hospital, doctors also practice elsewhere, which can cause physical and mental fatigue due to working hours outside of Sariningsih Army Hospital IV Level 03.07.03, Bandung City. This research aligns with research conducted by Arasyandi & Bakhtiar (2016), which found that physical demand is the largest workload for PT DBM operators.

Temporal Demand (TD) of Healthcare Workers Using NASA TLX in the Emergency Room of Sariningsih Hospital Level IV, Bandung City

Based on the results of a study on the Temporal Demand (PD) of healthcare workers in the Emergency Room of Sariningsih Hospital Level IV, Bandung City, the majority of healthcare workers experienced high and very high TD, totaling 30. It was found that doctors experienced the highest temporal demand (9 doctors), nurses experienced the highest temporal demand (10 nurses), and midwives experienced an equal number of high and very high demands (3 midwives each). Of the total healthcare workers, nurses experienced the highest temporal demand (5 nurses). Temporal Demand (TD) is the amount of time-related pressure experienced during work activities. Healthcare workers in the ER are required to handle patients quickly, or to have a high response time. Doctors must quickly and accurately diagnose and provide temporary management instructions to nurses and midwives in emergency services in the Emergency Department (ED). This ensures prompt patient care and improves hospital quality. This is one of the indicators the ED must achieve and is used as a basis for hospital reports. Healthcare workers, in this case, always have deadlines for completing their work. If they fail to complete their work, they must work outside of working hours due to additional work that must be completed that same day. Research by Solaeman et al. (2022) states that healthcare workers must adapt quickly to their environment and are required to be more agile in-patient care (Solaeman et al., 2022).

Performance (P) of healthcare workers using NASA TLX in the ER of Sariningsih Hospital Level IV on 03.07.03, Bandung City

Based on the results of the study, nurse performance in the ER of Sariningsih Hospital Level IV was assessed. IV 03.07.03 Sariningsih, Bandung City, the majority of health workers experienced high and very high mental performance workloads, namely 35 people. It was found that those who experienced performance were the most in the high category of doctors, namely 10 doctors, the most in the very high category of nurses, namely 8 nurses, and the most in the high category of midwives, namely 5 midwives. Meanwhile, of the total health workers, the highest was found in nurses with a very high category, namely 8 nurses. Performance is the level of success of health workers in completing their duties. Health workers are required to always serve patients. Health workers must pay attention to the safety of patients and themselves, so concentration, caution and accuracy are required in carrying out their duties. Performance is the level of success of nurses in completing their duties. Employees are required to always serve patients. Hospital employees must pay attention to the safety of patients and themselves, so concentration is required (Zeho et al., 2023). The physical workload of nurses includes lifting patients, bathing patients, helping patients to the bathroom, pushing medical equipment, making patient beds, and pushing patient stretchers. The effects of excessive workload can cause a decline in nurses' work performance. The negative impact of an increased workload can lead to nurses' emotions not meeting patients' expectations (Irawati & Carollina, 2017). Furthermore, an excessive workload can lead to stress at work. Nurses feel burdened by the need to provide extra-strict and rapid nursing care to save patients' lives. Furthermore, nurses must routinely and continuously monitor and record the patient's condition before they are discharged, transferred to a ward, or even referred, which is a burden in itself. The burden felt by nurses ultimately causes continuous pressure and triggers stress at work (Mariana et al., 2021).

Frustration (FR) of Healthcare Workers Using NASA TLX in the Emergency Room of Sariningsih Hospital Level IV, Bandung City

Based on the results of a study on nurse frustration in the Emergency Room of Sariningsih Hospital Level IV, Bandung City, the majority of healthcare workers experienced high and very high frustration, totaling 26 people. Doctors were most frustrated in the high category (5 doctors), nurses were most frustrated in the very high category (9 nurses), and midwives were most frustrated in the moderately high category (3 midwives). Of the total healthcare workers, the highest frustration rate was found in nurses with a very high rating (9 nurses). Performing this work requires significant mental effort, coupled with a high workload. Healthcare workers often encounter uncontrollable situations during critical patient periods. Research by Hart & Staveland (1991) found that frustration ratings correlated significantly with overall workload ratings across all experimental categories. Stress ratings represent the manipulation that influences overall workload ratings and are the most independent scale. Under low stress conditions, people tend to relax. As stress increases, concentration on relevant aspects of a task becomes more disrupted. This is due to individual factors within the subject. These factors include motivation, fatigue, fear, skill level, temperature, noise, vibration, and comfort (Hancock and Meshkati, 1988).

Effort (EF) of healthcare workers using NASA TLX in the Emergency Room of Sariningsih Hospital Level IV, Bandung City

Based on the results of the study, the majority of healthcare workers in the Emergency Room of Sariningsih Hospital Level IV, Bandung City, experienced high and very high levels of effort (EF), with 30 individuals experiencing high levels of effort. The highest levels of effort were found among doctors (10 doctors), followed by nurses (9 nurses), and midwives, with an equal number in the moderate and high levels, each with 3 midwives. Meanwhile, the highest level of workload among healthcare workers was found in nurses, with a very high score of 5 nurses. Effort refers to the extent of mental and physical effort required to perform a job. Healthcare workers are required to serve and accept patients regardless of their condition. Healthcare workers are the first line of defense to assist patients in need.

Results of Mental Workload Analysis of Healthcare Workers Using the NASA TLX Total Score

Overall, the mental workload of healthcare workers in the Emergency Room of Sariningsih Hospital Level IV, Bandung City, is classified as moderate. This is due to the increasing number of patients each month and the unpredictable nature of the various types of patients experiencing emergencies in the ER. Furthermore, healthcare workers have jobs outside the ER and are responsible for responsibilities beyond ER patient care. However, the response time for emergency care in the ER is typically less than 5 minutes.

CONCLUSION

Based on the results of the research and discussion, it can be concluded as follows: 1) Mental Demand (MD) workload on health workers in the Emergency Room of Sariningsih Hospital Level IV, Bandung City with the results of 9 high doctors, 12 high nurses and 5 high midwives. 2) Physical Demand (PD) workload on health workers in the Emergency Room of Sariningsih Hospital Level IV, Bandung City with the results of 8 high doctors, 8 high nurses, and 5 very high midwives. 3) Temporal Demand (TD) workload on health workers in the Emergency Room of Sariningsih Hospital Level IV, Bandung City with the results of 9 high doctors, 10 high nurses, and 6 midwives, including 3 high and 3 very high. 4) Performance (P) workload on health workers in the Emergency Room of Sariningsih Hospital Level IV. IV

03.07.03 Sariningsih, Bandung City, with results of 10 doctors with high, 8 nurses with very high, and 5 midwives with high. 5) Frustration (FR) workload among healthcare workers in the Emergency Room of Level IV RST 03.07.03 Sariningsih, Bandung City, with results of 5 doctors with high, 9 nurses with very high, and 3 midwives with somewhat high. 6) Effort (EF) workload among healthcare workers in the Emergency Room of Level IV RST 03.07.03 Sariningsih, Bandung City, with results of 10 doctors with high, 9 nurses with high, and 6 midwives, including 3 moderate and 3 high. After weighting and scoring, the overall mental workload of healthcare workers in the Emergency Room of Level IV RST 03.07.03 Sariningsih, Bandung City is in the moderate category.

For Level IV RST. IV 03.07.03 Sariningsih Bandung City is expected to pay attention to working hours for health workers and reduce physical work demands based on the capabilities of each health worker, so that health workers do not experience excessive workloads so as not to cause stress responses caused by physical activities in addition to additional workers needed to reduce the workload of health workers. Create policies that can pay attention to achievements, so as to motivate the work of health workers, so that knowledge and skills are in accordance with competencies through education and training and create policies regarding shift schedules for health workers so that they can be controlled by hospital management so that there are no gaps in the creation of shift schedules for health workers.

REFERENCES

Arasyandi, M., & Bakhtiar, A. (2016). Analisa beban kerja mental dengan metode NASA TLX pada operator kargo di PT. Dharma Bandar Mandala (PT. DBM). *Industrial Enggineering Online Journal, 5*(4).

Azhari, T. R., & Suparno, A. (2024). Analisis beban kerja mental di Divisi OPJ pada perusahaan jasa Telekomunikasi dengan NASA-TLX. *Jurnal Penelitian Dan Aplikasi Sistem Dan Teknik Industri (PASTI), XVIII*(3), 329–343.

Cucu, Nuraeni, H., & Muryani, A. (2019). Analisis Beban Kerja Perawat di Ruang Rawat Inap Rumah Sakit Gigi Mulut Universitas Padjadjaran Tahun 2018. *Jurnal Sistem Kesehatan, 4*(4). https://doi.org/https://doi.org/10.24198/jsk.v4i4.22983

Diniaty, D. (2018). Analisis beban kerja mental operator lantai produksi pabrik kelapa sawit dengan metode NASA-TLX di PT. Bina Pratama Sakato Jaya, Dharmasraya. *Jurnal Teknik Industri: Jurnal Hasil Penelitian Dan Karya Ilmiah Dalam Bidang Teknik Industri, 4*(1). https://doi.org/http://dx.doi.org/10.24014/jti.v4i1.5880

Efendi, F., & Makhfudli. (2009). *Keperawatan Kesehatan Komunitas Teori dan Praktik dalam Keperawatan*. Salemba Medika.

Gulo, L. T., Pane, S. F., & Harani, N. H. (2020). *Alogaritma NASA-TLX untuk Analisis Beban Kerja*. Kreatif Industri Nusantara.

Hart, S. G., & Staveland, L. E. (1998). Development of NASA-TLX (Task Load Index): Results of Empirical and Theoretical Research. *Advances in Psychology, 52*, 139–183.

Haryanti, Aini, F., & Purwaningsih, P. (2013). Hubungan antara beban kerja dengan stres kerja perawat di Instalasi Gawat Darurat RSUD Kabupaten Semarang. *Jurnal Manajemen Keperawatan, 1*(1). https://jurnal.unimus.ac.id/index.php/JMK/article/view/949

Hoonakker, P., Carayon, P., Gurses, A. P., Brown, R., Khunlertkit, A., McGuire, K., & Walker, J. M. (2011). Measuring workload of ICU nurses with a questionnaire survey: the NASA Task Load Index (TLX). *IIE Transactions on Healthcare Systems Engineering, 1*(2), 131–143. https://doi.org/10.1080/19488300.2011.609524

Indiyaningsih, K. M. H., Murdyastuti, A., & Puspitaningtyas, Z. (2020). Efeect of human resource competency, work culture and utilization of information technology to performance of employees. *International Journal of Scientific and Technology Research, 9*(4), 3636–3641. https://doi.org/10.19184/issrd.v2i1.17468

Indra Nara Persada, Maiza, & Septa Diana Nabella. (2023). The Influence of Leadership, Motivation and Incentives on the Performance of Personnel of the Operations Section of Polda Kepri. *International Journal of Accounting, Management, Economics and Social Sciences (IJAMESC), 1*(4), 403–416. https://doi.org/10.61990/ijamesc.v1i4.38

Kasmir. (2019). *Manajemen Sumber Daya Manusia*. Rajawali Pers.

Krisdiana, H., Ayuningtyas, D., Iljas, J., & Juliati, E. (2022). Hubungan Beban Kerja Tenaga Kesehatan dengan Kelelahan Kerja di Puskesmas Kecamatan Sukmajaya Kota Depok Selama Pandemi. *Bikfokes, 2*(3), 136–147.

Mugisha, J. F., & Namaganda, G. (2014). Using The Workload Indicator Of Staffing Needs (WISN) Methodology To Assess Work Pressure Among The Nursing Staff Of Lacor Hospita. *Health Policy and Development, 6*(1), 1–15.

Munandar, A. S. (2001). *Psikologi industri dan organisasi*. UI Press.

Putri, U. L., & Handayani, N. U. (2017). Analisis beban kerja mental dengan metode NASA TLX pada departemen logistik PT ABC. *Industrial Enggineering Online Journal, 6*(2). https://ejournal3.undip.ac.id/index.php/ieoj/article/view/16483

Raziansyah, Pertiwi, M. R., Ifansyah, M. N., & Hasaini, A. (2021). *Manajemen Sumber Daya Manusia Rumah Sakit* (M. Nasrudin (ed.)). PT. Nasya Expanding Management.

Rizqiansyah, M. Z. A., Hanurawan, F., & Setiyowati, N. (2017). Hubungan antara beban kerja fisik dan beban kerja mental berbasis ergonomi terhadap tingkat kejenuhan kerja pada karyawan PT Jasa Marga (Persero) TBK Cabang Surabaya Gempol. *Jurnal Sains Psikologi, 6*(1), 37–42.

Saputra, R. T. (2016). *Hubungan Beban Kerja Perawat dengan Mutu Pelayanan Keperawatan di Rawat Inap Rumah Sakit Umum Daerah Sultan Syarif Mohamad Al-Kadrie Kota Pontianak*. Naskah Publikasi.

Setiyawan, A. E. (2020). Gambaran beban kerja perawat di ruang instalasi gawat darurat (IGD) RSUD Undata provinsi Sulawesi Tengah. *Preventif: Jurnal Kesehatan Masyarakat, 11*(1), 38–46.

Sugiyono. (2015). *Metode Penelitian Kuantitatif Kualitatif dan R&D*. Alfabeta.

Sugiyono, D. (2018). *Metode Penelitian Kuantitatif, Kualitatif, dan R & D*. Alfabeta.