Novelty Journals

ISSN 2394-7330

International Journal of Novel Research in Healthcare and Nursing
Vol. 6, Issue 3, pp: (596-606), Month: September - December 2019, Available at: www.noveltyjournals.com

Factors Affecting Compliance level Regarding Standard Precautions Measures among the Operating Room Nurses

[1]Marwa Ahmed Shaban, [2]Zeinab Hussein Ali, [3]Heba Abdel-Azeem Mostafa

[1]Demonstrator at Medical Surgical Nursing, Faculty of Nursing Fayoum University

[2]Professor of Medical Surgical Nursing, Faculty of Nursing Helwan University

[3]Assistant professor of Medical Surgical Nursing, Faculty of Nursing Fayoum University

Abstract: **Standard précautions have been introduced as means to protect health care workers from exposure to blood borne pathogens. Aim of the study: Was to determine the factors affecting compliance level regarding standard precautions measures among the operating room nurses. Research design: Descriptive design was utilized to meet the aim of the present study. Setting: This study was conducted in operating room unit at Fayoum University Hospital. Methodology: A purposive sample of all operating room nurses (no=40) who are working in operating room unit at Fayoum University Hospital was selected as a study sample. Tools: Two tools were used in data collection, included: self-administer interview questionnaire and observation checklist sheet. Results: The study revealed that operating room nurses' had satisfactory level of knowledge regarding standard précautions measures of infection control. Meanwhile had unsatisfactory level of practice for compliance standard precautions measures in operating room. As were many factors affecting on nurses 'compliance as; nurses' related factors and hospital' related factors. Conclusion: Major factors that negatively affect on compliance with standard precautions are shortage of nurses numbers and lack of equipment and supplies that needed for compliance standard precautions measures. Meanwhile, major factors that positively affect on compliance with standard precautions are that the operating room nurses' had satisfactory level of knowledge about standard precautions of infection control and cooperation between nursing staff members. Recommendations: Apply developed program in the study setting for operating room nurses regarding compliance standard precautions of infection control for continues updating their knowledge. The study should be replicated on large sample and different hospitals setting in order to generalize the results.**

Keywords: **Compliance, Standard Precautions, Operating Room Nurses.**

1. INTRODUCTION

Health care workers (HCWs) especially operating room personal are exposed to blood and other body fluids in the course of their work. The operating room is a healthcare setting where surgical procedures are performed, and it is controlled geographically, environmentally, and bacteriologically. Each member of the operating room staff plays a different and defined role during the surgery and thus experiences had different levels of risk for blood exposure. Studies showed that in the hospital setting, the highest proportion of percutaneous injuries occurred **(1).**

Risk of exposure to blood borne pathogens and toxic chemicals is a major concern among healthcare providers who work in the operating room. In response to these risks, they should be adhere to strict precautions against such exposures to protect themselves and the patients from the infection **(2).** However, recent studies have shown that compliance with these precautions in high-risk settings as operating theaters is less than optimal. The evidence confirms that compliance with specific aspects of standard precautions (SPs) varies, and practitioners are selective in their application of recommended practice, so that it is very important to know the level of compliance of the healthcare workers with these precautions **(3).**

Standard Precautions are the minimum infection prevention practices that apply to all patient care, regardless a suspected or confirmed infection status of the patient, in any setting where health care is delivered **(4).** These practices are effective means of providing protection, to both health care workers and to patients, but only when they are systematically and fully implemented **(5).**

Major reported factors that negatively affect on compliance level regarding standard precautions are lack of understanding and knowledge among healthcare workers about standard precautions **(6)**. Also shortage of time to implement the precautions measures ,work overload, limited resources, lack of proper training, uncomfortable equipment, skin irritation, forgetfulness, distance from the necessary facilities, and insufficient support from management in creating a facilitating work environment **(3)**. Not only those previously factor that affect on compliance with standard precautions but also sociodemographic variables such as age, sex, job category, marital status, working site in the hospital and work experience were found to be associated with compliance with standard precautions **(7).**

Significance of the Study:

The OR represents one of the highest risk environments in the hospital setting for occupational blood hazards **(8).** The Healthcare workers in the operating room are exposed to the risk of acquiring HBV and HCV infection through mucosal-cutaneous exposure (eyes or mouth mucosa or skin) to potentially infectious blood or blood products or through percutaneous exposure to contaminated sharp objects (needles, blades, *etc*.). Twenty-five percent of the total occupational exposure is mucosal-cutaneous and 75% percutaneous. The risk for HBV or HCV infection among the healthcare worker is higher in percutaneous than in mucosal-cutaneous exposure **(9)**.

2. AIM OF THE STUDY

The aim of the present study was to determine the factors affecting compliance level regarding standard precautions measures among the operating room nurses through the following objectives:

1-Assess operating room nurses level of knowledge regarding standard precautions.

2-Assess operating room nurses level of compliance regarding standard precautions.

3- Determine factors affecting compliance level regarding standard precautions measures among the operating room nurses.

3. RESEARCH QUESTIONS

To fulfill the aim of the present study the following research questions was formulated:

1-What is the operating room nurses level of knowledge regarding standard precautions?

2-What is the operating room nurses level of compliance regarding standard precautions?

3-What are the factors affecting compliance level regarding standard precautions measures among the operating room nurses?

Design:

Descriptive research design was utilized to meet the aim of the present study.

Setting:

The present study was conducted at the operating room unit at Fayoum University Hospital.

Subjects:

A purposive sample of nurses (no=40) who are working in operating room unit at Fayoum University Hospital and accept to be in the study**.**

Data collection tools:

Two tools were used to collect the data according to the following:

Tool I: **Self-administered interview questionnaire:**

This tool was designed and written in simple Arabic language by the investigator after reviewing relevant literature, **(10), (11)** and agreed upon by a panel of medical surgical experts to assess nurses knowledge. It was divided into four major parts:

Part (1): To assess demographic characteristics of the operating room nurses such as age, gender, educational qualifications, years of experience in the OR, training courses regarding standard precautions of infection control and numbers of this courses.

Part (2): To assess nurses' level of knowledge regarding the infection that consist of 16 questions divided into:- 6 items true and false questions, 8 items multiple choice questions (MCQ) and 2 items complete questions.

Part (3): To assess nurses' level of knowledge regarding standard precautions of infection control in operating room it includes:- 21 questions: 7 items true and false questions and 14 items of structured questions about global precautions for infection control in the operating theater answered by checking yes or no.

Part (4): To determine the factors affecting on compliance level regarding standard precautions measures among operating room nurses that divided into: Nurses related factors and hospital related factors (32 items).

Tool II: Observation checklist sheet:

This checklist adopted by the investigator from **(5)** to assess nurses practice regarding standard precautions . It included a list of compliance with eight standard precautions practices, with yes/no answers to determine whether the practice was performed correctly or not. Practices were observed and recorded by the investigator.

Operational Design:

The operational design for this study includes preparatory phase, content validity of the modified tool and reliability, pilot study and fieldwork.

validity:

Content validity was conducted to determine whether or not the instrument measures what it is designed to measure. The tools were revised and ascertained by a jury of 5 expertise staff in medical surgical nursing specialty, from Faculty of Nursing Helwan University, Fayoum University and Cairo University to review the tools for clarity, relevance, comprehensiveness, understanding and applicability. Modification of the tools were done according to the panel judgment on clarity of the sentence, appropriateness of content, sequence of items and accuracy of scoring and recording of the items.

reliability:

Reliability of the tool was tested to determine the consistency of the measurement instrument. The degree to which an instrument measures the same way each time it used under the same condition with the same subjects. The Cronbach's alpha model, which is a model of internal consistency, was used to test tool reliability. The reliability was scaled as follows: <0-0.25 weak reliability, 0.25-0.75 moderate reliability, 0.75-<1strong reliability and 1 is optimum. The reliability for this tools were 0.812.

Pilot study:

A pilot study was applied on 10% (4) of operating room nurses to assess the ability of the tools to achieve the stated study objectives and to determine to applicability of the study, test feasibility of the study tools and to determine possible problems in the methodological approach or instrument. The pilot study used to test the proposed statistical and data analysis methods. Nurses involved in the pilot study were replaced by another nurses.

Administrative Design:

To carry out the study, the necessary approval was obtained from the hospital director and nursing director of Fayoum University Hospital, in which the study was conducted. A letter was issued to them from the Faculty of Nursing, Helwan University explains the aim of study for obtaining the permission for data collection and cooperation.

Ethical consideration:

An approval was obtained from a scientific research ethics committee of the faculty of nursing at Helwan University and oral informed consent was obtained from the study subjects individually before starting the study. The aim and objectives of the study was clarified to the nurses included in the study by the investigator. Participants were assured that anonymity and confidentiality would guarantee. Nurses were informed that they are allowed to choose to participate or withdraw from the study at any time. Ethics, culture, values were respected**.**

Field work:

Data were collected in the following sequence:

- An approval was obtained from a scientific ethical committee of the faculty of Nursing at Helwan University.
- An official permission was obtained from the director of Fayoum University Hospital in which the study was conducted after explanation of the purpose of the study.
- An oral permission was obtained from the nurses included in the study after explaining the aim of the study.
- Sampling was started and completed within five months from August (2018) to the end of December (2018).
- Initial assessment was done by the investigator for all study subjects to explain the aim of the study and take their approval to participate in the study prior to any data collection.
- They were reassured that the information collected would be treated confidentially and would be used only for the purpose of research. Only code numbers were used to mark sheets and no names appeared on them.

Actual Field work

The investigator visited the selected setting regularly three days/week and collecting the data, through meeting the subjects after explaining the purpose of the study. The data was collected in two phases as the following:

I- First phase: Self-administered interview questionnaire: This questionnaire was used to assess the nurses level of knowledge regarding to the infection, infection control in the operating room and factors affecting on the level of compliance with the standard precautions of infection control in operating room. During this phase each nurse was assessed individually and data collection was filled by the nurses in the morning or afternoon shift, at the end of surgical procedures. It took around within 15-20 minutes for each nurse.

2-Second phase: Observation checklist sheet: This checklist was used to assess the nurses practice regarding standard precautions. During this phase the investigator observe nurses compliance of eight standard precautions practices as the following: headgear (2 items), surgical mask (5 items), goggles (2 items), OR boots (3 items), surgical hand washing (15 items), surgical gown (7 items), surgical gloves (10 items) and handling sharp instruments (6 items). The observation took sometimes the whole shift or more than one shift to assess the nurses practices regarding to compliance the standard precautions measures of infection control in operating room. This observation started from the beginning of putting on the headgear, then all the followed standards till the end of the surgical procedure without interrupting the sterility of the surgical field and with good visualization of the nurses practice. Practices were recorded by the investigator with using the direct observation checklist sheet.

Statistical Analysis:

Data were collected and coded to facilitate data manipulation and double entered into Microsoft Access and data analysis was performed using Statistical Package of Social Science **(SPSS)** software version 20 in windows 7.

Simple descriptive analysis in the form of numbers and percentages for qualitative data, and arithmetic means as central tendency measurement, standard deviations as measure of dispersion for quantitative parametric data, chi-square and linear correlation coefficient were utilized to analyze data pertinent to the study.

Chi-square: The hypothesis that the row and column variables are independent, without indicating strength or direction of the relationship. Pearson chi-square and likelihood-ratio chi-square. Fisher's exact test and Yates' corrected chi-square are computed for 2x2 tables.

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Linear Correlation coefficient: Was used for detection of correlation between two quantitative variables in one group.

>0.05 Non significant

*<0.05 * significant*

*<0.001 ** High significant*

The **P-value≤ 0.05** was considered the cut-off value for significance.

4. RESULTS

Table (1): Demographic characteristics of the nurses in the study (n=40).

Items	No	%
Gender		
Male	6	15.0
Female	34	85.0
Age (years)		
<30	31	77.5
30- <40	9	22.5
Mean±SD	27.52±4.12	
Educational qualifications		
Bachelor of Nursing	7	17.5
Nursing Technical Institute	27	67.5
Nursing Diploma	6	15.0
Training courses about standard precautions of infection control		
Yes	25	62.5
No	15	37.5
Number of attended training courses		
1	7	28
2	11	44
3	7	28
Mean±SD	4.43±1.14	

Table (1) shows that, the demographic characteristics of the study nurses were, 85% of them were females, 77.5% of them were aged less than 30 years and 67.5% of them had nursing technical institute. As well as 62.5% of them attended a training courses about standard precautions of infection control.

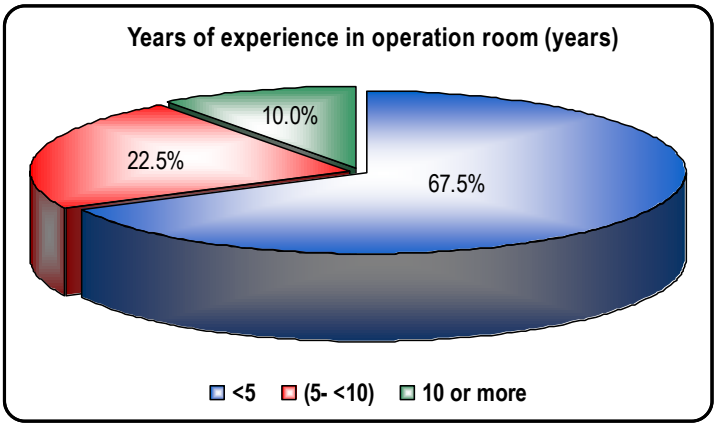

Figure (1) shows nurses years of experience in operating room (n=40) .

Figure (1) shows that, 67.5% of the study nurses had less than 5 years of experience in operating room. As well as 10 % of them had 10 years of experience in operating room.

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Table (2): Distribution of total level of Knowledge regarding to infection control among operating room nurses (n=40).

Items	Satisfactory		Unsatisfactory		Chi-square	
	N	%	N	%	X^2	P-value
Knowledge about infection	32	80	8	20	28.800	<0.001**
knowledge about infection control in the operating room	29	72.5	11	27.5	16.200	<0.001**
Total knowledge	30	75	10	25	20.000	<0.001**

Table (2): This table revealed that , Total knowledge 75%,The nurses had satisfactory level of knowledge regarding to the infection and infection control in operating room.

Table (3): Percentage distribution of total factors affecting on compliance with the standard precautions among the OR nurses (n=40).

Items	Yes		No		Chi-square	
	N	%	N	%	X^2	P-value
Nurses related factors	26	65	14	35	20.741	<0.001**
Hospital related factors	28	70	12	30	18.462	<0.001**
Total Factors	27	67.50	13	32.50	19.623	<0.001**

Table (3):This table shows that, 65% of the studied nurses agree that total nurses related factors affect on the compliance level with the standard precautions and 70% of the studied nurses agree that total hospital related factors. While 67.5% of the studied nurses agree that nurses related factors and hospital related factors are affect on the compliance level with the standard precautions measures in operating room.

Table (4): Percentage distribution of total level of practice regarding compliance standard precautions among OR nurses (n=40).

Nurses' practices regarding Standard Precautions	Satisfactory		Unsatisfactory	
	N	%	N	%
1-OR Boots	0	0.00	40	100.00
2-Surgical Hand Washing	26	65.00	14	35.00
3-Headgear	35	87.50	5	12.50
4-Surgical Mask	32	80.00	8	20.00
5-Goggles	0	0.00	40	100.00
6-Surgical Gown	34	85	6	15
7-Surgical Gloves	35	87.5	5	12.5
8-Handling Sharp Instruments	26	65.00	14	35.00
Total practice	22	55.00	18	45.00

Table (4): This table shows that, Total practice 55%, The nurses had unsatisfactory level of practice regarding to compliance standard precautions measures in operating room.

Table (5): Correlation between total factors affecting, total practice and total knowledge

Items	Total practice		Total knowledge	
	r	P-value	R	P-value
Total knowledge	0.845	<0.001**		
Total Factors	0.634	<0.001**	0.522	<0.001**

Table (5): The table shows highly statistically significant correlation between total factors affecting, total practice and total knowledge when p-value was <0.001**.

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ISSN 2394-7330

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Table (6): Correlation between total knowledge and level of practice

Items of practice	Total knowledge	
	R	P-value
1-OR Boots	0.549	<0.001*
2-Surgical Hand Washing	0.267	0.026*
3-Headgear	0.375	<0.001*
4-Surgical Mask	0.110	0.365
5-Goggles	0.265	0.027*
6-Surgical Gown	0.378	<0.001*
7-Surgical Gloves	0.443	<0.001*
8-Handling Sharp Instruments	0.490	<0.001*

Table (6): The table shows highly statistically significant correlation between total knowledge and level of practice when p-value was <0.001**.

Table (7): Relation between total knowledge and nurses' demographic characteristics

Items	Total knowledge						
	Satisfactory		Unsatisfactory		Total	Chi-square	
	N	%	N	%		X^2	P-value
Gender							
Male	4	66.7	2	33.3	6	0.261	0.609
Female	26	76.5	8	23.5	34		
Age							
< 20- <30 years	21	67.7	10	32.3	31	3.871	0.049*
30- <40 years	9	100.0	0	0.0	9		
Educational qualification							
Bachelor of Nursing	7	100.0	0	0.0	7	3.556	0.169
Nursing technical Institute	18	66.7	9	33.3	27		
Nursing Diploma	5	83.3	1	16.7	6		
Years of experience in operating room							
<Year to less than 5 years	17	63.0	10	37.0	27	6.420	0.040*
5 years to less than 10 years	9	100.0	0	0.0	9		
10years to > 10 years	4	100.0	0	0.0	4		
Training courses about standard precautions of infection control							
Yes	24	96.0	1	4.0	25	22.857	<0.001**
No	6	40.0	9	60.0	15		
number of attended training courses							
1	7	100.0	0	0.0	7	1.326	0.515
2	10	90.9	1	9.1	11		
3	7	100.0	0	0.0	7		

Table (7): The table shows statistically significant relation between total knowledge and nurses' age, Years of experience in operating room and training courses about standard precautions for infection control when p-value was <0.05*

Table (8): Correlation between total practice and total knowledge with age and years of experience in operating room.

Items	Total practice		Total knowledge	
	R	P-value	r	P-value
Age (years)	0.485	<0.001**	0.708	<0.001**
Years of experience in operating room	0.258	0.018*	0.819	<0.001**

Table (8): The table shows highly statistically significant correlation between total practice and total knowledge with age and years of experience in operating room when p-value was <0.001**.

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ISSN 2394-7330

International Journal of Novel Research in Healthcare and Nursing
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Table (9): Correlation between total practice and total knowledge with age and years of experience in operating room

Items	Total practice		Total knowledge	
	R	P-value	r	P-value
Age (years)	0.485	<0.001**	0.708	<0.001**
Years of experience in operating room	0.258	0.018*	0.819	<0.001**

Table (10): The table shows highly statistically significant correlation between total practice and total knowledge with age and years of experience in operating room when p-value was <0.001**.

5. DISCUSSION

Part I: Demographic characteristics of the nurses' under the study

In the present study, findings regarding to the nurse's demographic characteristics revealed that, more than two third of the nurses' ages were less than 30 years old. As regard to the educational qualification, more than half of nurses' were nursing technical institute and less than 5 years of experience in operating room, while the minority of nurses had bachelor degree in nursing. More than two third of nurses under study were females. Study results revealed that, more than half of nurses attended a training courses about standard precautions of infection control.

As were, more than half of nurses' their age were less than 30 years old, which might explain that they are young and tolerate the nature of OR atmosphere of work. This result agreement with **(12)** who conducted "Developing educational program for Nurses' Related to Infection Control of Invasive Procedures in Neonatal Units at EL-Minia University and General Hospitals"**,** reported that the majority of the studied sample were in age group from 20 to less than 30 years old. This finding also agreement with **(13)** who conducted "Are standard precautions for hospital-acquired infection among nurses in public sector satisfactory? "**,** revealed that around two-thirds of the nurses were aged 20–30 years group.

In relation to attending infection control courses, the finding of the current study revealed that more than half of nurses attended a training courses about standard precautions of infection control. This may be related to their work load, it is important for all nurses attend a training courses about standard precautions of infection control . This finding also contradict with **(13)** who revealed that the majority of the nurses were received an infection control training courses. This finding agreed with **(14)** who conducted "Impact of a Blood Borne Diseases Prevention Program on Compliance with Infection Control Standard Precaution Practices among Nurse in Family Health Centers"**,** revealed that around half of the study sample had attended Infection Control courses.

Part 2: Nurses' knowledge regarding to the infection

The finding of the current study revealed that two third of nurses under study had satisfactory level of knowledge about the infection. This agreement with**,(15)** who conducted "Impact of a designed infection control training program on nurses' knowledge and practices at Intensive Care Units "**,** mention that the majority of the studied nurses had good level of knowledge regarding infection. This finding disagreed with **, (16)** who found that the minority of the studied nurses had knowledge about infection.**(10)** who conducted "Impact of training education program on improving of nurses performance regarding infection control in endoscopy unit "**,** reported that Knowledge is considered the back bone of the prevention of infection. So that, operating room nurses need for continuous update their knowledge.

Part 3: Nurses' knowledge regarding to the standard precautions of infection control in operating room

The finding of the current study revealed that more than two third of nurses under study had satisfactory level of knowledge regarding standard infection control precautions in operating room. This finding agreement with **(17)** who conducted "Knowledge of infection control practices among intensive care nurses in a tertiary care hospital "**,** revealed that the majority of nurses had knowledge about infection control precautions.

This finding, disagreement with **(18)** who conducted "Improving knowledge and compliance with infection control Standard Precautions among undergraduate nursing students in Jordan, "**,** reported that the majority of nurses had low level of knowledge about standard precautions. Were **(13)** revealed that approximately half of the participants had good level of knowledge about standard precautions.

Part 4: Factors affecting nurses' compliance regarding to standard precautions measures in operating room

The study finding revealed that, there are different factors that affect on nurses compliance with standard precautions measures as nurses related factors and hospital related factors. Major factor that negatively affect on compliance with standard precautions are shortage of nurses numbers and lack of equipment and supplies that needed for compliance standard precautions measures. While, major factor that positively affect on compliance with standard precautions are that the operating room nurses' had satisfactory level of knowledge regarding standard precautions of infection control, and there are cooperation between nursing staff members during their work.

This finding contradict with **(13)** Who revealed that the majority of the nurses had vaccinated against hepatitis B. This finding goes in the same line with **(15)** who found that the majority of nurses had not immunization against viral hepatitis .and congruent with **(19)** who conducted " Infection control"**,** reported that , the nurses should get vaccinated to prevent potential of HBV.

Part 5: Nurses' practice regarding to compliance Standard Precaution measures in operating Room

Standard precautions serves as the corner stone of occupational blood exposure prevention in all health care setting, including the OR. It is clearly evident from the results of this study that the OR nurses had unsatisfactory level of practice regarding to compliance standard precautions measures in operating room. The lest level of practice was observed with surgical hand washing and handling sharp instruments and zero with eye goggles and OR boots. The highest level of practice was observed with use of headgear and surgical gloves.

These finding, disagreement with **(13)** who reported that the majority of nurses had good levels of compliance with Standard Precaution practices. These finding, in agreement with **(5)** who stated that, the most of studied nurses had low level of compliance with the SPs practices in operating room. These finding, agreement with **(18)** who reported that the majority of nurses had low levels of compliance with standard precaution practices. These finding, in agreement with **(20)** who revealed that only half of nurses demonstrate good levels of compliance with Standard Precaution practices.

Part 6: Relations between different study variables.

The study findings shows highly statistically significant relation between total factors influencing, total practice and total knowledge when p-value was <0.001**. These finding, in disagreement with **(15)** revealed that were no significant relation between nurses knowledge about infection control measures and practice of nurses. As well as these finding, in agreement with **(21)** who conducted "Evaluation of an Isolation Program of Hepatitis C Virus Infected Hemodialysis Patients in Some Hemodialysis Centers in Egypt "**,** show that statistically significant relation between total factors influencing, total practice and total knowledge.

6. CONCLUSION

The results of the present study revealed that, the operating room nurses' had satisfactory level of knowledge regarding standard precautions of infection control. Meanwhile had unsatisfactory level of practice for compliance standard precautions measures in operating room, there were many factors affecting on nurses 'compliance as; nurses' related factors and hospital' related factors.

Recommendations: Apply developed program in the study setting for operating room nurses regarding compliance standard precautions of infection control for continues updating their knowledge.

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