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# Performance of Healthcare workers regarding Infection Control Precautions in Primary Health Care Centers

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## Abstract

Background: Standard precautions are designed to protect healthcare staff from risks resulting from exposure to blood and body fluids and to protect patients from potential cross-infection. Knowledge of clinical infection control practices is continually growing and changing. The study aimed to assess healthcare workers' performance regarding infection control precautions in primary healthcare centers. Research design: a descriptive-analytical design was used. Subjects: a simple random sample of a total of 379 healthcare workers was recruited from January to March 2022, at selected primary healthcare centers, in Jeddah, KSA according to a large number of healthcare workers. Tools of data collection: three tools were used to collect data: a structured self-administered healthcare workers' questionnaire, an observational checklist, and an environmental assessment checklist. Results: The results revealed that 44.6% of the studied participants had an average level of total knowledge, whereas 58.6% of them had incompetent practice regarding infection control precautions. Moreover, there was a highly statistically significant positive linear correlation between total healthcare workers' knowledge about infection control precautions in primary healthcare centers and their practice at ($r = 0.317$, and $p = 0.000$). In conclusion, Based on the findings of this study, it can be concluded that more than one-third of healthcare workers in the current study had average overall knowledge scores, while

more than one-half of them had incompetent practice regarding infection control precautions. A highly statistically significant positive linear correlation between total healthcare workers' knowledge about infection control precautions in primary healthcare centers and their practice was pointed up. Recommendations: A mandatory regular base educational program must be planned to overcome the weak level of knowledge and update the practice regarding infection control standard precautions.

**Keywords***: Infection Control; Performance; Precautions; Primary Health Care Centers.*

## Introduction

Primary Health Care is essential health care made universally accessible to individuals and families in the community by means acceptable to them, through their full participation, and at a cost that the community and country can afford. It forms an integral part of the country's health system of which it is the nucleus and of the overall social and economic development of the community (1). Infections have a serious impact on the quality of patient healthcare outcomes, and increased morbidity, leading to unnecessary deaths and additional costs (2).

The advent of COVID-19 has brought the role of infection prevention strategies into focus. The primary means of preventing Health Associated Infections (HAI) is seen as the implementation of practices that minimize the risk of transmission of infectious agents. The best practices in the prevention of (HAI) with surveillance; the use of transmission-based precautions; access to personal protective Equipment (PPE); sterilization and cleaning of reusable equipment; environmental cleanliness; and antimicrobial stewardship (3).

The universal precaution practice applies the basic principles of infection control through hand washing, utilization of appropriate protective barriers such as gloves, masks, gowns, and eyewear, safe handling and disposal of sharps, safe handling and disposal of linen, disposal of waste, and disinfection (4). According to the Centers for Disease Control and Prevention, standard precautions were defined as "the minimum infection prevention measures that should be applied to all patient care" regardless of their suspicion or confirmation of the infection status of the patients, which are used in any setting where health care is delivered (5). These precautions should be applied in any setting where healthcare services are delivered and always assume that patients' blood, body fluids, secretions, and excrements have infectivity potential (6).

The professional practice of infection prevention and control has long been a responsibility of healthcare facilities, although typically considered patient protection. Infection prevention and control aims to prevent health-care facility–acquired infections, whether transmitted through inhalation or contact with body fluids or tissue (7). Healthcare providers (HCPs) are primarily responsible for implementing daily patient care activities in healthcare facilities and other health institutions that involve more contact with patients than other healthcare workers (HCWs). Consequently, HCPs are more exposed to various infections and play a vital role in transmitting them (2).

HCPs have a critical role in restricting the spread of organisms in two ways: first, as health professionals who spend the most time with patients, nurses have a significant possibility to disseminate organisms. Before and after patient contact, as well as after performing a potentially infectious action, nurses must cleanse their hands. The second method nurses reduce hand-to-hand dissemination is by working as patient promoters with a large number of social insurance experts (8).

Healthcare-acquired infections are a worldwide problem. Infection acquired during health care delivery is estimated between 5% and 10% in developed countries on the other hand, in

developing countries the risk of infection is 2 to 20 times higher and the proportion of patients infected can exceed 25% as declared by World Health Organization (9). So, this study aimed to assess healthcare workers' performance regarding infection control precautions in primary healthcare centers.

## Methods:

A descriptive analytical design was used to conduct this study. This study was conducted at selected primary healthcare centers, in Jeddah, KSA according to a large number of healthcare workers. In a Multistage simple random sample, the estimated sample size was 379 nurses working at the previously mentioned setting, at a confidence level of 95% by using the Steven Thompson equation, Since the total number of nurses was 3000 nurses (10).

Tools of the study:

Tool I: A structured self-administrated HCPs' questionnaire:

Part 1: Demographic characteristics of HCPs such as age, gender, marital status, level of education, experiences, workplace, residence, and training for the infection control program. Part 2: HCPs' knowledge of infection control precautions in primary health care centers. It was modified by the researcher after reviewing the literature based on Kandeel, (2016) (11). The questionnaire consisted of 41 closed-ended questions in the form of "Yes or No".

The total questionnaire (41 questions) is divided into three parts: Hand hygiene (11 questions), Personal protection tools and respiratory precautions (7 questions), Safe injection and vaccinations against virus B (10 questions), Cleaning, disinfection & sterilization (7 questions) and Health care waste management and textile reprocessing (6 questions). A scoring system was followed to assess HCPs' knowledge of infection control precautions in primary health care centers. The Questionnaire contained 41 questions, the total scores of the questionnaire were 41 grades, the right answer was scored as a single point and the wrong answer was scored as a zero point. These scores were summed and were converted into a percent score. It was classified into 2 categories: Good knowledge if score > 75%, Average knowledge if score from 60-75%, and Poor knowledge if score < 60%.

Tool II: Observational checklist:

It was adapted by the researcher after reviewing the literature based on Harder, (2014) (12) in English and it was revised by supervisors. This checklist was used to assess the HCPs' performance toward infection control precautions in primary health care centers. A scoring system was the total checklist contained 59 steps divided as Hand washing technique (18 steps), Personal protective equipment and Respiratory precautions (5 steps), Cleaning, disinfection, and sterilization (17 steps), Safe injection and precautions for handling of medicines (12 steps) Safe disposal of waste and Dealing with textiles (7 steps). Each checklist was assigned a score according to sub-items. The total score of HCPs' practices was 59 grades, each item was evaluated as "done" was taken one score, and "not done" was taken zero score. These scores were summed up and were converted into a percentage score. It was classified into 2 categories: Competent if score ≥ 75%, and Incompetent if score < 75%.

Tool III: Environmental assessment checklist:

It was modified by the researcher after reviewing the recent literature based on the Centers for Disease Control and Prevention, (2014) (13) to assess the environmental infrastructure in the previously mentioned setting. Scoring system: The environment assessment contained 43 statements; the total score was 43 grades. Each statement was scored as "Yes" was taken as one score and "No" was taken as a zero score. The scores of the items were summed up and converted into a percentage score. It was classified into 3 categories: Good if score ≥ 75%, Average if score 60% - 75%, and Poor if score < 60%.

Study tools were validated by a jury group consisting of seven experts in the infection control field. The jury group reviewed the tools to judge its clarity, comprehensiveness, and

accuracy. Internal consistency was done by Cronbach Alpha coefficient test was (0.89) for the first tool, (0.85) for the second tool, and (91.0) for the third tool.

A pilot study was carried out on 10% of HCPs to test the applicability and clarity of the constructed tools. The pilot also served to estimate the time needed for each subject to fill in the questions. According to the results of the pilot, some corrections and omissions of items were performed so the pilot nurses were not included in the main study sample. Approval was obtained from the directors of the previously mentioned setting. A letter was issued to them from the University, explaining the aim of the study to obtain their permission and cooperation.

The researcher first met with the HCPs at the previously mentioned settings and explained the purpose of the study after introducing herself. The questionnaire for knowledge was filled out by HCPs which took 15-20 minutes, while the checklist for assessing HCPs' practice regarding infection control precautions was filled by the researchers in 50-60 minutes during daily routine care. The research approval was obtained from the Faculty Ethical Committee before starting the study. The ethical research considerations include the following: The researcher clarified the objectives and aim of the study to HCPs included in the study before starting.

Approval was obtained from the HCPs before inclusion in the study; a clear and simple explanation was given according to their level of understanding. They ensured that all the gathered data was confidential and used for research purposes only. The researcher was assuring maintaining anonymity and confidentiality of subjects' data included in the study. The subjects were informed that they were allowed to choose to participate or not in the study and they had the right to withdraw from the study at any time.

Data collected from the studied sample was revised, coded, and entered using a Personal Computer (PC). Computerized data entry and Statistical analysis were fulfilled using the Statistical Package for Social Sciences (SPSS) version 28. Data were presented using descriptive statistics in the form of frequencies, and percentages. The chi-square test (X2) was used for comparisons between qualitative variables. Spearman correlation measures the strength and direction of association between three ranked variables. Significance of the results: Highly significant at p-value <0.01, Statistically significant was considered at p-value <0.05, and Non-significant at p-value>0.05.

## Results:

Table (1): reveals that 41.2% of the studied participants' ages ranged from 30< to 40 years. Related to gender, 85.8% of the studied participants were females. Regarding the educational level of the studied participants, it was found that 55.7% of them had a Technical Institute of Nursing. Moreover, 50.4% of the studied participants their years of experience ≥ 10 years. Also, 63.6% of the HCPs under study were not attending training courses related to infection control.

Figure (1): shows that 44.6% of the studied participants had an average level of total knowledge about infection control precautions in primary health care centers. Also, 26.4% of them had a good level of total knowledge. While 29% of them had a poor level of total knowledge.

Table (2): demonstrates that 62.5% of the studied participants were competent related to the hand washing technique. While 59.1% of them were incompetent related to the use of Alcohol-Based Hand rub and personal protective equipment also 55.7% of them were incompetent related to respiratory precautions respectively. Also, 54.9% of them were incompetent related to cleaning, disinfection, and sterilization and 76.3% of them were incompetent related to the disinfection of thermometers respectively.

Moreover, 73.6% of the studied participants were incompetent related to cleaning the bloody spillage and safe injection and

precautions for handling medicines respectively. 70.4% of the studied participants were incompetent related to Safe injection and precautions for handling of medicines. While 58.3% of the studied nurses were safe disposal of waste and Dealing with textiles respectively.

Table (3): illustrates that 58.6% of the studied participants had incompetent practice regarding infection control precautions in primary health centers. While 41.4% of them had competent practice.

Table (4): demonstrates that there was a highly statistically significant relation between the total knowledge of the studied participants about infection control precautions in primary health care centers and their demographic data such as educational level, years of experience, and attending training courses related to infection control at (P= < 0.01). Also, there were statistically significant relations with their age and workplace at (P= < 0.05). While there was no significant relation between their gender and place of residence (P= >0.05).

Table (5): shows that there was a highly statistically significant relation between the total practice of the studied participants about infection control precautions in primary health care centers and their demographic data such as educational level and attending training courses related to infection control at (P= < 0.01). Also, there were statistically significant relations with their age and years of experience (P= < 0.05). While, there was no significant relation with their gender, place of residence and workplace at (P= >0.05).

Table (6): showed that there was a highly significant positive correlation between total HCPs' knowledge about infection control precautions in primary health care centers and their practice.

Table (1): Distribution of the studied participants according to their demographic characteristics

| **Items** | | **N** | **%** |
|---|---|---|---|
| **Age (year)** | | | |
| 20-<30 | | 102 | 26.9 |
| 30-<40 | | 156 | 41.2 |
| ≥ 40 | | 121 | 31.9 |
| **Mean SD** | **38.94 ± 6.32** | | |
| **Gender** | | | |
| Female | | 325 | 85.8 |
| Male | | 54 | 14.2 |
| **Educational level** | | | |
| Nursing school | | 118 | 31.1 |
| Technical Institute of Nursing | | 211 | 55.7 |
| Bachelor of Nursing | | 38 | 10 |
| Postgraduate | | 12 | 3.2 |
| **Years of Experience** | | | |
| <5 | | 88 | 23.2 |
| 5-<10 | | 100 | 26.4 |
| ≥ 10 | | 191 | 50.4 |
| **Mean SD** | **17.69 ± 1.75** | | |
| **Training for infection control program** | | | |
| Yes | | 138 | 36.4 |
| No | | 241 | 63.6 |

Figure (1): Distribution of the studied participants according to their total knowledge about infection control precautions in primary health care centers.

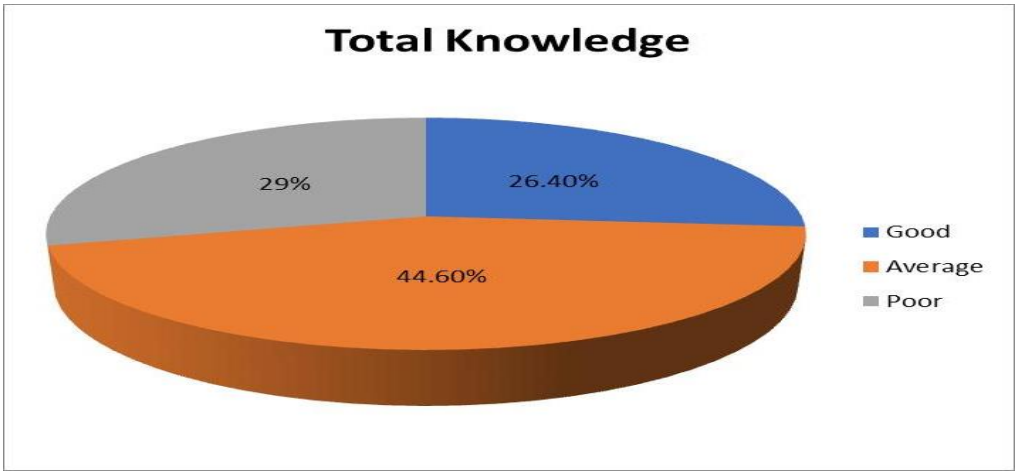


Table (2): Distribution of the studied participants according to their total practice related to infection control precautions in primary health centers.

| Items | Competent | | Incompetent | |
|---|---|---|---|---|
| | N | % | N | % |
| Hand washing technique | 237 | 62.5 | 142 | 37.5 |
| Using Alcohol-Based Hand rub | 155 | 40.9 | 224 | 59.1 |
| Personal protective equipment and respiratory precautions | 168 | 44.3 | 211 | 55.7 |
| Cleaning, disinfection and sterilization | 172 | 45.4 | 207 | 54.9 |
| Disinfection of thermometer | 90 | 23.7 | 289 | 76.3 |
| Bloody spillage | 100 | 26.4 | 279 | 73.6 |
| Safe injection and precautions for handling medicines | 112 | 29.6 | 267 | 70.4 |
| Safe disposal of waste and Dealing with textiles | 221 | 58.3 | 158 | 41.7 |

Table (3): Distribution of the studied participants according to their total practice regarding infection control precautions in primary health centers

| Total practice | N | % |
|---|---|---|
| Competent | 157 | 41.4 |
| Incompetent | 222 | 58.6 |

Table (4): Relation between demographic characteristics of the studied participants and their total knowledge about infection control precautions

| Items | | Total knowledge | | | | | | X2 | P-Value |
|---|---|---|---|---|---|---|---|---|---|
| | | Good (n=100) | | Average (n=169) | | Poor (n=110) | | | |
| | | N | % | N | % | N | % | | |
| **Age (year)** | 20-<30 | 60 | 60 | 30 | 17.8 | 12 | 10.9 | 13.69 | **0.01*** |
| | 30-<40 | 22 | 22 | 84 | 49.7 | 50 | 45.5 | | |
| | ≥ 40 | 8 | 8 | 55 | 32.5 | 48 | 43.6 | | |
| **Gender** | Female | 82 | 82 | 155 | 91.7 | 88 | 80 | 6.693 | 0.138 |
| | Male | 18 | 18 | 14 | 8.3 | 22 | 20 | | |

| Items | | Total knowledge | | | | | | X2 | P-Value |
|---|---|---|---|---|---|---|---|---|---|
| | | Good (n=100) | | Average (n=169) | | Poor (n=110) | | | |
| | | N | % | N | % | N | % | | |
| **Educational level** | Nursing school | 6 | 6 | 26 | 15.4 | 86 | 78.2 | 25.07 | **.000**** |
| | Technical Institute of Nursing | 46 | 46 | 141 | 83.4 | 24 | 21.8 | | |
| | Bachelor of Nursing | 36 | 36 | 2 | 1.2 | 0 | 0.0 | | |
| | Postgraduate | 12 | 12 | 0 | 0.0 | 0 | 0.0 | | |
| **Years of Experience** | <5 | 8 | 8 | 44 | 26.1 | 36 | 32.7 | 22.28 | **.003**** |
| | 5-<10 | 74 | 74 | 70 | 41.4 | 26 | 23.7 | | |
| | ≥ 10 | 18 | 18 | 55 | 32.5 | 48 | 43.6 | | |
| **Training courses related to infection control** | Yes | 92 | 92 | 44 | 26.1 | 2 | 1.8 | 26.94 | **.000**** |
| | No | 8 | 8 | 125 | 73.9 | 108 | 98.2 | | |

Table (5): Relation between demographic characteristics of the studied participants and their total practice regarding infection control precautions in primary health care centers

| Items | | Total practice | | | | X2 | P-Value |
|---|---|---|---|---|---|---|---|
| | | Competent (n=157) | | Incompetent (n=222) | | | |
| | | N | % | N | % | | |
| **Age (year)** | 20-<30 | 82 | 52.2 | 20 | 9 | 13.69 | **0.01*** |
| | 30-<40 | 65 | 41.4 | 91 | 41 | | |
| | ≥ 40 | 10 | 6.4 | 111 | 50 | | |
| **Gender** | Female | 133 | 84.7 | 192 | 86.5 | 5.854 | 0.201 |
| | Male | 24 | 15.3 | 30 | 13.5 | | |
| **Educational level** | Nursing school | 18 | 11.5 | 100 | 45 | 24.95 | **.000**** |
| | Technical Institute of Nursing | 93 | 59.2 | 118 | 53.2 | | |
| | Bachelor of Nursing | 34 | 21.7 | 4 | 1.8 | | |
| | | | | | | | |
| | Postgraduate | 12 | 7.6 | 0 | 0.0 | | |
| **Years of Experience** | <5 | 18 | 11.5 | 70 | 31.5 | 15.24 | **0.01*** |
| | 5-<10 | 24 | 15.3 | 76 | 34.2 | | |
| | ≥ 10 | 115 | 72 | 76 | 34.2 | | |
| **Training courses related to infection control** | Yes | 130 | 82.8 | 8 | 3.6 | 25.98 | **.000**** |
| | No | 27 | 17.2 | 214 | 96.4 | | |

Table (6): Correlation between the participants` knowledge about infection control precautions in primary health care centers and their practice

| Items | Total practice |
|---|---|
| **Total knowledge** | **r = 0.317**<br>**P = .000**** |

Statistically significant at $p<0.05$ highly significant at $p<0.01$

## Discussion:

The results of the current study revealed that the majority of the studied nurses were females. This finding agreed with the study done by (Henderson et al., (2021) (3) in Australia to compare the perceptions of nurses with infection control expertise and ward nurses as to what infection control activities are missed and the reasons why these activities were omitted. and found that the majority of the studied nurses were females and only one-fifth of the study participants were males. On the other hand, in a study conducted by Phan et al., (2019) (14) to determine Personal protective equipment doffing practices of healthcare workers it was found that about two-thirds of the study participants were females and nearly one-third were males. These study results may be due to that the nursing occupation is more common among females than males and that the numbers of female nurses are more than male nurses.

The result of the present study discovered that around one-half of the studied participants were aged between thirty and less than forty years with a mean age of 38.94 ± 6.32. This result nearly agrees with the results of a study done by Akande, (2020) (15) stated that the mean age of the intervention group was 43.9 years old and the mean age of the study group was 43.6 years old. These results may be due to the increased age of the current study participant could be a risk factor for poor adherence to infection control intervention and precaution due to decreased knowledge about the appropriate practice.

The result of the current study exposed that about two-thirds of the studied nurses had not received training in infection control. This result was contradicted by the study done by Wong (2021) (16) to assess the level of compliance with infection prevention and control practices among HCWs and reported that the majority of the studied nurses received training about infection control precautions. The results of the current study may be due to the different nature of the setting in which the study was performed.

The result of the current study showed that one-half of the studied nurses had ten years or more of experience. This study result was contradicted by a study done by Alrubaiee et al., (2021) (2) to evaluate the implementation of an educational module on NI control measures and found that two-thirds of the studied nurses had nursing experience of more than five years. These results may be due to years of nursing experience affecting nurses' abilities to work and empower them, enhancing nurses' practice in all nursing fields specifically in infection control and handling infectious agents, and adherence to infection control standard precautions.

Regarding the distribution of the studied participants according to their total knowledge of infection control precautions in primary health care centers, the current study showed that nearly half of the studied nurses had an average level of total knowledge about infection control precautions in primary health care centers. Also, about a quarter of them had a good level of total knowledge. While more than one-quarter of them had a poor level of total knowledge.

This finding is in contrast with the results of the study, which was conducted by Hassan et al., (2020) (17) to study the effect of an educational program on maternity nurses' knowledge and practices towards infection control. It was mentioned that most of the studied nurses had a good level of total knowledge about infection control precautions post-infection control program. Hence it is a must to provide education and training to healthcare staff and it's an important strategy in implementing an infection prevention program. Education has a positive impact on the retention of knowledge and practices of staff and has a positive effect

on their compliance with infection control practices.

According to total practice, the present study detected that more than half of the studied nurses had incompetent practice regarding infection control precautions in primary health centers. While more than one-third of them had competent practice. These results were cohered with the study conducted by Kerity, and Naji, (2017) (18) to evaluate the healthcare workers' practices toward infection control measures at primary healthcare centers and found most healthcare workers working in primary healthcare centers had a moderate level of practice regarding infection control. These results explained that only one-quarter of studied nurses had good knowledge about infection control precautions in primary health care centers.

The current study revealed that there was a highly statistically significant relation between the total knowledge of the studied nurses about infection control precautions in primary health care centers and their demographic data such as educational level, years of experience, and attending training courses related to infection control at (P= < 0.01). These results explained that nurses attended training programs related to using illustrative educational methods during a training program.

These results were consistent with the study conducted by Geberemariyam et al., (2018) (19) to assess the knowledge and practices of healthcare workers concerning infection prevention and associated factors in healthcare facilities and clarified that Healthcare workers were more likely to have infection prevention knowledge if they worked longer ten years or more. In addition, regular with the study performed by Shrestha et al., (2017) (20) assessed the healthcare workers' knowledge, attitudes, and practices on infection control at primary healthcare and revealed that training programs had a positive effect on their knowledge level with p-value <0.01**.

In the current study, there was a highly statistically significant relation between the total practice of the studied nurses about infection control precautions in primary health care centers and their demographic data such as educational level and attending training courses related to infection control at (P= < 0.01). Also, there were statistically significant relations with their age and years of experience (P= < 0.05).

These results agree with the study by Patil et al., (2018) (21) to assess the knowledge and practices of health care professionals to prevent surgical site infection in a tertiary health care center and reported that work experience and qualification had significantly improved their practice level with p value <0.01**. Also, in the same line with the study by Desta et al., (2018) (22) examined the knowledge and practice of healthcare workers on infection prevention and its associated factors among health professionals and mentioned that older age, lengthy work experience, and higher educational status were significantly associated with both practice of infection prevention.

The current results showed that there was a highly significant positive correlation between total knowledge about infection control precautions in primary health care centers and their practice. These results were supported by the study by van Rensburg et al., (2018) (23) to describe the infection prevention knowledge, attitudes, and practices of PHC nurses and stated that there was a positive correlation between nurses' knowledge and their practice with p-value <0.01**.

In addition, regular with the study by Assefa, Diress, & Adane, (2020) (24) to assess the level of knowledge and practices of healthcare providers towards infection prevention and its associated factors in health facilities presented that there was a significant correlation between nurses' practice and their knowledge with p-value <0.05*.

## Conclusion:

Based on the findings of this study, it can be concluded that more than one-third of study participants had average overall knowledge scores, while more than one-half of them had incompetent practice regarding infection

control precautions. A highly statistically significant positive linear correlation between total knowledge about infection control precautions in primary health care centers and their practice was pointed up. In light of this research findings, recommended that healthcare managers supervise the HCPs in practicing infection prevention standards and techniques and monitor nursing adherence to policies of primary healthcare centers. The Administrators should promote feedback on practice, updated knowledge, individual reinforcement, and appropriate rewards for good practice.

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