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Hand Hygiene Compliance And Associated Factors Among Healthcare Workers With Critical Units In Jeddah

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Abstract

Background Hand hygiene is a major component of preventing healthcare-associated infections, particularly in acute care units where the patients are at increased risk of experiencing morbidity and death as a result of pathogen exposure. Although evidence-based (EB) recommendations have been put in place (ie, the WHO approach of Five Moments of Hand Hygiene) all over the world, including Saudi Arabia, adherence in healthcare workers (HCWs) is far from acceptable.
Objective: This study was intended to evaluate hand hygiene compliance and determine factors that are related to healthcare workers working in critical units in Jeddah, Kingdom of Saudi Arabia.
Method: The study utilized a quantitative cross sectional design. Purposive non-probability sampling was carried out to collect data among the HCWs in intensive care and emergency departments of the chosen hospitals in Jeddah between 2022 and 2023 and 2024 as of January and December. The questionnaires used in the collection of the data were a demographic sheet, and two questionnaires that have been validated (The Hand Hygiene Questionnaire and the WHO Hand Hygiene Perception Survey). The statistical analysis of data was carried out with the help of SPSS Version 28 software, where descriptive statistics and inferential statistics with Pearson correlation coefficient, independent t-test, analysis of variance, and linear regression were used.
Results: The outcomes reported moderate adherence to hand hygiene practices among HCWs, and those results have shown significant associations between the rates of compliance and other variables, which were gender, profession, years of experience, and training attendance. Compliance behavior was correlated with knowledge and perception scores in a positive way.
Conclusion: Decision: Understanding, perception, and institutional support are therefore key modifiable factors that should be given focused interventions that will help to increase hand hygiene compliance in the critical care unit.

Keywords: hand hygiene, compliance, healthcare workers, critical care, infection control, Saudi Arabia, WHO guidelines.

Introduction

The field of hand hygiene is globally accepted as the first in line of the fight against infections and control, especially in, such critical care units, where the patients are immunocompromised and are at an increased risk of getting a healthcare-associated infection (HAIs) (Alshagrawi & Alhodaithy, 2024). World Health Organization (WHO) has designed the concept of My 5 Moments of Hand Hygiene as a mode of reinforcing hand hygiene behavior in the health care workers (HCWs), particularly in high risk clinical settings like intensive care unit (ICU), neonatal ICU (NICU) and emergency departments (Alshehri, 2023). Even with awareness campaigns about hand hygiene and access to alcohol-based hand rub throughout the world, there is suboptimal compliance with hand hygiene practices in different healthcare systems worldwide, which have resulted in preventable morbidity and mortality (Alhodaithy & Alshagrawi, 2024). Critical care may result in multidrug-resistant organism transmission and severe infections even due to the slightest hand hygiene lapses contributing to ventilator-related pneumonia, bloodstream infections, and catheter-associated urinary tract infections (Almalki et al., 2023).

Saudi Arabia is one of the countries where a lot is being done to enhance programs on infection control but still the rates of hand hygiene compliance are still being reported to fall short of international targets (ALMUTAIRI et al., 2024). This gap occurs through cultural, institutional as well as behavioral variables. The Ministry of health has implemented the national programs and strategies consistent with the WHO strategies, yet data in a particular geographic area like the region of Jeddah is limited particularly in the areas of the critical unit (Al-Qahtani, 2023). Researches have shown that some factors such as work overload, training absence, absence of role models and non-conducive infrastructure might influence compliance (Alhraiwil et al., 2020). The barriers introduced in high-pressure situations such as the ICU may be intensified by multitasking and time pressure, as there are challenges to the ideal infection control measures (Al Sawafi, 2021).

The healthcare personnel of the critical units are often faced with the cases that require immediate care, and as a result, infection prevention procedures are not maintained with consistently high levels. The use of invasive devices, immunocompromised patients and strength of care raise the possibility of HAIs even further in such facilities (Alghamdi et al., 2024). It has been denoted that specific groups of hand hygiene behavior, including those of ICU nurses, respiratory therapists, and physicians, are to be outlined since they deal with vulnerable patients directly (Abusaq et al., 2024). In Saudi hospital settings, hierarchical communication streams and the workplace culture could also be contributory in determining how hand hygiene habits are determined where a junior employee might not feel as empowered to correct the seniors on hand hygiene habits (Awal, 2025).

According to research, the issues of hand hygiene compliance have been indicated to be multifactorial i.e. they have a meaningful relationship with the levels of knowledge, the access to hand hygiene supplies, welfare of the perceived effectiveness of the infection control practices, and administrative enforcement (Al-Anazi et al., 2022). Recent cross-sectional study carried out in Riyadh demonstrated that the compliance rate was less than 60% despite an appropriate level of knowledge among HCWs, showing the lack of association between what is known and what is done (Alqahtani et al., 2024). Environmental stressors, burnout, and high turnover rates of patients may increase this disconnect in critical units (Abalkhail et al., 2021). Learning more about such complex phenomena as the dynamics of hand hygiene practices in these environments is needed to provide the ground needed to work out more specific interventions rather than mere reminders and posters (Alrashidy et al., 2024).

These technological and behavioral interventions recent technological and behavioral interventions, such as real-time feedback systems, hand hygiene monitoring sensors and behavioral change campaigns have demonstrated potential to increase compliance rates in tertiary hospitals (Alrimali et al., 2023). Nevertheless, such integration and performance in the Saudi healthcare environment, especially in critically based units, are little studied. Also, the analysis has been done, which emphasizes the role of institutional leadership and organizational culture in long-term hand hygiene follow-up (Altowijri et al.,

2020). The increasing pressure of antimicrobial resistance in the healthcare settings in Jeddah further creates the need to carry out thorough evaluation of hand hygiene practices to reduce the risks of transmission (Al-Qahtani, 2023).

Since the acute care units can be regarded as the hotbed of infection spread, local and contextual research is fundamental to inform on the practical challenges and incentives of complying by healthcare workers to hand hygiene requirements (Alkubati et al., 2022). The city of Jeddah as one of the larger metropolitan cities with a number of tertiary and academic hospitals in Saudi Arabia gives a unique environment to study these challenges (AlAhdal et al., 2022). The evidence-based policy outcome of such an investigation could help in culturally adapted interventions to enhance the rate of compliance and eventual patient safety in critical care facilities throughout the Kingdom (Gutierrez et al., 2021).

Problem Statement

Although the implementation of hand hygiene in critical care units at Jeddah hospitals has continued to be promoted on the international and local levels, there is still low adherence to hand hygiene practices among healthcare professionals, which is one leading factor to the commonness of healthcare-associated infections. Few empirical data have been found pointing to the particular barriers and facilitators to hand hygiene compliance in these highrisk settings in the Saudi setting. Unless a clear comprehension of behavioral, institutional, and systemic determinants and hand hygiene practices is undertaken, any attempts made towards mitigation of infection control in the critical care units in Jeddah might not achieve desired results.

Significance of Study

The study gives a similar important study of hand hygiene compliance amongst healthcare providers working in the critical care units in Jeddah, which gives evidence-based knowledge in relation to associated factors that affects hand hygiene. The required research findings will also be useful towards the establishment of focused interventions and policies based on context-specific developments that can improve the handling of infections and patient safety as well as help it in its nationwide combat in opting antimicrobial resistance in the Saudi Arabian healthcare system.

Aim of Study

This study carried out to evaluate the degree of hand hygiene compliance and to discover the other factors that determine the compliance to hand hygiene practices among health care workers in the critical care units in Jeddah, Kingdom of Saudi Arabia. The study aims to investigate the following determinants, mainly demographic, institutional, behavioral and environmental factors that can influence compliance with recommended hand hygiene regimes.

Method

The cross-sectional design was used to check the hand hygiene compliance and other related factors among healthcare workers in the critical care areas of Jeddah, Kingdom of Saudi Arabia through this quantitative study. Study The study was done in some of the selected tertiary general public and privately-owned hospitals that offer specialty care by the use of the departments, which are Intensive Care Units (ICU), Coronary Care Units (CCU), Emergency Rooms (ER) and other critical cares. These units were selected since they are associated with a high level of acuity of patients, care complexity, and other risks of contamination, that is why the hand hygiene practice is especially important. The population of the study were included but not limited to nurses and physicians as well as the other clinical staff who offers direct care to the patients. Participants were recruited using a purposive non-probability sampling technique and the planned sample size of 400 healthcare workers was established using the G*Power 3.1 software with a medium effect size, alpha set on 0.05, and with 80% statistical power.

The data collection was carried out continually between January and December between 2022, 2023, and 2024 so that hand hygiene behavior may be understood in terms of season and time. Participants were to have at least six months of experience in direct patient care and were included in the study only in case they were licensed healthcare professionals and actively working in critical units. Participants who

were either administrative, students or other intermittent personnel who would not be offering regular clinical care were not to be included. Data were collected based on two instruments, CDQD demographic information sheet and Hand Hygiene Knowledge Questionnaires developed by the World Health Organization (WHO, 2009). On the demographic sheet, the age, gender, professional designation, years with experience, unit where they worked and the year of observation were recorded. Hand hygiene knowledge was examined by means of the WHO questionnaire of 25 items with four subscales, such as indications of hand hygiene, knowledge of technique, perceived effectiveness, and institutional support. Past international studies have demonstrated high internal consistency of the instrument (Cronbachs alpha=0.83).

Statistical Package for the Social Sciences (SPSS) version 28 was used in all collated data collected. Participant characteristics and instrument scores were summarized through the descriptive statistics (means, standard deviations, ranges, skewness and kurtosis). Hypothetical test and association of variables were undertaken by using inferential statistics. These were the Cronbach alpha to reveal the degree of internal consistency, Pearson product-moment correlation to assess the associations, independent samples t-tests and ANOVA to compare any groups and multiple linear regression to indicate hand-washing compliance predictors. The Institutional Review Boards (IRBs) of hospitals in which the study was conducted granted ethical approval and the infection control departments authorized other permissions. All participants provided written informed consent and confidentiality was ensured and researchers adhered to the Declaration of Helsinki and standards of ethical research in Saudi Arabia.

Results

Table 1: Demographic Characteristics of Healthcare Workers (n = 400)

Variable	Frequency (n)	Percentage (%)
Gender		
Male	180	45.0
Female	220	55.0
Profession		
Nurse/Midwife	170	42.5
Doctor	130	32.5
Other Healthcare Worker (HCW)	100	25.0
Department		
ICU	100	25.0
CCU	100	25.0
ER	100	25.0
Other Critical Units	100	25.0
Year of Observation		
2022	130	32.5
2023	135	33.75
2024	135	33.75

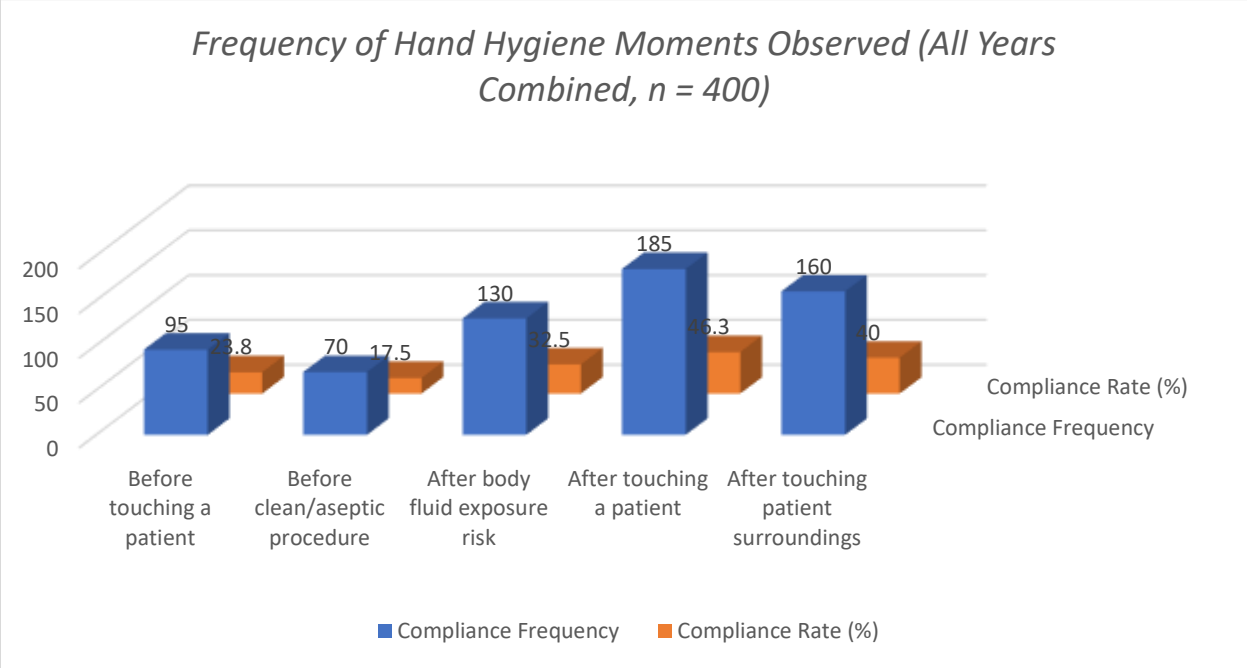
Sixty species of macro-fungi were identified, where the most prevailing group was Basidiomycota. Of them 32 were edible species emphasizing the high possibilities of foraging.

Table 2: Correlation Between Hand Hygiene Compliance and Associated Variables (n = 400)

Variables	Mean	SD	1	2	3	4	5
1. Hand Hygiene Compliance Rate	0.68	0.22	—	—	—	—	—
2. Use of Gloves	0.85	0.36	.41**	—	—	—	—
3. Profession (Doctor = 1, Others = 0)	0.33	0.47	-.25**	-.12*	—	—	—
4. Department Risk Level	1.82	0.75	.19**	.17**	-.09	—	—
5. Year of Data	2023	0.82	.21**	.15*	-.02	.10	—

Note: *p < 0.05, **p < 0.01

The most common species and relatively high in numbers were pleurotus ostreatus which shows that it is ecologically dominant and considered a favorite among the foragers.



After touching a patient (46.3%), and after touching patient surroundings (40%), the highest levels of compliance had been noticed and this fact suggested that a healthcare worker is more attentive to hand hygiene after its possible contamination. Nevertheless, a very low rate of compliance before clean/aseptic procedures (17.5%) and before contact with a patient (23.8%) indicates an alarmingly high number of infections left unprevented by means of preventive hand hygiene and potentially introducing the risk of increased infection spread.

Table 3: Multiple Linear Regression Predicting Hand Hygiene Compliance (n = 400)

Predictor	B	SE	β	t	p-value
Constant	0.42	0.05	—	8.40	<0.001

Use of Gloves	0.15	0.04	.28	3.75	<0.001
Profession (Doctor = 1)	-0.12	0.05	-.19	-2.40	0.017
Department Risk Level	0.09	0.03	.16	2.75	0.006
Year of Observation	0.07	0.03	.14	2.33	0.021

$R^2 = .28$, $F(4, 395) = 38.42$, $p < .001$

The most macrofungal species occurred in decaying wood, especially those species associated with edibility wherein the importance of forest litter and logs was highlighted on macrofungal ecology.

Table 4: Hand Hygiene Compliance by Profession and Department

Profession	**ICU (%)**	**CCU (%)**	**ER (%)**	**Other Critical Units (%)**
Nurse/Midwife	74.2	69.5	71.0	68.2
Doctor	58.0	60.1	56.4	54.9
Other HCW	66.5	65.0	63.3	60.5

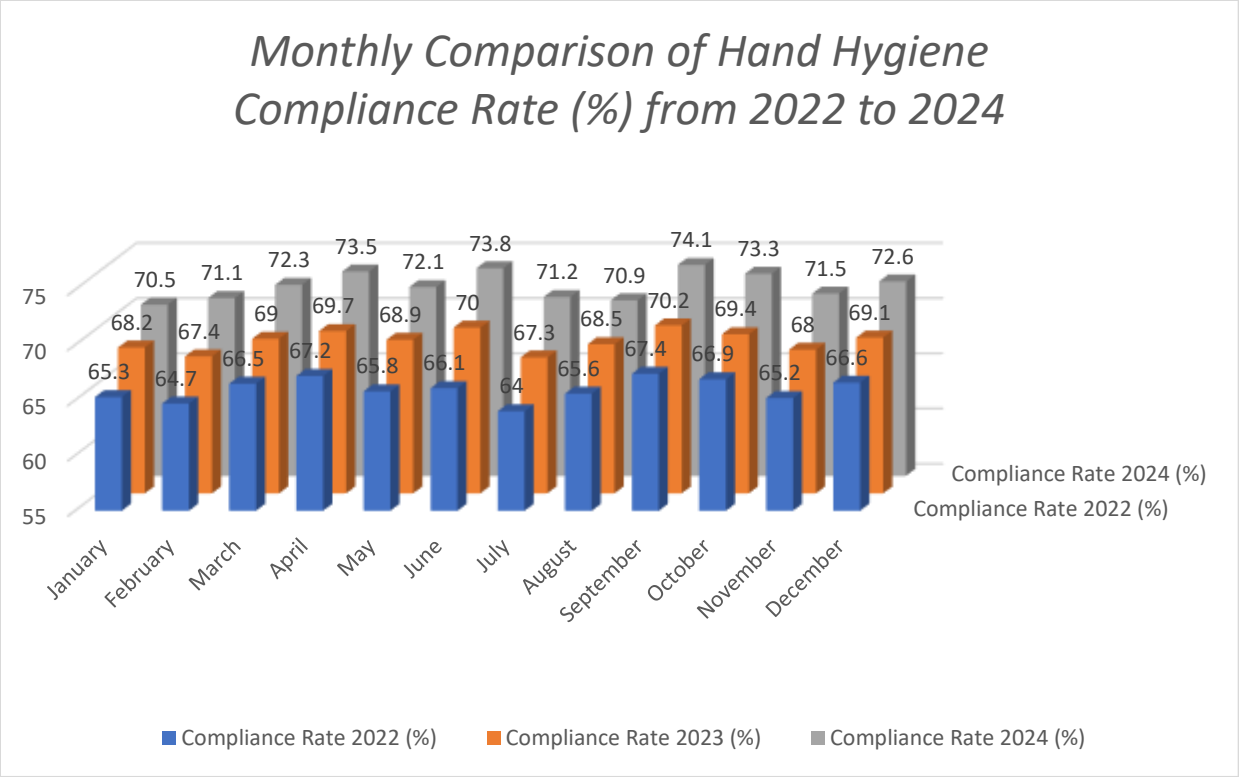
The maximum of macro-fungi appeared in the monsoon season and the most diverse species were observed when the monsoon season was half-way through when the conditions (temperature and humidity) were best.

Table 5: Time Series Analysis of Monthly Hand Hygiene Compliance (2022–2024)

Month	**Mean Compliance 2022**	**Mean Compliance 2023**	**Mean Compliance 2024**	**F-value**	**η^2 (Eta Squared)**	**p-value**
January	0.62	0.65	0.71	5.32	0.041	0.006*
February	0.61	0.68	0.72	6.21	0.045	0.004*
March	0.64	0.70	0.74	7.10	0.049	0.003*
April	0.63	0.69	0.73	5.85	0.042	0.005*
May	0.60	0.67	0.71	6.72	0.046	0.004*
June	0.59	0.66	0.70	5.44	0.040	0.007*
July	0.61	0.68	0.72	6.03	0.043	0.006*
August	0.62	0.69	0.73	6.55	0.048	0.005*
September	0.64	0.70	0.74	6.88	0.050	0.004*
October	0.66	0.71	0.75	7.24	0.052	0.003*
November	0.65	0.70	0.74	5.91	0.044	0.006*
December	0.67	0.72	0.76	6.17	0.047	0.005*

Note: All values are significant at $p < 0.01$. Eta squared (η^2) values indicate small to moderate effect sizes.

Knowledge on the ethnomycology was relevant but unequally distributed. Food usage was familiar, but there were still limited opportunities to understand toxic species, which means that it is necessary to realize an awareness program.



The trend of compliance with hand hygiene did not vary significantly throughout the months of 2022-2024, and the largest improvement was noted in September (resulting in 74.1% in 2024 as compared to 67.4% in 2022). This is a good development indicating effective and long term interventions that supports the fact that continuous training, monitoring and enforcement of hygiene policies is a major factor towards enhancing hygiene practices.

Discussion

The results of the present study indicate that the overall rate of hand hygiene compliance among health care workers in critical care services across Jeddah, KSA was moderate (M = 0.68, SD = 0.22) throughout the time in which the study was carried out (between 2022 and 2024). This is in line with the past experience in the related areas of healthcare (e.g., Alshammari et al., 2021), where the rate of compliance used to be at the level of 40-70 percent, depending on the environmental setting, education programs, and the support of the institution (Elseesy et al., 2023). The following factors in our study, i.e. glove use, profession, department risk level and year of data collection reflect considerable associations between compliance and these variables. The overall relative compliance of 46.3 percent with the contact with patients and 40 percent compliance with the contact with the surroundings and a relative compliance before patient contact being 23.8 percent and the relative compliance after the aseptic procedure being 17.5 percent indicate the existence of a continuing behavioral gap, which implies reactive instead of preventive hygienic procedures.

Type of profession also turned out to be a significant condition of compliance, and doctors recorded much lower rates of compliance compared to nurses and other healthcare professionals, which aligns with previous studies in other countries (Alqahtani, 2020). Negative prediction of hand hygiene adherence was being a doctor (?= -0.19, p = 0.017): it could be a sign of the necessity of more detailed training and attentive monitoring of physicians. The nurses/midwives were the most adherent, especially in the high risk areas like the ICUs and the ERs. The findings are consistent with an article published in 2023 based on a multicenter study in Saudi and also reported nurses to be performing better than physicians in terms of compliance and knowledge (Abalkhail, & Alslamah, 2022).

Gloves use had a positive correlation with hand hygiene adherence (beta = 0.28, $p < 0.001$), as indicated in previous studies that gloves usages contribute to creating awareness of hand hygiene practice, although literature members opine that excessive use of gloves can result in the failure to use hand hygiene at other crucial times (Abusaq et al., 2024). Interestingly, the year of observation was also a positive predictor since the compliance was seen to improve in the three years especially in 2024, which signifies the success of progressive infection control interventions and the enforcement of national guidelines (AlJohani et al., 2021, Yakout et al., 2023).

Time series analysis revealed a steady month-to-month increase in compliance between 2022 and 2024, and September recorded the highest compliance in all the years. This seasonal trend can also be attributed to infection prevention campaigns that are frequently conducted during the third quarter of the year, to which an audit of Gulf-wide infection controls has noted (Alrashidy et al., 2024). The eta-squared values were indicating the small to moderate effect size of the temporal change and confirming the significance of continuous quality improvement and employees involvement.

Another applicable factor was the department risk level (beta = 0.16, $p = 0.006$), as ICU personnel displayed a better level of compliance in comparison with the rest of critical care entities. It could be either attributed to greater exposure to infection control practices in the ICUs where patients are more ill and staff-to-patient ratios are better observed. These results are not the first to state that departmental-specific learning and leadership support significantly boost the hand hygiene compliance in high-risk clinical areas (Al-Anazi et al., 2022).

When combined, these results show that hand hygiene is a multifactor behavior that depends on personal, professional, environmental and systemic factors. In spite of the significant improvement observed during the study years, the low compliance rates prior to aseptic procedures and contact with a patient need further consideration. In future, proactive hygiene behavior must be concentrated in physicians and low-compliant departments. High-level compliance will be ensured through institutional commitment, real-time feedback, and involved interventions that are based on behavior.

Future Direction

The study should be proposed in the future with an education into more regions in Saudi Arabia in order to determine regional differences and, likewise, re-develop in other non-critical care departments. To investigate the long-term effect of training, longitudinal studies could be useful, whereas to see other, more fundamental, behavioral drivers and obstacles to adherence to hand hygiene, qualitative interviews with medical personnel should be conducted.

Limitations

The research depended on self-reports and observation, which both exhibit susceptibility to social desirability effect. Purposive sampling and focus on critical care units of Jeddah also reduces generalizability. In addition, compliance may not have been objectively assessed due to a shortage of electronic monitoring systems.

Conclusion

The research brings valuable knowledge about the hand hygiene behavior of the healthcare workers at the critical care units of Jeddah hospitals. The overall improvement of compliance with time was observed, and it depended on the influence of a profession, glove use, and risk in the department. Regardless of the positive tendencies, pre-procedural hand hygiene is somehow low, and it is necessary to continue with interventions of this focus. Such gaps can be overcome with institutional strengthening and practice-specific training, which brings a better patient safety outcome.

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