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ORIGINAL ARTICLE

ASSESSMENT OF THE KNOWLEDGE OF NURSES ON POST-CARDIOPULMONARY ARREST CARE

AVALIAÇÃO DO CONHECIMENTO DOS ENFERMEIROS SOBRE OS CUIDADOS PÓS-PARADA CARDIORRESPIRATÓRIA

EVALUACIÓN DEL CONOCIMIENTO DE LOS ENFERMEROS SOBRE LOS CUIDADOS POST-PARADA CARDIORRESPIRATORIA

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ABSTRACT

Objective: to assess the knowledge of nurses working in the emergency units of public hospitals on post-cardiorespiratory arrest care. ***Method:*** this is a descriptive study with quantitative approach carried out with nurses from five first-aid posts of public hospitals in the Federal District. A questionnaire about post-cardiorespiratory arrest care was used for data collection and the results were statistically analyzed (p <0.005). ***Results:*** the average score obtained by respondents was 5.9 and gaps were identified in their knowledge. It was observed that the group that performed better was composed of nurses who had attended more updating courses in the last year. ***Conclusion:*** nurses had little knowledge on post-cardiorespiratory arrest care, and for this reason we suggest to expand continuing education activities as well as to give emphasis on post-cardiac arrest care in order to qualify the assistance. ***Descriptors:*** Cardiac Arrest; Nursing care; Continuing Education.

RESUMO

Objetivo: avaliar o conhecimento dos enfermeiros que atuam nas unidades de emergências de hospitais públicos acerca dos cuidados pós-parada cardiorrespiratória. ***Método***: estudo descritivo, de abordagem quantitativa, do qual participaram enfermeiros de cinco unidades de prontos-socorros de hospitais públicos do Distrito Federal. Na coleta de dados, utilizou-se um questionário, os cuidados pós-parada cardiorrespiratória, cujos resultados foram analisados estatisticamente (p<0,005). ***Resultados***: a média da nota obtida pelos respondentes foi 5,9 e foram identificadas lacunas no conhecimento dos mesmos. Observou-se que o grupo que obteve melhor desempenho participou de mais cursos de atualização no último ano. ***Conclusão*:** os enfermeiros apresentaram conhecimento insatisfatório sobre cuidados pós-parada cardiorrespiratória, por isso sugere-se ampliar as atividades de educação permanente, bem como a ênfase nos cuidados pós-PCR a fim de qualificar a assistência prestada. ***Descritores***: Parada Cardíaca; Cuidados de Enfermagem; Educação Continuada.

RESUMEN

Objetivo: evaluar el conocimiento de los enfermeros que actúan en las unidades de emergencias de hospitales públicos acerca de los cuidados post-parada cardiorrespiratoria. ***Método***: estudio descriptivo, de enfoque cuantitativo, en el cual participaron enfermeros de cinco unidades de pronto socorro de hospitales públicos del Distrito Federal. En la recolección de datos, se utilizó un cuestionario, los cuidados post-parada cardiorrespiratoria, cuyos resultados fueron analizados estadísticamente (p<0,005). ***Resultados***: la media de la nota obtenida por los respondientes fue 5,9 y fueron identificadas lagunas en el conocimiento de los mismos. Se observó que el grupo que obtuvo mejor desempeño participó de más cursos de actualización en el último año. ***Conclusión*:** los enfermeros presentaron conocimiento insatisfactorio sobre cuidados post-parada cardiorrespiratoria, por eso se sugiere ampliar las actividades de educación permanente, así como el énfasis en los cuidados post-PCR para cualificar la asistencia prestada. ***Descriptores***: Paro Cardíaco; Cuidados de Enfermería; Educación Continua.

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INTRODUCTION

Cardiopulmonary arrest (CPA) is defined as the cessation of cardiac mechanical activity, confirmed by the absence of signals of circulation associated with lack of respiration. About 17 million people throughout the world die due to this event every year. In Brazil, in 2004, 341 out of every 100 thousand inhabitants were victims of cardiovascular disease.1

In addition to actions to prevent cardiac problems, cardiopulmonary resuscitation (CPR) has advanced very much in recent years. However, even when maneuvers are well performed, only 30% of the individual normal blood flow is reached during CPR. The body is, thus, subjected to a state of systemic hypoperfusion for a certain period. Even spontaneous cardiac circulation is resumed, the patient's condition is still serious, and in such cases it is common to see a state that is characterized by brain injury, myocardial dysfunction and systemic response to ischemia/reperfusion known as post-CPA syndrome (PCPAS).[2,3]

PCPAS justifies the high mortality rates resulting from CPA. A study conducted in Spain in 2010 found that 52.5% of patients assisted in an advanced support unit survived CPA, but only 10.8% reached the thirtieth day alive.[4] In addition to the complications that may lead to death, CPA may leave significant neurological sequelae, which affect the long-term quality of life of survivors.

Post-CPA care was included in international protocols for the first time in 2005. With the publication of the guidelines of the American Heart Association (AHA) for CPA in 2010 such care was reaffirmed and gained greater emphasis with the inclusion of a fifth item in the Chain of Survival: integrated post-cardiac arrest care, as shown in Figure 1.[5]

Figure 1. Survival chain of ACE and AHA.[5]

The success of CPA maneuvers does not mean that the patient will not need further care. This patient is still in a serious situation and it is necessary that the multidisciplinary team be attentive to the possible consequences of the event in order to, not only improve the patient's chances of living, but also reduce the risk of damage from sudden failure of heart function. Nursing care actions are fundamental in this context because nurses are the main professionals that carry out essential acts of care and management, besides being the intermediaries between the family, the patient and the healthcare team.

In order to play their role with skillfulness, it is essential that nursing care be grounded in technical-scientific knowledge that may allow articulation between theory and practice and expand critical reflection about the context of care. This reflection should help the nurse to identify points that need to be improved and means to describe their work.[6] Thus, in the scenario of post-CPA care, qualified care requires that nurses anchor such care on scientific evidence regarding the pathophysiology of disease and therapeutic conducts adopted.

Given the above, the present study aimed to assess the knowledge of nurses working in emergency units of public hospitals about post-cardiorespiratory arrest care.

METHOD

Descriptive study with quantitative approach carried out with nurses working in first-aid posts (FAP) of the public health network of the Federal District. Although the literature indicates that intensive care unit are the ideal sites for follow-up patients who have suffered CPA, the first care is given in emergency services. The transfer of such patients to ICUs will depend on the availability of beds and on their clinical condition for transportation. Thus, five units of in-hospital emergency care were elected for this study. Three of these units were under the coordination of the Mobile Emergency Care Service of the Federal District

(SAMU/DF). This service is part of the mobile component of pre-hospital care for emergencies, which was inserted in hospitals of the Federal District in 2011 as a local government's strategy of addressing the personnel deficit.

Although this was not the initial objective of the research, while conducting analyses, significant differences between the practice of professionals working in units coordinated by SAMU and professionals not included in this service were observed. For this reason, nurses were divided into two groups, taking into account their position: the first group was formed by professionals who work in units where SAMU is present, and the second was composed of professionals who do not have this service in the workplace.

The number of professionals whose names were on the schedule of April/2013 was 69 nurses, and this was the total population of the study. As inclusion criteria, nurses should have to work in direct assistance to post-PCA patients, have experience of at least six months in the emergency department, and have signed the Informed Consent.

A questionnaire composed of two parts was used for data collection: the first part addressed the characterization of subjects and the second consisted of 13 multiple choice questions and one open question about the possible causes of CPA. Questions were prepared in accordance with AHA Guidelines for CPA in 2010 ACE and the instrument was assessed by two nurses, one with experience in emergency and the other with experience in construction of questionnaires.

The responses given by participants were considered **correct** when all minimum content had been described and/or pointed; **partially correct** when one or more minimum contents had not been described and/or pointed; and **incorrect** when none of the minimum contents had been described and/or pointed.[7] The value of one point was assigned for each question; and at the end of the evaluation, the final score was divided by 1.2 to convert the total points into a score with values between zero and ten. The question 11 had consultative character, and thus, was not assigned any point.

Data were analyzed using Epi Info 7 *software* in order to verify the frequencies through absolute and relative values, and possible associations between variables.

Average scores were compared between the categories *sex*, *time working in FAP*, *refresher course*, *time of the last update in CPA* and *place of work* (in unit coordinated by SAMU or units not coordinated). For verifying the statistical significance of comparisons, we used the ANOVAs with 5% significance level.

This research had the project approved by the Research Ethics Committee of the Teaching and Research Foundation of the Health Secretariat of the State the Federal District (SES/DF) under CAAE nº 16244313.1.0000.5553 and assent 270.507, on May 13, 2013.

RESULTS

The participants were 55 nurses, predominantly female (60%), with mean age of 33.1 years. The average training time was 6.5 years, and 20 (36.4%) professionals had been graduated at a public institution. About degree of specialization, it was found that 50 (91.1%) had a specialization *Latu Sensu,* one (1.8%) had expertise *Stricto sensu* in master mode and only four (7.3%) were just graduated in nursing.

The time of experience in FAP service ranged between 6 months and 22 years with a mean of 4.4 years. Among participants, 36 (65.5%) professionals worked in units that are under the management of SAMU. In turn, 19 (34.5%) nurses from units where this service is not present were included in the research population.

Regarding refresher courses in CPA, it was found that 42 (76.4%) professionals had participated in courses that addressed this issue. Among the nurses of SAMU, 32 (88.9%) had attended these courses, while among those who do not work in units with the presence of the service, this frequency was 10 (52.6%). The relationship between these two variables was significant (p =0.005), indicating that SAMU nurses are more likely to have attended refresher courses in CPA compared to professionals in other units.

The frequency of nurses who attended courses on CPA in the last year was 21 (65.6%) among nurses working in the SAMU, and five (50%) among those who do not belong to this group. The difference between the two groups was also significant in this association (p = 0.001), indicating that SAMU nurses did more courses in the last year.

It was found that PCPAS was approached during the training of 28 (50.9%) nurses. There was no significant association between this variable and the place of work of nurses (p = 0.217).

In assessing the knowledge of nurses, the average final score obtained in the questionnaires was 5.9 ± 1.3, with a minimum score of 2.9, a median of 5.5 and a maximum score of 9.3. There was no significant

relationship between the score obtained in the questionnaire and the variables *sex*, *time working in FAP* and *refresher courses in CPA*. However, there was significant correlation between the score obtained in the questionnaire and the variable place of work. AMU nurses obtained a mean score of 6.1, while nurses not working in this service obtained 5.42, p = 0.047.

The content assessed for each question (Q) and the frequency of correct concepts (C) partially correct (PC) and incorrect (I) are shown in Table 1..

Table 1. Distribution of assessments of answers to the questions. Brasília, 2014.

Q.	Content	C n (%)	PC n (%)	I n (%)
1	CPA causes	3 (5.5)	44 (80)	8 (14.5)
2	Pathophysiological mechanisms involved in PCPAS	6 (10.9)	47 (85.6)	2 (3.6)
3	Therapeutics used in case of hypotension	28 (50.9)	-	27 (49.1)
4	SaO_2 ideal to prevent hypoxia	40 (72.7)	-	15 (27.3)
5	Ideal supply of oxygen to avoid hyperoxia	34 (61.8)	-	21 (38.2)
6	Most common metabolic disorder	49 (89.1)	-	6 (10.9)
7	Values of arterial blood gas parameters	23 (41.8)	23 (41.8)	9 (14.4)
8	Temperature control	28 (50.9)	-	25 (45.5)
9	Parameters to be evaluated in the post-CPA period	10 (18.2)	44 (80)	1 (1.8)
10	Evaluation of neurological function	4 (7.3)	50 (90.9)	1 (1.8)
12	Temperature to be reached in the TH	39 (70.9)	-	16 (29.1)
13	Caring for patients who are under HT	-	52 (94.6)	3 (5.5)

CPA - Cardiopulmonary Arrest; SaO2 - Oxygen saturation; PCPAS - post-cardiorespiratory arrest syndrome; TH - Therapeutic hypothermia.

In the first question, only 5.5% participants answered correctly, pointing out all the causes of CPA. The situations most cited by nurses in addition to the ACS were hypoxia (67.3%), hypovolemia (52.7%) and disorders involving serum potassium level (41.8%). Cardiac tamponade, intoxication and pneumothorax hypertension were the causes less reported by nurses, with respective frequencies of 16 (29.1%), 13 (23.6%) and 10 (18.2%).

The second question invited nurses to point the pathological mechanisms involved in post-CPA syndrome, and the most pointed were brain injury (74.6%), myocardial dysfunction (52.7%) and the persistence of the precipitating condition of CPA (45.5%). Systemic response to ischemia/reperfusion was indicated only by 18 (32.7%) participants.

On the third question, 28 (50.9%) nurses identified volume replacement as first therapeutic alternative to hypotension, 11 (20%) pointed noradrenaline and two (3.6%), dopamine, and the other 14 (25.5%) nurses pointed associations involving the above measures and dobutamine.

The fourth question asked nurses to point the level of SaO_2 ideal to prevent hypoxia, and 40 (72.7%) nurses correctly signaled the option indicating 94 to 99%, followed by the alternatives 90-94% and 100%, with frequencies of 8 (14.5%) and 6 (10.9%), respectively.

In the fifth question, nurses should indicate the fraction of oxygen to be supplied during mechanical ventilation to avoid hyperoxia. The correct answer (depends on the SaO_2 of patients) was observed in the case of 34 (61.8%) nurses, and seven (12.7%) chose the alternative of 100%, six (10.9) chose 75%, four (7.2) chose 50% and one (1.8) chose 21%.

Question six was intended to verify if nurses knew what metabolic disorder was more common after CPA. The correct answer (acidosis) was observed in 49 (89.1%) nurses.

The question seven, in turn, was intended to verify if nurses correctly attribute the values of blood gas parameters. The parameter that nurses correctly indicated more often was the pH (81.5%), followed by PCO_2 (72.2%), HCO_3 (64.8%) and PaO_2 (57.4%), and 23 (41.8%) nurses correctly assigned values to all parameters of arterial blood gas requested.

In question eight, 28 (50.9%) nurses correctly indicated that hyperthermia should be prevented in the post-CPA period; 19 (34.5%) indicated that hypothermia should be prevented; and six (10.9%) indicated that both hypothermia and hyperthermia should be prevented.

The question nine asked nurses to point the parameters that they thought to be necessarily evaluated during care after PCA. Among the most frequently pointed parameters were SaO_2 (94.6%), arterial blood gas (90.9%), heart rate (87.3%), glucose (80%), ECG (78.2%), potassium (60%) and cardiac enzymes (50, 9%). The alternatives that were less frequently chosen were pulmonary auscultation (47.3%), PVC (40%) and E_tCO_2 (29.1%).

Question 10 asked nurses to point the parameters to be checked in the neurological evaluation of the patient, and only four (7.3%) nurses pointed all the correct items. The assessment of the level of consciousness was the alternative most frequently pointed (89.1%), followed by pupillary response (72.7%), motor reaction (41.8%) and sedation (41.8%). Vital signs were the parameters less cited by nurses (16.4%).

In the question 11, of consultative nature, that is, without score, 20 (36.4%) nurses said they had witnessed the Therapeutic hypothermia (TH) at least once. In question 12, 70.9% of nurses correctly identified the temperature of 32-34°C to be reached during this procedure.

The last question asked nurses to point the care that should be provided to patients in TH, and the mostly pointed were: vital signs (92.7%) and skin care (70.9%). Care with eyes, airway aspiration, monitor and prevent bleeding, oral hygiene, high headboard and diet maintenance had frequencies under 25%.

DISCUSSION

The profile of the nurses found in this study is similar to the profile found in other studies on emergency services in all regions of Brazil. Thus, there is a predominance of professionals aged under 40 years (71.7%). Regarding the training time, it was found that 76.5% of nurses had graduated less than 15 years ago and the average time of performance in FAP was 3 years. Postgraduate courses *Latu Sensu* also predominated (97.9%).[8]

Nurses had graduated predominantly in private institutions, confirming a study on the theoretical training of nurses to care for CPA..[7] Regarding sex, it was observed that this research showed percentages of 60% female and 40% male, while the studies of Mezanini and Bianch (2009) and Bellan, Araújo and Araújo (2010) found, respectively, frequencies of 90.9% and approximately 82%.

According to AHA (2010), CPA occur due to ten causes, which are: hypovolemia, hypoxia, hypo/hyperkalemia, hypothermia, acidosis, acute coronary syndromes (ACS), pulmonary thrombosis, cardiac tamponade, pneumothorax hypertension and intoxication.

The identification of the causes that led to a CPA is essential in the implementation of care to patients victims of this event. This is because, if the underlying cause of the CPA is not found and resolved, probably this will cause another episode of sudden failure of mechanical activity of the heart. Although the nurse is not responsible for the prescription of therapeutic measures to address these causes, it is important that the nurse be able to recognize them, for both, to assist in identifying these causes, and to predict the occurrence of a new CPA. So this is an important gap in the knowledge of nurses indicated the present research. The non-identification of the cause of the CPA may postpone its correction and this may increase the chances of further injury and death of the victim.

In addition to the identification of what caused the CPA, it is important that the nurse, as well as all the health team, be attentive to the consequences of the event, which involve brain injury, myocardial dysfunction and systemic response to ischemia/reperfusion. Only 10.9% of the nurses pointed all these mechanisms, although 50.9% of nurses reported having studied this subject at some point in their training. Thus, it is recommended that this theme be emphasized in training courses and continuing education because of the need to understand the framework installed in order to direct therapeutic measures to be adopted.

In order to reverse these physiological mechanisms, in addition to identifying the cause of the arrest, the AHA (2010) points out that the care provided to the patient must include the optimization of hemodynamic, respiratory and neurological supports and monitoring of temperature.

In this context, blood pressure is an important measure of hemodynamic status of the patient, allowing to guide the volume replacement in order to achieve an adequate urine output.[9] The nurse's role is to constantly evaluate the blood pressure of the patient, alerting the medical staff in case of any changes, and employing therapeutic measures. In case of hypotension, the first measure should be the supply of volume to the reach of the average target blood pressure. Only when the mean arterial pressure is not obtained, and the CVP reaches 20mmHg, infusion of vasoactive drugs should start..[10]

In the third question, which addressed this issue, although most nurses pointed out the correct answer, many do not consider the volume replacement as first choice.

With optimization of ventilatory support, nursing aims to maintain oxygenation and adequate organ and tissue perfusion to prevent hypoxia and avoid hyperoxia. Therefore, it is the responsibility of nurses to monitor the signs and symptoms of respiratory failure, such as tachycardia, sudden increase in blood pressure, arrhythmia and cyanosis,

communicating to the medical and the physiotherapy team the observed changes, and providing the prescribed medications.[11] It is recommended that the SaO_2 of the patient be maintained between 94 and 99%. The goal is to avoid the harmful effects of hyperoxia, because the SaO_2 as high as 100% may correspond to a PaO_2 (Partial pressure of oxygen in arterial blood) in any point between 80 and 500mmHg..[5] Whether in the definition of ideal SaO_2 or in the amount of oxygen to be supplied during mechanical ventilation, nurses showed to have a satisfactory concept in more than 60% of the responses.

Arterial blood gas analysis can identify both the disturbances that led to the CPA and the consequences of this event, usually associated with acidosis, either respiratory or metabolic. The collection of this test is specific to the nurse role, requiring knowledge and ability to perform the technique, as well as to interpret results.[12] Acidosis was correctly identified by 89.1% nurses in the present research as the most common disorder in this case. However, 41.8% correctly attributed values to the parameters of this test.

The question nine asked nurses to point the parameters that they thought to be necessarily evaluated during care after PCA. Figure 2 shows the parameters presented in question and the reason why nurses should evaluate them.

Parameter (reference)	Reason
SaO[25]	Prevent hypoxia and hyperoxia
Arterial blood gas analysis[13]	Correction of metabolic and respiratory disorders
Heart rate[10]	Evaluation of cardiac function
Glycemia[10]	Prevent further neurological damage
ECG[9]	Evaluate cardiac function
Potassium[9]	Identify and prevent electrolyte disorders
Cardiac enzymes[5]	Evaluate cardiac function
Pulmonary auscultation[14]	Assess lung damage resulting from CPA maneuvers or from cardiac dysfunction
CVP[15]	Assess blood volume
ETCO2[10]	Evaluate the quality of chest compressions during CPA and confirm placement of the endotracheal tube

Figure 2. Parameters to be evaluated in post-cardiac arrest care. Brasília, 2014.
SaO2 - oxygen saturation; ECG - Electrocardiogram; CVP - Central venous pressure; ETCO2 - Final exhalation of carbon dioxide.

Only 10 (18.2%) nurses pointed out all items. The parameter less frequently pointed out was $_{ET}CO_2$. This parameter requires the use of capnography, a common tool in intensive care environments. Since the AHA (2010) recommends its use both to confirm the position of the endotracheal tube as to assess the quality of chest compressions during CPA, we indicate the need to include this technology in emergency care environments.

Neurological support in post-CPA care should be based on the early detection and prevention of the disorder of brain injury. This damage is a result of CPA due to the hypoxia to which the tissue is subjected for some time and due to posterior reperfusion. The consequences of this event will depend on the time of hypoxia and may result in transient coma, vegetative state and brain death. Thus, the patient requires extreme attention and vigilant monitoring from nursing. Nursing assessment of the neurological condition incorporates monitoring the level of consciousness and sedation level, the pupillary reaction, motor functions and the observation of vital signs.[16] In question 11, which assessed the knowledge of nurses concerning the neurological evaluation of the patient, only four (7.3%) nurses pointed all the items mentioned in the literature.

Finally, as for the control of patient's temperature in post-CPA moments, fever should be avoided (the temperature must be maintained below 37°C) and Therapeutic Hypothermia must be applied whenever possible and appropriate.[10] This therapy alone improves neurological recovery of patients suffering CPA by inhibiting the destructive process of cells that occur during ischemia/reperfusion and decreasing vascular permeability, with anticoagulant and anti-epileptic effect.[517] In the questionnaire, four questions addressed the subject (8, 11, 12 and 13) and the nurses' answers showed that only 36.4% of nurses have witnessed this practice and that knowledge on temperature control in post-CPA care is not consolidated, because half of the participants indicated that hypothermia should be prevented. It is evident, therefore, another issue that needs to be emphasized in continuing education environments.

During TH, the nurse's role includes, in addition to the measures already mentioned: the care of the eyes; maintaining nutrition through nasogastric tube; assessment of signs of bleeding and reinfection; and the continuous and accurate recording of vital signs. Nurses should be attentive to signs of infection and pressure ulcer because patients

are more susceptible to these complications during TH. The family must be informed of the procedure, since it is not a common therapy and may refer to a situation of carelessness with the patient.[17] The question 13, which addressed the care that must be maintained during TH, had low percentage of correct answers probably due to little experience with this therapy in the emergency care setting.

The knowledge of nurses on post-CPA care has not been assessed in other studies, and this made it impossible to directly compare the results of the present research with other populations. This is, therefore, a limitation of this study. However, a study that evaluated the knowledge of these professionals on attention to CPA and compared to sociodemographic data also found that the variables *sex* and *attendance to previous courses on the subject* did not have statistically significant relationship with the score in the test. However, there was an inverse relationship of the score with the time of experience of the professional..[18]

The variable presence of SAMU in the in-hospital emergency service did not appear in the design of this research, but proved relevant during data analysis. Its influence was confirmed with the fact that nurses working in the SAMU were more likely to conduct refresher courses in CPA in the last year and they greater knowledge on the subject.

It is known that the SAMU has an Emergency Education Center, which promotes training and continuing education programs in the form of in-service training related to assistance and emergencies. This may explain the differences observed in the present study.

CONCLUSION

The results of the research indicated that the average score for the group was 5.9 and showed important gaps of knowledge on the following issues: identification of the causes of CPA and the mechanisms involved in PCPAS; approach to hypotension; definition of values of blood gas analysis; parameters to be evaluated in the post-CPA period (Pulmonary auscultation, CVP and E_tCO_2); evaluation of neurological function; temperature control; and care with TH.

There was a difference between the performances of nurses working in the SAMU and of those who are not included in that service. SAMU nurses have attended more refresher courses in CPA in the last year, showing that in-service education has a positive impact on the knowledge of professionals.

By pointing out the gaps in knowledge and the impact of refresher courses on professional development, it is intended to draw attention to the need to encourage and direct continuing education activities on this theme. Thus, a better preparation of nurses for the care of patients who suffer CPA will contribute effectively to reduce the risk of death and additional injuries resulting from the event.

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