Journal of Nursing
Revista de Enfermagem
UFPE On Line
ISSN: 1981-8963

ORIGINAL ARTICLE

USE OF PERSONAL PROTECTIVE EQUIPMENT DURING ADMINISTRATION OF ANTICANCER CHEMOTHERAPY

UTILIZAÇÃO DE EQUIPAMENTOS DE PROTEÇÃO INDIVIDUAL DURANTE A ADMINISTRAÇÃO DE QUIMIOTERAPIA ANTINEOPLÁSICA

USO DEL EQUIPO DE PROTECCIÓN PERSONAL DURANTE LA ADMINISTRACIÓN DE QUIMIOTERAPIA ANTINEOPLÁSICA

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ABSTRACT

Objective*:** to verify the availability of individual protection measures in chemotherapy services. ***Method: descriptive study with a quantitative approach, with 121 nursing professionals in 13 health establishments of Recife-PE, Brazil. The data were collected using a questionnaire, analyzed descriptively and with the Pearson correlation coefficient and Chi Square test. The significance level adopted was 95%. The research project was approved by the Research Ethics Committee, CAAE no. 0034.0.106.174/09. ***Results:*** the most widely available personal protective equipment were gloves and respiratory protection. Reasons related to the work organization constituted the main reasons for the eventual use or non-use of these measures. ***Conclusion:*** although gloves and respiratory protection have been the most available equipment in the services studied, lack of compliance with the recommended specifications for their use contributes to the risk of occupational exposure for the professionals ***Descriptors:*** Chemotherapy; Worker health; Nursing; Protective Equipment.

RESUMO

Objetivo*:** verificar a disponibilidade de medidas de proteção individual nos serviços de quimioterapia. ***Método: estudo descritivo, de abordagem quantitativa, com 121 profissionais de enfermagem em 13 estabelecimentos de saúde de Recife-PE. Os dados foram coletados utilizando um questionário, analisados descritivamente e com o coeficiente de Correlação de Pearson e o Teste Qui Quadrado. O nível de significância adotado foi de 95%. O estudo teve aprovado o projeto de pesquisa pelo Comitê de Ética em Pesquisa, CAAE nº 0034.0.106.174/09. ***Resultados:*** os equipamentos de proteção individual mais disponibilizados foram luvas e proteção respiratória. Motivos relacionados à organização do trabalho constituíram as principais razões para o uso eventual ou não uso destas medidas. ***Conclusão:*** embora as luvas e a proteção respiratória tenham sido os equipamentos mais disponibilizados nos serviços estudados, a falta de atendimento às especificidades recomendadas para uso contribui para que os profissionais estejam sujeitos a riscos de exposição ocupacional. ***Descritores:*** Quimioterapia; Saúde do Trabalhador; Enfermagem; Equipamento de Proteção.

RESUMEN

Objetivo*:** verificar la disponibilidad de protección personal en los servicios de quimioterapia. ***Método: un estudio descriptivo, con abordaje cuantitativo, con 121 enfermeras en 13 centros de salud en Recife-PE, Brasil. Los datos fueron recolectados a través de un cuestionario, analizados de forma descriptiva y con el coeficiente de correlación de Pearson y Qui Quadrado. El nivel de significación fue de 95%. El proyecto fue aprobado por el Comité de Ética en Pesquisa, CAAE nº 0034.0.106.174/09. ***Resultados:*** los equipos de protección personal más ampliamente disponibles eran guantes y protección respiratoria. Razones relacionadas con la organización del trabajo fueron los principales motivos para el uso eventual o no uso de estas medidas. ***Conclusión:*** aunque los guantes y protección respiratoria hayan sido los equipos más disponibles en los servicios estudiados, la falta de cumplimiento de las especificaciones recomendadas para su uso, contribuye para que los profesionales estén sujetos al riesgo de exposición ocupacional. ***Descriptores:*** Quimioterapia; Salud Ocupacional; Enfermería; Equipo de Protección.

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INTRODUCTION

Exposure to anticancer chemotherapy (ANCH) can result in damage to the health of workers that handle it. Among the groups potentially exposed to these agents are patients, individuals who work in pharmaceutical industries, workers who prepare, administer and dispose of pharmaceuticals, medical and nursing professionals who take care of patients, personnel related to cleaning and the relatives of the patients.[1]

The risk of contamination with anticancer agents can occur at many points as, for example, in its manufacturing, transport, distribution, reception and storage, however, generally, the occupational activities, which present the greatest potential, are the preparation and administration of anticancer chemotherapy spills, cleaning and handling the excreta of patients.[2,3]

Among the recommendations to mitigate occupational hazards are the use of security measures by means of collective protection equipment (CPE) and individual (PPE). It is crucial that the professionals involved in these activities are adequately informed, trained and supervised in compliance with the recommended biosecurity measures. On the other hand, it is up to employers of any nature, in hospitals or clinics, provide accurate information and safe conditions for the preparation, administration and disposal of these drugs, in addition to providing the collective and individual protection equipment in sufficient quantities and in accordance with the recommended specifications.[3]

Traditionally the concern with occupational hazard has focused on ANCH preparation phase. Thus, there is a much smaller number of studies on the problems resulting from exposure to these drugs during their administration. It is worth mentioning that in this activity the nursing professionals may also be subject to exposure standards similar to those involved in the preparation[1],although often are not perceived this way. Thus, the collective and individual protection measures recommended for this activity should not be overlooked.

OBJECTIVES

- To verify the availability of individual protection measures in chemotherapy services.
- To describe the use of such equipment by nursing professionals, during the administration of anticancer chemotherapy.
- To verify the association between the use or non-use of the same variables and the function performed in the institution and conduct prior or periodic training.
- To investigate the reasons that influence the use or non-use of these measures during such activity.

METHOD

Descriptive study of a quantitative approach, developed in 13 medical institutions located in the city of Recife-PE, Brazil being five public and eight private audiences. For purposes of data collection 16 anticancer chemotherapy services were computed, one was the public network had outpatient and inpatient unit and the other was the private network had outpatient services for adults and pediatrics, in addition to the pediatric inpatient unit.

The target population for this study consisted of 141 nursing professionals. From this total a convenience sample of 121 professionals was selected, which corresponded to 85.0% of individuals who worked in these establishments.

Nurses, technicians and nursing assistants were included who agreed to participate by signing the Term of Free and Informed Consent and those who worked for more than three months in clinical and / or surgical oncology services, in ambulatory and / or inpatients, the selected establishments and that, among their activities, administered anticancer chemotherapy.

Data collection was preceded by the examination and approval of the research project by the Federal University of São Paulo (UNIFESP) Research Ethics Committee n ° 2051/08, with Certificate of Approval for Ethical Consideration (CAAE) No 0034.0.106.174 / 09 and other participating institutions who had them. For those institutions, which had, no research Ethics Committee in its structure was requested the authorization to the Director/management for data collection.

Data were collected between the months April to July 2009, through a self-administered questionnaire with open and closed questions. The answers to the open questions that elucidated the reasons for using or not each of PPE were grouped according to the frequency of citation in eight categories. Those related to use were personal protection, protection against local effects, against systemic effects

and patient protection. The non-use or possible use were personal reasons, reasons related to work organization and form of infusion of anticancer agents. It also included the category "other".

The survey of collective protection equipment was held from direct observation and questioning of the researcher to the nurse responsible for the anticancer chemotherapy. The characteristics of personal protective equipment offered by the establishment to those who administered ANCH were observed from the survey of products available for use at the time of the visit.

To verify the association between the variables, the statistical tests applied were the Pearson correlation coefficient and Chi Square test. The significance level adopted was 95%.

RESULTS

The availability of PPE analyzed presented in various ways in the institutions that participated in the study. Thus, as shown in table 1, and gloves were the respiratory protection equipment available in all or almost all services. However, only four of them (25%) and all the equipment were available for use. It is worth noting, though, that all services had chapel class II laminar flow, type B for the preparation of anticancer chemotherapy.

Table 1. Personal protective equipment according to their availability in the institution. Recife, 2009.

	PPE							
Existence of PPE	Glove		Apron		Respiratory Protection		Eye Protection	
	n	%	n	%	n	%	n	%
Yes	16	100	06	37.5	15	93.8	04	25.0
No	00	00	10	62.5	01	6.2	12	75.0
Total	16	100	16	100	16	100	16	100

Regarding professionals, the majority (92.6%) were female, with a minimum age of 19 years and maximum of 57 (mean 35.9 years, SD = 8).

From 121 professionals who participated in the research, 23 (19.0%) were nursing assistants, 68 (56.2%) and technicians and 30 (24.2%) were nurses. From the nurses, 22 (73.3%) claimed to possess post-graduation, and 21 of them have reported one or more specializations and a master's degree. Among the specializations studied, 11 (37.9%) were in the area of Oncology and 18 (62.1%) in different areas.

Regarding the frequency of use of personal protective equipment during the administration of anticancer chemotherapy it can be seen in Table 2, the equipment they had higher percentage response of nurses to always use the gloves were and respiratory protection (76% and 62% respectively) Regarding the use of apron and eye protection, response predominated never use them (66.9% and 80% respectively). No statistically significant association was observed between the use and non-use of PPE gloves, apron, respirator and eye function with variable exercised in the institution.

Table 2. Frequency of use of individual protection equipment for nursing professionals during the administration of anticancer chemotherapy. Recife, 2009.

	Professional role in the institution								
PPE	**Assistant**		**Technician**		**Nurse**		**Total**		
	n	**%**	**n**	**%**	**n**	**%**	**n**	**%**	**p**
Glove									
Always	18	78.3	52	76.5	22	73.3	92	76.0	
Not always	05	21.7	15	22.0	08	26.7	28	23.2	0.9037
Never	00	00	01	1.5	00	00	01	0.8	
Total	**23**	**100**	**68**	**100**	**30**	**100**	**121**	**100**	
Apron									
Always	03	13.0	10	14.7	01	3.3	14	11.6	
Not always	03	13.0	15	22.1	08	26.7	26	21.5	0.4230
Never	17	74.0	43	63.2	21	70.0	81	66.9	
Total	**23**	**100**	**68**	**100**	**30**	**100**	**121**	**100**	
Respiratory Protection									
Always	13	56.5	41	60.3	21	70.0	75	62.0	
Not always	10	43.5	23	33.8	05	16.7	38	31.4	0.1186
Never	00	00	04	5.9	04	13.3	08	6.6	
Total	**23**	**100**	**68**	**100**	**30**	**100**	**121**	**100**	
Eye Protection									
Always	03	13.0	02	2.9	02	6.7	07	5.8	
Not always	02	8.7	13	19.1	02	6.7	17	14.0	0.1866
Never	18	78.3	53	78.0	26	86.6	97	80.2	
Total	**23**	**100**	**68**	**100**	**30**	**100**	**121**	**100**	

Table 3 shows the data concerning the association between the frequency of use of each of the PPE and the realization or not of prior and periodic training are presented. It was observed that there was no statistically significant association between this variable and the use or not use of PPE.

Table 3. Frequency of use of personal protective equipment by achievement or no previous and periodic training. Recife, 2009.

	Previous Training					Periodic Training				
PPE	**No**		**Yes**			**No**		**Yes**		
	n	**%**	**n**	**%**	**p**	**n**	**%**	**n**	**%**	**p**
Glove										
Always	60	77.0	32	74.4		78	79.6	14	60.9	
Not always	18	23.0	10	23.3	0.3991	19	19.4	09	39.1	0.1206
Never	00	00	01	2.3		01	1.0	00	00	
Total	**78**	**100**	**43**	**100**		**98**	**100**	**23**	**100**	
Apron										
Always	07	9.0	07	16.3		12	12.2	02	8.7	
Not always	15	19.2	11	25.6	0.2766	20	20.4	06	26.1	0.7807
Never	56	71.8	25	58.1		66	67.4	15	65.2	
Total	**78**	**100**	**43**	**100**		**98**	**100**	**23**	**100**	
Respiratory Protection										
Always	46	59.0	29	67.4		62	63.3	13	56.5	
Not always	29	37.2	09	21.0	0.0746	29	29.6	09	39.1	0.6388
Never	03	3.8	05	11.6		07	7.1	01	4.4	
Total	**78**	**100**	**43**	**100**		**98**	**100**	**23**	**100**	
Eye Protection										
Always	03	3.8	04	9.3		05	5.1	02	8.7	
Not always	12	15.4	05	11.6	0.4243	11	11.2	06	26.1	0.1264
Never	63	80.8	34	79.1		82	83.7	15	65.2	
Total	**78**	**100**	**43**	**100**		**98**	**100**	**23**	**100**	

Regarding the reasons for use of PPE, it is observed in Table 4 that "personal protection" was the main reason for the use of gloves (45.4%), apron (85.5%) and respiratory protection (78.6%), while for the use of eye protection, the category with the highest number of responses was "protection against local effects" (71.4%).

Table 4. Reasons why nursing professionals always use gloves, aprons, respiratory protection and eye protection during the administration of anticancer chemotherapy. Recife, 2009.

Always		
Glove	n	%
Personal Protection	50	45.4
Protection against local effects	35	31.8
Protection against systemic effects	06	5.5
Patient protection	08	7.2
Other	05	4.5
Does not apply	06	5.5
Total	110	100
Apron	n	%
Personal Protection	12	85.8
Protection against local effects	01	7.1
Other	01	7.1
Total	14	100
Respiratory Protection	n	%
Personal Protection	55	78.6
Protection against systemic effects	10	14.3
Other	01	1.4
Does not apply	03	4.3
No response	01	1.4
Total	70	100
Eye Protection	n	%
Personal Protection	01	14.3
Protection against local effects	05	71.4
No response	01	14.3
Total	07	100

Table 5 shows that the main reason for the eventual use of gloves (47.4%) apron (56.7%) and respiratory protection (58.0%) was attributed to "personal reasons". The same is observed with regard to eye protection, whereas "reasons related to the organization of work" was the category that showed the highest number of responses (42.1%).

Table 5. Reasons why nursing professionals always use gloves, aprons, respiratory protection and eye protection during the administration of anticancer chemotherapy. Recife, 2009.

Not always		
Glove	**n**	**%**
Personal reasons	18	47.4
Reasons related to work organization	13	34.2
Reasons related to form of infusion of anticancer agents	04	10.5
Does not apply	03	7.9
Total	**38**	**100**
Apron	**n**	**%**
Personal reasons	17	56.7
Reasons related to work organization	12	40.0
Does not apply	01	3.3
Total	**30**	**100**
Respiratory Protection	**n**	**%**
Personal reasons	29	58.0
Reasons related to work organization	09	18.0
Reasons related to form of infusion of anticancer agents	06	12.0
Does not apply	03	6.0
No response	03	6.0
Total	**50**	**100**
Eye Protection	**n**	**%**
Personal reasons	07	36.8
Reasons related to work organization	08	42.1
Reasons related to form of infusion of anticancer agents	03	15.8
Does not apply	01	5.3
Total	**19**	**100**

Highlighted as the main reason for never using apron (52.7%) and eye protection (51.4%), "lack PPE in this industry" among "reasons related to work organization." Regarding respiratory protection, most of the responses (87.5%) were related to "personal reasons", highlighting the fact "doesn't think its necessary" (57.1%) the use of this equipment during chemotherapy administration procedures.

DISCUSSION

The offering of gloves in all the surveyed services and masks for respiratory protection in almost all of them may be a reflection of existing standards in health services compared to standard precautions, which have already been incorporated in the everyday actions of the nursing staff of these institutions. Some aspects related to the lack of specification of the equipment in compliance with national standards and international recommendations have led to that assumption. Regarding to the gloves made available, even though the latex, material that offers the best results regarding the permeability of the product[4] these were not sterile procedure type, short and slightly rolled cuffs. Although these features are according to RDC/ANVISA no. 220[5] who which recommends the use of gloves procedure for the administration of anticancer agents, it cannot be that professionals are adequately protected, because, according to the recommendations of the Occupational Safety and Health Administration (OSHA)[4], the gloves should be long and free powder to prevent absorption of dangerous drugs

Respiratory protection also available in 33.3% (five) of the services that were available to them in this PPE was a surgical mask, which is not appropriate because it does not prevent the inhalation of aerosols. This is contrary to international recommendations that guide the use of respirators with 95% filtration efficiency of particles of up to 0.3μ.[2, 4, 6,7]Only 13.3% (2) were respiratory protection services with this filtering effectiveness[8] and, in the other (53.4%) these respirators were of type PFF-1, which give 80% particle retention efficiency. Important to note that the RDC/ANVISA no. 220[5] guides the use of respiratory protection when ANCH administration, but does not mention the product specification.

Regarding aprons, in just 31.3 percent (five) of the services, the equipment meets the recommended specifications for the focus activity. [2,8] In addition, drew attention to the fact that in 62.5% (ten) of the services surveyed, this EPI was unavailable for use during anticancer drug administration, but only for the staging area, at odds with the recommendations of national and international bodies that govern the use of this PPE for both activities.

Eye protection equipment for cytostatic administration, Available from: only 25.5% (four) of the services surveyed, was according to the recommended for this activity.[4] As well as respiratory protection, RDC/ANVISA nº 220[5] the use of eye protection is recommended during administration of ANCH, without, however, specifying the features to be observed in the product.

Faced with such evidence, it is possible to conclude that none of the four types of PPE offered are in full compliance with national and/or international recommendations; whether the non-availability of some of them, contrary to NR 6 – personal protective equipment-PPE, the Ministry of labor and employment of Brazil[9] either by the presence of devices that do not meet the specifications described by bodies such as OSHA[4] and NIOSH[6] for the ANCH administration. This situation allows inferring that the participants of this study nursing professionals that administer these medicines; they are not completely safe from the point of view of individual protection, configuring, therefore, an occupational risk.

The incompleteness in the recommended PPE specifications, observed in current legislation, may be influencing the scarce supply and use of such equipment in accordance with more detailed and stringent international specifications, creating an important gap as regards guidelines for good practice of preparation and administration of anticancer therapy.

When searching for data from national literature on aspects raised here, it was found that the scientific production in this area is scarce. In a study of literature review on occupational hazards to which they are subjected employees of nursing, the authors state that only four of them (9.5%) addressed the risks in the preparation and administration of antineoplastic chemotherapy as a worker health issue.[10] However, none of them went into the merits of the observance or non-continuation of the specificities of individual protection equipment used. Another result of this research that deserves reflection is the referent to the expressive number of nursing professionals who reported not having received prior training or periodical about care in the handling of these anticancer agents as well as the lack of significant

statistical association between that fact and the use and non-use of PPE.

The lack of influence of specific training on the protection measures related to the preparation and administration of chemotherapy on adherence to use of PPE, was also evidenced in study conducted in Israel with a group of 61 nurses (31, exposed to cytotoxic drugs in the last 5 years and 30, unexposed), which examined the influence of the knowledge, attitudes and beliefs about their behavior and the use of protective measures on exposure to occupational risk. Although the Group of nurses exposed possessed specific training to the activity exercised in addition to manuals accessible on your desktop service routines and related security measures used in the preparation, administration and disposal of cytotoxic drugs; not all believed in the veracity of the danger to the exhibition, demonstrating that the level of knowledge is not influenced significantly the preventive behavior in practice even when subjected to direct observation and regular monitoring; It was also evidenced that the Group of non-exposed nurses meet more regularly the safety standards of their work, which can be explained, in this study, the fact that they carry less rules because they are less exposed to potential hazards of their activities.[11]

It also adds up to the realization that also specialized training in the area of Oncology Nursing, has not contributed to differentiate statistically the performance of these professionals regarding the use of protective measures. In this context, in addition to evident failure of DRC/ANVISA no. 2205 establishing that the trader involved in the administration of ANCH should receive initial and ongoing training to ensure their empowerment and update. The possibility arises of whether occurring problems in the process of permanent education, both linked to formal aspects of structuring the program, institutional policy that prioritizes the quality of care and patient and professional safety. Another possibility is that the training, when realized, may not be contemplating all aspects recommended by NR nº 32 of the MTE[12] with respect to antineoplastic chemotherapy.

It is worth mentioning that the permanent education of human resources in health constitutes one of the main strategies proposed by the Ministry of health of Brazil to tackle the problems of development of health services, and must be implemented by means of "intentional and planned actions that have as mission to strengthen knowledge, skills, attitudes and practices that the dynamics of offers by other means at least in sufficient scale".[13]

An example of this need was also noted in the survey conducted in 2003, in Ege University Hospital, in Turkey, in order to assess the level of knowledge of 137 nurses who worked with cytotoxic drugs on the health effects caused by exposure to these drugs, the protection measures they used during their handling; and determine the influence of this knowledge in their attitudes, behavior and clinical use of safety measures. The results showed that, even with rules and regulations, the nurses don't fully complied with and that an in-service training is of fundamental importance to increase the level of knowledge of these professionals.[14] Even with the existence of numerous manuals and reports, many nurses don't conform and didn't wear the recommended protective measures.[11,14]

When evaluated the reasons, which justified the "always", such as frequency of use of PPE, the answers regarding the use of gloves and respiratory protection showed that some of the participants of the study recognized that activities involving the administration of cytostatic agents puts them at potential risks to their health. Here are some examples of justifications given by professionals, corresponding to the categories, personal protection, protection against local effects and protection against systemic effects, respectively:

> *For my protection, because serum vials and syringes may be contaminated on its outside with chemotherapy, as also at the time of administration may be some spillage.* (G31)
>
> *Because chemotherapies release droplets in the air, lower case, we cannot see, so we need to protect the airway with mask coal always to prevent a subsequent complication.* (F10)
>
> *Because the particles of medication are irritating, vesicants and can develop hematologic disease, and is highly penetrating and harmful to our health.* (E8)

A different situation was observed regarding the use of aprons and eye protection where a small number of professionals stated they always use these PPE. This fact may be related, in part, to the lower availability of these devices, which can lead the professionals who works in oncology services to infer that the use of this

equipment is not important to reduce exposure to chemotherapeutic agents.

When evaluated, the individual responses for the category "reasons related to the organization of work" it is observed that there are still institutional flaws unacceptable nowadays, that lead the professional to justify the low frequency of use of PPE for the execution of activities related to the care of the patient in chemotherapy. Are examples of these problems, the lack of personal protective equipment, inadequate equipment for this activity, high demand for service and patient flow, which can be translated by insufficient human resources for the service.

It is worth mentioning that the employer is responsible for providing all equipment necessary for handling of drugs and have such equipment readily available, in the appropriate size for their employees, in sufficient quantity and in perfect state of preservation and operation. [9] In addition, the physical and organizational structure of the institutions or units where he manages the ANCH should provide safer working conditions for professionals.[3]

When analyzed, the reasons for the "not always" and "never" as frequency of use of PPE, it was found that, for "personal reasons", factors such as forgetfulness, lack of habit or even the fact that I don't find it necessary, revealed the unpreparedness and lack of awareness of the risks to which professionals are exposed during the administration of anticancer chemotherapy.

Several studies on the reasons that lead the nursing professionals not using or improperly using the PPE describe results similar to those found in the present investigation, which show that this behavior is related, on the one hand, the health beliefs and the perception of professionals about the risks to which they are exposed and their susceptibility to these risks and on the other hand, the organizational aspects of their work.[15-7]

Confirming these findings, an integrative review about occupational risks arising from the exposure of the nursing staff the chemotherapeutic drugs, published in national articles during the period from 2006 to 2011, the authors noted that among the limitations found for the effectiveness of prevention and protection, resulting from the use or misuse of PPE, are the attitudes and inadequate habits (50%) in addition to the lack of information or knowledge of these professionals (25%).[18]

It is further understood that if there by institutions, a program of preventative safety and health of appropriate work able to recognize and manage the risks in work environments through the institution of control measures of individual and collective character as well as monitoring and monitoring of the health of workers; and by employees, awareness of the potential risks they face and adherence to all existing security measures, the risks are always present, continue to adversely affect the health of individuals generating high costs for the individual and society.

CONCLUSION

Personal protective equipment is recommended for use during the administration of chemotherapy anticancer, gloves were available at all services and respiratory protection in almost all of them.

The lack of some PPE or even the existence of these, however disagree with the specifics required for personal safety in case of use, absence of previous training and/or periodic, large flow of patients and demand of service were the most significant findings related to non-adherence to recommended individual protection measures for the administration of anticancer chemotherapy, which involves potential risk to the health of these workers.

The incompleteness of information contained in national legislation, compared to international documents, in relation to good practice in the preparation and administration of anticancer drugs, may be contributing to the inadequate supply of PPE by the institutions surveyed.

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Submission: 2014/06/09
Accepted: 2014/08/09
Publishing: 2014/12/01

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