**RESEARCH | PESQUISA**

# Compliance with standard precautions by nursing professionals and related factors

*Cumprimento às precauções-padrão por profissionais de enfermagem e fatores associados*

*Observancia de precauciones estándar por parte de profesionales de enfermería y factores asociados*

Vitória Helena Pereira[1]
Leticia Nunes Torres[2]
Nathália Montanher Rodrigues[1]
Damiana Aparecida Trindade Monteiro[3]
Juliano Teixeira Moraes[4]
Fernanda Maria Vieira Pereira-Ávila[5]
Mariana Alvina dos Santos[6]
Elucir Gir[7]
Silmara Elaine Malaguti-Toffano[1]

1. Universidade Federal do Triângulo Mineiro. Uberaba, MG, Brasil.

2. Universidade Federal do Triângulo Mineiro Federal, Curso de Graduação em Enfermagem. Uberaba, MG, Brasil.

3. Universidade Federal do Triângulo Mineiro, Programa de Pós-Graduação em Atenção à Saúde. Uberaba, MG, Brasil.

4. Universidade Federal de São João del-Rei. São João del-Rei, MG, Brasil.

5. Universidade Federal Fluminense. Rio de Janeiro, RJ, Brasil.

6. Universidade Federal do Mato Grosso do Sul. Campo Grande, MS, Brasil.

7. Universidade de São Paulo, Escola de Enfermagem de Ribeirão Preto. Ribeirão Preto, SP, Brasil.

Corresponding author:
Silmara Elaine Malaguti-Toffano.
E-mail: silmalaguti@yahoo.com.br.

## ABSTRACT

**Objective:** To verify compliance with the Standard Precautions by nursing professionals and associated factors. **Method:** A descriptive, cross-sectional study was carried out with 522 nursing professionals, in two Brazilian hospitals, between January 2017 and March 2018. Data were collected using a form containing demographic and professional variables and the Compliance with Standard Precautions Scale (Portuguese-Brazilian version); later, analyzed by descriptive and exploratory statistics and a multiple linear regression model. **Results:** The global mean score was 12.9 (SD = 2.5). Nursing professionals had statistically significant higher scores ($p < 0.01$) than nurses. There was a significant difference in terms of professional category ($p < 0.01$)) and education ($p < 0.01$), and marginally significant in relation to age ($p = 0.06$). There were no differences regarding professional experience ($p = 077$), participation in training ($p = 0.79$), and type of hospital ($p = 0.13$), respectively. Education did not contribute to greater compliance with the measures ($p < 0.01$), nor did higher education ($p \leq 0.01$). **Conclusion and implications for practice:** Increased education and professional experience did not contribute to greater compliance with the Standards Precautions. By considering aspects of nursing practice, occupational exposure prevention strategies can be reviewed and improved.

**Keywords:** Infection control; Universal Precautions; Nursing, Team; Occupational Exposure; Communicable Diseases.

## RESUMO

**Objetivo:** Verificar o cumprimento às Precauções-Padrão por profissionais de enfermagem e fatores associados. **Método:** Estudo descritivo, transversal, com 522 profissionais de enfermagem, realizado em dois hospitais brasileiros, entre janeiro de 2017 a março de 2018. Os dados foram coletados por meio de um formulário contendo variáveis demográficas e profissionais e a *Compliance with Standard Precautions Scale* (versão Português-Brasil); posteriormente, analisados por estatísticas descritivas e exploratórias e um modelo de regressão linear múltiplo. **Resultados:** O escore médio global 12,9 (DP=2,5). Técnicos de enfermagem tiveram escores médios estatisticamente significativos maiores ($p < 0,01$) do que enfermeiros. Houve diferença significativa quanto à categoria profissional ($p < 0,01$) e escolaridade ($p < 0,01$), e, marginalmente significativa em relação à idade ($p = 0,06$). Não houve diferenças quanto à experiência profissional ($p = 077$), participação em treinamentos ($p = 0,79$), tipo de hospital ($p = 0,13$), respectivamente. A escolaridade não contribuiu para um maior cumprimento às medidas ($p < 0,01$), assim como o ensino superior ($p \leq 0,01$). **Conclusão e Implicações para a prática:** O aumento na escolaridade e experiência profissional não contribuiu para maior cumprimento às Precações. Por contemplar aspectos da prática de enfermagem, estratégias de prevenção de exposição ocupacional podem ser revistas e aperfeiçoadas.

**Palavras-chave:** Controle de Infecção; Precauções Universais; Equipe de Enfermagem; Exposição Ocupacional; Doenças Transmissíveis.

## RESUMEN

**Objetivo:** Verificar la observancia de las Precauciones Estándar por parte de profesionales de enfermería, y sus factores asociados. **Método:** Estudio descriptivo, transversal, con 522 profesionales de enfermería, realizado en dos hospitales brasileños entre enero de 2017 y marzo de 2018. Datos recolectados mediante formulario incluyendo variables sociodemográficas y profesionales, y *Compliance with Standard Precautions Scale* (versión Portugués-Brasil); analizados por estadística descriptiva y exploratoria y un modelo de regresión lineal múltiple. **Resultados:** Puntaje medio global de 12,9 (DS=2,5). Los auxiliares de enfermería obtuvieron puntajes promedio mayores, estadísticamente significantes (p<0,01) respecto de los enfermeros. Existió diferencia significante respecto de la categoría profesional (p<0,01) y la escolarización (p<0,01); y marginalmente significante en relación a la edad (p=0,06). No hubo diferencias relativas a la experiencia profesional (p=0,77), participación en capacitaciones (p=0,79) y tipos de hospital (p=0,13). La escolarización no contribuyó a una mayor observancia de las medidas (p<0,01), al igual que los estudios superiores (p≤0,01). **Conclusión e Implicaciones para la práctica:** Mayores grados de escolarización y experiencia profesional no contribuyeron a la observancia de las Precauciones. En razón de contemplar aspectos de la práctica de enfermería, las estrategias de prevención y exposición profesional merecen ser revisadas y perfeccionadas.

**Palabras clave:** Control de Infecciones; Precauciones Universales; Grupo de Enfermería; Exposición Profesional; Enfermedades Transmisibles.

## INTRODUCTION

Nursing professionals are vulnerable to the risks of occupational exposure and are exposed to the viruses of human immunodeficiency (HIV) and hepatitis B (HBV) and C (HCV) due to contact with blood and other body fluids, as documented in the literature.[1]

The adoption of specific protective measures for health professionals becomes a major challenge, considering the COVID-19 pandemic and the overload of the health system. In addition to high infection rates, infected professionals can also become a vehicle for transmitting the virus to patients and other people with whom they maintain contact, if they do not take the proper protective measures.[2,3]

A set of measures called Standard Precautions (SP), formerly called Universal Precautions, were recommended for all health services to protect health professionals, given the possibility of contact with body fluids, regardless of the patient's presumed or suspected diagnosis.[4]

The SP contemplate essential practices for the prevention and control of infection in health care, such as hand hygiene, the use of gloves and the maintenance of a safe environment, such as the correct disposal of piercing or cutting materials, and the cleaning of floors and other surfaces after blood spill.[2-5]

Thus, since the SP include measures that contribute to reducing healthcare-associated infections (HAIs), such as hand hygiene, health professionals also promote safety to the patients under their care when fulfilling the SP.[6-9]

Compliance with the SP can be influenced by individual, psychosocial and organizational factors.[5,7-11] In order to measure the adherence of professionals, research has pointed out that even more than twenty years after the publication of the SP, health professionals and students, including those in nursing, still have difficulties complying with the recommendations.[5,7,10-18]

Low adherence to hand hygiene, incorrect use, ignorance and devaluation of the use of personal protective equipment (PPE) were pointed out as reasons for non-compliance with the SP.[10,11,17]

Considering all these aspects, this study aimed to verify compliance with the SP by nurses and nursing professionals, as well as the associated factors.

## METHOD

This is a descriptive, cross-sectional and quantitative study that was carried out in two Brazilian hospitals, one public and the other philanthropic, between March 2017 and January 2018.

The public teaching hospital is a reference for medium- and high-complexity treatments for 27 municipalities in the *Triângulo Mineiro*, with 320 beds. The philanthropic hospital is a reference for 53 municipalities in the Midwest region of Minas Gerais, with 300 beds.

The population consisted of 1240 nursing professionals who worked in the admissions (wards) and high complexity sectors, who met the following inclusion criteria: exercising the function of nurse, nurse technician and nursing aide; acting in direct care and in the selected sectors. Those who held managerial positions or administrative activities at the time of data collection were excluded.

Initially, the sample size calculation considered a proportion referring to the categories and institutions to which the participants belonged, and also a coefficient of determination $R^2 = 0.02$ in a multiple linear regression model with six variables (level of significance or type 01 error of $\alpha=0.05$ and type II error of $\beta=0.2$) and statistical power of 80%. A sample size of 674 was obtained by using the Power Analysis and Sample Size, application version 13, introducing the values mentioned. Considering a loss of 15% (refusal to participate), 775 participants were drawn; however, 522 professionals participated. The following power analysis of a multiple linear regression model, with six variables and a coefficient of determination $R^2 = 0.055$, indicated a statistical power of 99.1%. Thus, the losses did not compromise the preliminary stipulated statistical power. The professionals drawn were approached and invited by the researchers to participate in the research, in their own work shift.

A form was developed by the researchers with demographic and professional variables: gender (female or male), age (in years), professional category (nurses, nursing technicians or nursing aides), work experience (in years), institution (public or philanthropic), weekly workload (in hours), work sector (high complexity or wards) and participation in training on Standard Precautions. The Brazilian Portuguese version of the "Compliance with Standard Precautions Scale" (CSPS-PB) was also applied.[15] The answered instruments were placed by the participants themselves in unidentified envelopes, sealed and handed to the researcher at the end of filling. The instrument could not be handed in at another time.

The CSPS is a Likert-type scale built and validated for nursing professionals, with four answer options (never, seldom, sometimes and always) that indicate the frequency of compliance with the SP. It consists of 20 items allocated into five dimensions. The instrument was considered adequate to measure compliance with the SP, and its authors allowed the application and development of this study.[15]

Bearing in mind that professionals must fully adhere to the SP, the option "always" was expected to total the majority of responses. On the other hand, the option "never" was expected for inverted items (items 2, 4, 6 and 15); the individual score of the CSPS-PB varies from 0 to 20 and therefore, the higher the score, the better the compliance with the SP (average between groups and percentage).

The data were entered into an Excel® spreadsheet for Windows XP®, validated by double entry (typing) and transferred and analyzed using the Statistical Package for the Social Sciences (SPSS), version 19.0.

Compliance with the SP (dependent variable) was analyzed according to the maximum score (20) in the global CSPS-PB. Measures of central tendency (mean and median) and dispersion (standard deviation) were used to assess the quantitative variables to characterize the participants and the demographic

and professional variables. The categorical measures used were absolute and relative frequencies. The chi-square test was used to verify whether there was a correlation between the dependent variable and the dichotomized categorical independent variables (gender, hospital of employment and participation in SP training). The Spearman test was used to evaluate the nominal and ordinal variables.

Using the independent variables selected according to the national and international literature relevant to the outcome and the estimated regression coefficients, the independent variables proved to be satisfactory to the model in terms of linearity, constant variance, independence, and normality. Thus, professional category, age, education, hospital of employment, professional experience and participation in SP training were indicated for the saturation regression model (Enter Method).

This study was carried out in accordance with resolution 466/12 of the National Health Council. The project was submitted for consideration and approved by the Research Ethics Committee (Opinion n.1.953.499/2017, CAAE: 457346616.1.0000.5154).

## RESULTS

Most participants were female (n = 522 / 80.8%), with a mean age of 37.2 (SD ± 8.9) years, and in the role of nursing technician (n = 367 / 70.3%). The answers indicated more than 10 years of formal education (73.8%), working in clinical or surgical care wards in both hospitals.

Regarding the number of workplaces, most worked in only one place (90.8%) for less than five years (62.3%), with an average of 42.1 working hours (SD ± 12.0) in nursing during the week, with a minimum of 12 hours and a maximum of 128. (Table 1).

Considering the percentage of responses "always", equivalent to 100% compliance with each item on the scale, most participants had no positive results regarding compliance with the SP, especially regarding the use of masks and goggles. The reuse of masks was pointed out by most participants.

The items with higher percentage of compliance by both categories were related to hand hygiene and recapping of contaminated needles (Table 1).

**Table 1.** Distribution and percentage of compliance with the Standard Precautions by nursing professionals (n=522), according to the items on the CSPS-PB scale. Uberaba-MG, 2017-2018.

| Items of the Compliance with Standard Precautions Scale | Nurse | | | | Nursing technicians | | | |
|---|---|---|---|---|---|---|---|---|
| | Yes | | No | | Yes | | No | |
| | n | % | n | % | n | % | n | % |
| 1. I wash my hands between patient contacts. | 155 | 100 | - | - | 367 | 100 | - | - |
| 2. I only use water for hand washing. | 141 | 91.0 | 14 | 9.0 | 325 | 88.6 | 42 | 11.4 |
| 3. I use alcoholic hand rubs as an alternative if my hands are not visibly soiled. | - | - | 155 | 100 | - | - | 367 | 100 |
| 4. I recap used needles after giving an injection. | 149 | 96.1 | 06 | 3.9 | 351 | 95.6 | 16 | 4.4 |
| 5. I put used sharp articles into sharps boxes. | - | - | 155 | 100 | - | - | 367 | 100 |
| 6. The sharps box is disposed only when it is full. | 89 | 57.4 | 66 | 42.6 | 193 | 52.6 | 174 | 47.4 |
| 7. I remove Personal Protective Equipment (PPE) in a designated area. | - | - | 155 | 100 | - | - | 367 | 100 |
| 8. I take a shower in case of extensive splashing even after I have put on Personal Protective Equipment (PPE). | - | - | 155 | 100 | - | - | 367 | 100 |
| 9. I cover my wound(s) or lesion(s) with waterproof dressing before patient contacts. | - | - | 155 | 100 | - | - | 367 | 100 |
| 10. I wear gloves when I am exposed to body fluids, blood products, and any excretion of patients. | - | - | 155 | 100 | - | - | 367 | 100 |
| 11. I change gloves between patient contacts. | - | - | 155 | 100 | - | - | 367 | 100 |
| 12. I decontaminate my hands immediately after removal of gloves. | - | - | 155 | 100 | - | - | 367 | 100 |
| 13. I wear a surgical mask alone or in combination with goggles, face shield and apron whenever there is a possibility of a splash or splatter. | - | - | 155 | 100 | - | - | 367 | 100 |

**Table 1.** Continued...

| Items of the Compliance with Standard Precautions Scale | Nurse | | | | Nursing technicians | | | |
|---|---|---|---|---|---|---|---|---|
| | Yes | | No | | Yes | | No | |
| | n | % | n | % | n | % | n | % |
| 14. My mouth and nose are covered when I wear a mask. | - | - | 155 | 100 | - | - | 367 | 100 |
| 15. I reuse a surgical mask or disposable Personal Protective Equipment (PPE). | 138 | 89.0 | 17 | 11.0 | 318 | 86.6 | 49 | 13.4 |
| 16. I wear a gown or apron when exposed to blood, body fluids or any patient excretions. | - | - | 155 | 100 | - | - | 367 | 100 |
| 17. Waste contaminated with blood, body fluids, secretion and excretion is placed in red plastic bags irrespective of the patient's infection status. | - | - | 155 | 100 | - | - | 367 | 100 |
| 18. I decontaminate surfaces and equipment after use. | - | - | 155 | 100 | - | - | 367 | 100 |
| 19. I wear gloves to decontaminate used equipment with visible soils. | - | - | 155 | 100 | - | - | 367 | 100 |
| 20. I clean up spillage of blood or other body fluids immediately with disinfectants. | - | - | 155 | 100 | - | - | 367 | 100 |

The global score mean of compliance with the SP (n=522) was 12.8 (SD ± 2.4), with a minimum of five, and a maximum of 20. The average scores of compliance with the SP were higher among males (Table 1).

Nursing technicians had higher average scores than nurses (Table 2) and the results showed a statistically significant correlation between the groups ($p < 0.01$).

The estimated regression coefficients and the independent variables were satisfactory according to the model as for the aspects of linearity, constant variance, independence, and normality. The analysis resulted in the statistically significant model [$F_{(6.479)}$ = 5.513; $p < 0.01$; $R^2$ 0.065] described in Table 3.

The following factors were associated with compliance with the Standard Precautions: being a nursing technician (p<0.01) with a higher educational level (p<0.01), regardless of age (p=0.06), professional experience (p=077), participation in training (p=0.79) and type of hospital (p=0.13).

## DISCUSSION

This study verified the compliance with the SP by nursing professionals and the associated factors, and the results showed that compliance was lower than expected in most items on the scale. Professional category and educational level were the factors associated with compliance with the SP.

Most participants were female working as nursing technicians. However, men had higher scores than women in the analysis of the mean scores of compliance with the SP. These data corroborate other studies on compliance with the SP, which also had a greater participation of women.[13,15]

Regarding professional category, there was greater compliance with the SP among nursing technicians than among nurses, which may be linked to the fact that nursing technicians have a greater participation in procedures involving blood and other body fluids than nurses. As team leaders, nurses are more focused on the supervision of these activities. These results differ from other self-reported studies.[14,15,19]

Most nursing technicians reported having a bachelor's degree in nursing or another field. However, according to the regression analysis and contrary to the hypothesis, the increase in years of study was not associated with increased compliance with the SP. The results were different from another study in which the academic nursing level was a predictor associated with increased compliance with the SP.[17]

The nursing team is composed of distinct categories in Brazil, with differences related to years of study. This research included the participation of nurses with four or five years of study (bachelor's degree), and nursing technicians with two years of a specific course. These two categories assume different responsibilities in clinical practice, and nursing technicians perform more procedures involving body fluids, which may justify their higher scores for compliance with the SP.

Type of hospital or work sector were not considered predictors of compliance with the SP, although differences were observed in the mean scores of these variables. The results showed that most of the participants in this study worked in a single hospital. Other studies have pointed out that a good part

**Table 2.** Association of mean scores of compliance with the SP according to different groups of nursing professionals (N=522). Uberaba, 2017-2018

| Variable | n (%) | Average scores | Standard deviation | P |
|---|---|---|---|---|
| **Gender** | | | | |
| Female | 422 (80.8) | 12.7 | 2.42 | 0.19* |
| Male | 100 (19.2) | 13.1 | 2.63 | |
| **Category** | | | | |
| Nurse | 155 (29.6) | 12.3 | 2.53 | < 0.01* |
| Nursing technicians | 367 (70.3) | 13.0 | 2.39 | |
| **Hospital** | | | | |
| Public | 399 (76.4) | 12.9 | 2.51 | 0.13* |
| Philanthropic | 123 (23.5) | 12.6 | 2.26 | |
| **Work Sector** | | | | |
| High Complexity | 288 (55.1) | 12.8 | 2.48 | 0.75* |
| Wards | 222 (44.9) | 12.8 | 2.43 | |
| **Participation in Training on Standard Precautions** | | | | |
| Yes | 394 (75.4%) | 12.8 | 2.48 | 0.64* |
| No | 128 (24.5%) | 12.9 | 2.41 | |

* Chi-square test

**Table 3.** Multiple linear regression of factors related to nurses' compliance with Standard Precautions (n=522). Uberaba, 2017- 2018

| Variable | B | Standard Error | β | t | Confidence Interval (CI) 95% | | P |
|---|---|---|---|---|---|---|---|
| | | | | | Minimum | Maximum | |
| Professional Category | .063 | .241 | 0.11 | 0.26 | 0.14 | 1.03 | ≤ 0.01 |
| Age* | .590 | .225 | 0.11 | 2.62 | -0.00 | 0.05 | 0.06 |
| Education** | .029 | .016 | −0.18 | 1.83 | −0.64 | −0.23 | ≤ 0.01 |
| Hospital | -.442 | .104 | −0.01 | −4.23 | −0.55 | 0.43 | 0.80 |
| Professional experience (in years)*** | -.005 | .018 | −0.01 | −0.24 | −0.04 | 0.03 | 0.77 |
| Standard Precautions Training | -.062 | .252 | 0.01 | −0.28 | −0.41 | 0.53 | 0.79 |

[1] Dependent variable: Average score of compliance with the Standard Precautions; * Missing data 5.3% (n = 494); ** Missing data 0.1% (n = 521); *** Missing data 0.1% (n = 521)

of nursing professionals has double work relationships with a heavy workload,[20-22] which can increase the risks of exposure to potentially contaminated biological material and influence the compliance with the SP.

The performance in a single workplace could be explained by the change in management of the public hospital, who admitted most professionals in the five years prior to the collection of the study data. This situation was also pointed out in another study carried out in the same state, in a public hospital with the same profile.[23]

Previous studies have shown that the weekly workload can influence compliance with the SP.[14,23-25] Workload was not assessed in the regression model of this study, because most participants work in a single location.

According to a Chinese study, hospital managers need to increase human resources appropriately to reduce the intensity of work and contribute to improving compliance with the SP, while also reducing occupational risks.[14]

The results of this study can contribute to the discussion of aspects related to nursing education programs and the labor market. Considering that there has been an increase in positions in higher education and graduate courses in recent years in Brazil, which contributed to an advance in nursing education and to the increased presence of these professionals at the bedside,[20,21] greater compliance with the SP was expected, which was not pointed out in the results, as it is not the subject of this study.

There was also no significant difference in compliance with the SP among nursing professionals who did or did not participate

in SP training. This finding differs from another study carried out in Italy, in which participants who attended at least one training had higher compliance scores than others who did not.[16]

Differences in compliance with the SP between nursing categories can be considered in planning strategies to prevent occupational exposures and infections related to health care.

Considering the Covid-19 pandemic, the authors of one study pointed out that the SP are extremely necessary for the protection of health professionals and for this reason, it is important that they learn and value preventive measures since nursing school. Therefore, there is a need for revision of the undergraduate curricula, so that in the future professionals can be prepared to face emerging diseases and value not only individual measures, but mainly the management of PPE in health services.[26]

Taking the sample studied into account, the results cannot be extrapolated to all nursing professionals who work in hospitals, which can be considered as a study limitation. Another point is the fact that the instrument was applied at the workplace, in addition to being answered by the participants themselves, which may not reflect the reality of compliance with the SP in its entirety. Finally, the reproduction of this research by electronic means or in a home environment may bring different results.

The CSPS-PB includes aspects of clinical nursing practice and the results of this study can contribute to the planning of in-service education actions, and guide strategies for the prevention of occupational exposure involving biological material.

## CONCLUSION

Compliance with the SP was lower than expected for most items on the scale. In addition, younger age was associated with less compliance. Among the different professional categories, nurses had higher scores than nursing technicians. Higher education contributed negatively to compliance with the SP. Results was different from those expected, since most participants had a college degree and received training on SP compliance.

## AUTHOR'S CONTRIBUTIONS

Study design. Silmara Elaine Malaguti-Toffano

Data collection or production. Damiana Aparecida Trindade Monteiro. Juliano Teixeira Moraes. Nathália Montanher Rodrigues. Leticia Nunes Torres. Vitória Helena Pereira.

Data analysis. Silmara Elaine Malaguti-Toffano. Damiana Aparecida Trindade Monteiro. Nathália Montanher Rodrigues. Leticia Nunes Torres. Vitória Helena Pereira. Elucir Gir. Mariana Alvina dos Santos.

Interpretation of results. Silmara Elaine Malaguti-Toffano. Damiana Aparecida Trindade Monteiro. Juliano Teixeira Moraes. Nathália Montanher Rodrigues. Leticia Nunes Torres. Vitória Helena Pereira. Elucir Gir. Mariana Alvina dos Santos.

Writing and critical review of the manuscript. Vitória Helena Pereira. Leticia Nunes Torres. Nathália Montanher Rodrigues. Damiana Aparecida Trindade Monteiro. Juliano Teixeira Moraes. Fernanda Maria Vieira Pereira-Ávila. Mariana Alvina dos Santos. Elucir Gir. Silmara Elaine Malaguti-Toffano

Approval of the final versión of the article. Vitória Helena Pereira. Leticia Nunes Torres. Nathália Montanher Rodrigues. Damiana Aparecida Trindade Monteiro. Juliano Teixeira Moraes. Fernanda Maria Vieira Pereira-Ávila. Mariana Alvina dos Santos. Elucir Gir. Silmara Elaine Malaguti-Toffano

Responsibility for all content aspects and integrity of the published article. Vitória Helena Pereira. Leticia Nunes Torres. Nathália Montanher Rodrigues. Damiana Aparecida Trindade Monteiro. Juliano Teixeira Moraes. Fernanda Maria Vieira Pereira-Ávila. Mariana Alvina dos Santos. Elucir Gir. Silmara Elaine Malaguti-Toffano

## ASSOCIATE EDITOR

Rafael Celestino da Silva

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