

Reporting the adverse events and healthcare-associated infections in relation to the work environment

Zgłaszanie zdarzeń niepożądanych i zakażeń związanych z opieką zdrowotną w odniesieniu do środowiska pracy

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STRESZCZENIE

ZGŁASZANIE ZDARZEŃ NIEPOŻĄDANYCH I ZAKAŻEŃ ZWIĄZANYCH Z OPIEKĄ ZDROWOTNĄ W ODNIESIENIU DO ŚRODOWISKA PRACY

Cel pracy. Celem tego wielośrodkowego badania była analiza zgłaszania zdarzeń niepożądanych i zakażeń związanych z opieką zdrowotną (HAI) w odniesieniu do środowiska pracy.

Materiał i metody. To przekrojowe, wielośrodkowe badanie przeprowadzono w 14 szpitalach opieki doraźnej (w przypadkach nagłych) na terenie Republiki Czeskiej. Do badania włączono 105 oddziałów szpitalnych opieki w przypadkach nagłych. Do oceny środowiska praktyki wykorzystano *the Practice Environment Scale of the Nursing Work Index*. Ankiety oceniającą środowisko praktyki wypełniło 805 pielęgniarek. Co tydzień zgłaszano dane dotyczące zdarzeń niepożądanych i zakażeń związanych z opieką zdrowotną.

Wyniki. Ogólna średnia liczba zdarzeń niepożądanych, w tym zakażeń związanych z opieką zdrowotną, wyniosła 27,7 ($\pm 36,10$) na 100 pacjentów, przy czym najczęstsze były odleżyny i upadki. Najczęstszymi zakażeniami związanymi z opieką zdrowotną były zakażenia dróg moczowych, przewodu pokarmowego i miejsca operacji. Analiza wszystkich zdarzeń niepożądanych i zakażeń związanych z opieką zdrowotną nie potwierdziła istotnego statystycznie związku pomiędzy środowiskiem praktyki pielęgniarskiej a występowaniem zdarzeń niepożądanych lub zakażeń związanych z opieką zdrowotną.

Wnioski. Zdarzenia niepożądane i zakażenia związane z opieką zdrowotną są ważnymi wskaźnikami jakości opieki nad pacjentami hospitalizowanymi. Żaden rodzaj środowiska praktyki pielęgniarskiej nie miał wpływu na zgłaszanie zdarzeń niepożądanych i zakażeń związanych z opieką zdrowotną.

Słowa kluczowe: środowisko placówki ochrony zdrowia, zakażenia, zarządzanie bezpieczeństwem, badanie wielośrodkowe

ABSTRACT

REPORTING THE ADVERSE EVENTS AND HEALTHCARE-ASSOCIATED INFECTIONS IN RELATION TO THE WORK ENVIRONMENT

Aim. The aim of this multicenter study was to analyze the reporting of the adverse events and health care-associated infections (HAIs) in relation to work environment.

Material and methods. This cross-sectional multicenter study was conducted in 14 acute care hospitals throughout the Czech Republic. A total of 105 acute care hospital wards were included in the study. The Practice Environment Scale of the Nursing Work Index was used to assess the practice environment. The questionnaire to assess the practice environment were completed by 805 nurses. The data on adverse events and HAIs were weekly reported.

Results. The overall mean number of adverse events including healthcare-associated infections was 27.7 (± 36.10) per 100 patients, the most frequent being pressure ulcers and falls. The most frequent healthcare-associated infections were urinary tract, gastrointestinal tract and surgical site infections. Analysis of all adverse events and HAIs failed to confirm a statistically significant relationship between the nursing practice environment and occurrence of adverse events or healthcare-associated infections.

Conclusions. Adverse events and healthcare-associated infections are important indicators of quality of care in hospitalized patients. No type of the nursing practice environment affected the reporting of adverse events and HAIs.

Key words: Health Facility Environment, infections, safety management, multicenter study

INTRODUCTION

Adverse events and healthcare-associated infections (HAIs) are important indicators of quality of care in hospitalized patients.

The occurrence of an adverse event has a range of harmful effects on both patients and healthcare workers, including physical and/or psychological harm, a loss of trust in the healthcare system, and reduced staff morale [1]. Large national reviews of patient charts estimate that approximately 10% of hospital admissions are associated with an adverse event [1].

Also known as nosocomial or hospital-acquired infections, HAIs affect patients in a hospital or another type of healthcare facility. A considerable proportion of HAIs are preventable, with a well-organized system for their prevention and control being cost-effective. The effectiveness of prevention and control is multiplied if targeted preventive measures are implemented, responding to continuous risk assessment and infection monitoring results, that is, reasonable surveillance is carried out [2].

As already mentioned, although risks cannot be eliminated, they may be minimized. More than a decade ago, this was formulated by the European Council recommendation on patient safety, subsequently incorporated into Czech legislation on healthcare quality management. Since 2018, monitoring of adverse events has been obligatory for all providers of inpatient healthcare services in the Czech Republic. The national System for Reporting Adverse Events is the first to monitor adverse events reported by all these providers. The reports include falls, pressure ulcers, clinical administration, clinical performance, medical records, medications and intravenous solutions, blood and blood products, diet and nutrition, medical gases, medical devices and equipment, behavior of individuals, accidents and unexpected injuries, technical problems, organization's resources and management, unexpected deterioration in condition and other adverse events [3].

Nurses play a crucial role in patient safety and in prevention of adverse events and HAIs. A good work environment constitutes a determinant factor for high care quality and, at the same time, relates to improved outcomes for nurses, such as intention to stay or job satisfaction [4,5,6]. Researchers [6,7,8] put their interest in finding the relationship between nurses' practice environment and outcomes, such as quality of care, intention to leave. It is believed that nurses working within positive environments are encouraged to work to best practice and work effectively with multidisciplinary team members, which, in turn, promotes the quality of care provided and results in better patient outcomes [9]. A good nurse work environment has been associated with lower levels of adverse events [10].

The aim of this multicenter study was to analyze the reporting of the adverse events and health care-associated infections in relation to work environment.

MATERIALS AND METHODS

This cross-sectional multicenter study was conducted in 14 acute care hospitals throughout the Czech Republic. Hospitals were selected from all regions of the Czech

Republic. Those who agreed to participate in research were personally contacted by project principal investigator in order to select research assistants in each department/ward included in the sample. A total of 105 acute care wards were included in the study. The number of surveyed units in the included hospitals varied from 2 to 14 with average mean of 8 units per hospital.

Data collection started in September 2019. The original intention was to conduct research for 12 months as a prospective observational study but data collection was interrupted by pandemic situation. The current study reports data from the first three months of the research. The data in this study comprise nurse survey data ($n = 805$) and hospital ward data ($n = 105$). All nurses working as bedside nurses in the selected hospital units were asked to participate in the research. Out of 1014 printed questionnaires distributed among nurses, 805 completed questionnaires were returned, a response rate of 79.39%.

The nursing practice environment was measured using the Practice Environment Scale of the Nursing Work Index (PES-NWI) [11]. The PES-NWI is an instrument containing five subscales: nurse participation in hospital affairs, staffing and resource adequacy, nursing foundations for quality of care, nurse manager ability, leadership, and support for nurses, and collegial nurse-physician relations [11]. The total number of items was 31. Nurses rated each item on a scale from 1 (strongly disagree) to 4 (strongly agree) to indicate whether the feature is 'present in the current job'. The mean of composite subscale scores rather than item scores was chosen to give equal weight to each subscale. Unit-level means were calculated for each item from each unit's nurse respondents. Unit-level subscale scores were calculated as the mean of the unit-level item scores. Based on the number of composite subscale, scores with values above 2.5 the unit nurse practice environments were classified as favorable, mixed, or unfavorable. Favorable settings are those with four or five subscales with scores greater than 2.5. Mixed settings are those with two or three subscales with scores greater than 2.5 and unfavorable settings none or one subscale [12]. The PES-NWI reliability measured by Cronbach's alpha was 0.84 [11]. The PES-NWI questionnaire was used with the permission of the author. The PES-NWI was translated from English to Czech language according to the Guidelines for the Process of Cross-Cultural Adaptation of Self-Report Measures [13], which included several steps: translation (two translations into the target language), synthesis of the translations (producing one translation), back translation, expert committee, test of the prefinal version (in a sample of 49 respondents). Two nursing experts, a professional translator and a native speaker were involved in the instrument translation process. The Czech version of the questionnaire was tested in May 2019 on a sample of 49 nurses from a selected Czech hospital. The translation process is described in another paper [14].

Data on organizational characteristics, HAIs and adverse events were collected by research assistants recruited in each participating hospital. These data were reported weekly by research assistants. The following information on nurse staffing was collected: the nurse-patient ratio and number of nurses on the day/night shift.

The information on patient workload was as follows: the number of patients during day/night shifts, new patient admissions during day/night shifts and patient discharges during day/night shifts.

Adverse events and HAIs were weekly reported based on patient records, nursing documentation or through hospital reporting systems. Nurses on each unit weekly reported adverse events and HAIs.

The research protocol was approved by the institutional ethics committee (no. 603/2017 Ethics Committee, University Hospital Ostrava, Czech Republic and no. 19/2017 Ethics Committee, Faculty of Medicine, University of Ostrava, Czech Republic). All participants were fully informed about the purpose of the study. Confidentiality of the participants was fully respected.

Descriptive statistics were used for describing and presenting unit characteristics. The Kruskal-Wallis test was

used for analyzing adverse events according to the type of the nursing practice environment. A p-values of <.05 were considered statistically significant. Statistical analyses were performed in Stata 14.

RESULTS

Nurses in our sample reported caring for a mean of 8.3 ± 3.56 patients. The mean number of patients in the ward was 23.5 ± 14.40 during day shifts and 23.3 ± 14.57 during night shifts. The number of patient admissions to the ward during day shifts was 4.0 ± 3.40 and during night shifts was 1.2 ± 1.01 (Tab. 1).

The overall mean number of adverse events including HAIs was $27.7 (\pm 36.10)$ per 100 hospitalized adults, the most frequent being pressure ulcers – a mean of $10.4 (\pm 31.34)$ per 100 patients, falls without injury – a mean

■ Tab. 1. Ward characteristics (n = 105)

	Day shifts				Night shifts			
	Mean±SD	Median	Min	Max	Mean±SD	Median	Min	Max
Number of nurses on the ward	2.3±1.90	2.0	1.0	15.0	1.6±0.88	1.3	0.7	6.9
Number of practical nurses on the ward	1.3±0.62	1.1	0.1	3.5	1.0±0.50	1.0	0	2.9
Number of nursing assistants/auxiliary staff on the ward	2.0±1.64	1.7	1.0	11.6	1.0±0.61	1.0	0	3.9
Number of patients on the ward	23.5±14.40	19.9	3.3	100.4	23.3±14.57	19.9	0	98.5
Number of patient admissions to the ward	4.0±3.40	3.0	0.8	26.1	1.2±1.01	1.1	0	7.5
Number of discharges from the ward	4.3±3.43	3.6	0.8	25.3	0.9±1.01	1.0	0	5.3
Number of patients assigned to a nurse*	8.3±3.56	7.4	1.5	20.9				

*nurses and practical nurses

■ Tab. 2. Prevalence of adverse events and HAIs per 100 hospitalized patients (n = 105 wards)

Adverse events and HAIs	Mean±SD	Median	Min	Max
Total adverse events	27.7±36.10	19.4	0.0	273.2
Pressure ulcers	10.4±31.34	2.6	0.0	254
Falls without injury	4.5±6.58	0.0	0.0	28.2
Falls with injury	1.9±3.59	0.0	0.0	20.4
Urinary tract infections	3.5±5.74	0.0	0.0	26.2
Gastrointestinal tract infections	1.5±3.64	0.0	0.0	22.4
Surgical site infections	1.1±3.53	0.0	0.0	19.7
Peripheral line-associated bloodstream infections	0.8±4.21	0.0	0.0	34.3
Failure to adhere to the time of administration of medication	0.5±2.83	0.0	0.0	21.9
Skin infections	0.5±1.72	0.0	0.0	10.4
Other infections	0.4±2.04	0.0	0.0	16.0
Improper preparation of patient before surgery	0.4±2.66	0.0	0.0	25.4
Respiratory tract infections	0.4±1.90	0.0	0.0	17.2
Others	0.4±1.53	0.0	0.0	10.6
Pneumonia	0.4±1.62	0.0	0.0	11.2
Patient identification	0.4±2.37	0.0	0.0	22.7
Central line-associated bloodstream infections	0.3±1.78	0.0	0.0	13.7
Other medication failures	0.3±1.41	0.0	0.0	8.3

HAI – healthcare-associated infections

■ Tab. 3. Unit-level perception of work environment (n = 105)

Work environment	n	%
Favorable	60	57
Mixed	33	31
Unfavorable	12	11
Total	105	100

■ Tab. 4. Analysis of adverse events per 100 patients in relation to the work environment (n = 105)

Item	Environment	n	Mean	SD	Min	Max	p-value
Pressure ulcers	Favorable	60	9.5	32.83	0.0	254.0	0.9211
	Mixed	33	13.7	24.14	0.0	142.8	
	Unfavorable	12	5.3	7.07	0.0	20.1	
Falls without injury	Favorable	60	4.7	6.62	0.0	28.2	0.8202
	Mixed	33	4.3	7.29	0.0	27.8	
	Unfavorable	12	3.7	4.29	0.0	10.0	
Falls with injury	Favorable	60	2.1	3.75	0.0	20.4	0.4775
	Mixed	33	1.8	3.74	0.0	16.0	
	Unfavorable	12	0.8	2.05	0.0	6.5	

■ Tab. 5. Analysis of HAIs per 100 patients in relation to the work environment (n = 105)

Item	Work environment	n	Mean	SD	Min	Max	p-value
Urinary tract infections	Favorable	60	4.3	6.04	0.0	22.4	0.2748
	Mixed	33	2.3	5.18	0.0	26.2	
	Unfavorable	12	2.8	5.49	0.0	15.3	
Gastrointestinal tract infections	Favorable	60	1.7	4.01	0.0	22.4	0.8052
	Mixed	33	1.2	2.66	0.0	9.4	
	Unfavorable	12	1.2	4.23	0.0	14.7	
Surgical site infections	Favorable	60	1.1	2.70	0.0	10.5	0.7335
	Mixed	33	1.0	4.06	0.0	19.7	
	Unfavorable	12	1.6	5.54	0.0	19.2	
Peripheral line-associated bloodstream infections	Favorable	60	1.4	5.50	0.0	34.3	0.7779
	Mixed	33	0.1	0.56	0.0	3.2	
	Unfavorable	12	0.0	0.00	0.0	0.0	

HAI – healthcare-associated infections

of 4.5 (±6.58) per 100 patients, and falls with injury – a mean of 1.9 (±3.59) per 100 patients.

The most frequent HAIs were urinary tract infections – a mean of 3.5 (±5.74) per 100 patients, gastrointestinal tract infections – a mean of 1.5 (±3.64) per 100 patients and surgical site infections – a mean of 1.1 (±3.53) per 100 patients (Tab. 2).

On average, nurses from 105 hospital departments considered their work environment as favorable on 60 (57%) wards, mixed on 33 (31%) wards and unfavorable on 12 (11%) wards (Tab. 3).

Analysis of all adverse events (Tab. 4) and HAIs (Tab. 5) failed to confirm a statistically significant relationship between the nursing practice environment and occurrence of adverse events or healthcare-associated infections

DISCUSSION

Presented study aimed at analysis of adverse events and HAIs in connection to work environment. The analysis showed that the adverse events most frequently reported by Czech nurses in our sample were pressure ulcers, followed by falls without injury and falls with injury.

The finding that falls and pressure ulcers are the common adverse events in hospitals may be explained by the fact that these are the least punishable situations in clinical practice and are reported by healthcare workers guided to do so [15]. In Korean study the most frequent nurse-perceived adverse events were falls [16]. In comparison, according to the Czech national System for Reporting Adverse Events, there were 135.99 pressure ulcers and 123.22 falls per 1000 patients in long-term care hospitals in 2019. In acute-care hospitals, the rates were 19.94 and 10.55 per 1000, respectively [3]. In the present study, nurses reported more adverse events and HAIs than those in the national system. This finding uncovered the problem of underreporting to the mandatory national reporting system. According to Aiken et al. [17], a more reliable estimate of the occurrence of adverse events may be provided by nurses' reports of adverse events.

“The systems approach requires a shift from a blame culture which incentivizes people to cover up, to an ethos of safety management in the context of a just culture to maximize the potential to avoid future adverse events” [1]. Also, the International Council of Nurses [18] promotes a culture that does not blame individuals, but encourages the reporting of all adverse events with the purpose of learning from them.

The primary purpose of patient safety reporting systems is to learn from experience [19]. Reporting in itself does not improve safety. It is the response to reports that leads to change. The most important function of a reporting system is to use the results of data analysis and investigation to formulate and disseminate recommendations for systems change [19].

Healthcare-associated infections, or infections acquired in healthcare settings, are the most frequent adverse event in healthcare delivery worldwide. Of every 100 hospitalized patients at any given time, seven in developed and ten in developing countries acquire at least one HAI [19]. Among all HAIs in the present study, urinary tract infections were most commonly reported. This is in congruence with the literature findings that urinary tract infections account for the majority of HAIs, with most of these occurring in catheterized patients. Nosocomial urinary tract infections account for up to 40% of all HAIs [20].

The present study failed to confirm relationships between HAIs and adverse events and the nursing practice environment. No type of the nursing practice environment affected the prevalence of adverse events including HAIs. Our findings are in congruence with the study Kang et al. [16], where no hospital-level nursing practice environment variable affected the rate of nurse-perceived HAIs. On the contrary, a Korean study confirmed that a better work environment had a significant inverse relationship with adverse events [9]. In another study in nursing homes [10], poor work environment was significantly associated with adverse events. Our findings pointed out an interesting phenomenon where mean number of reported adverse events and HAIs was higher in favorable work environment and lower in unfavorable work environment. Even though our findings were not supported by statistical significance, it can highlight that favorable work setting supports reporting adverse events and HAIs without blaming individuals. Reporting culture is often mentioned as a leading factor behind differences in reporting [21]. An effective reporting system is the cornerstone of safe practice and, within a hospital or other health-care organization, a measure of progress towards achieving a safety culture [19].

Although human errors play a role in serious adverse events, there are usually inherent system factors, which, if addressed properly, would have prevented the errors or reduced the likelihood of their occurrence [18]. The prevalence of patient falls and pressure ulcers is significantly influenced by several characteristics of the nursing practice environment, namely collaborative relationships, positively perceived communication between nurses and physicians, nurse education, and nursing experience [22]. However, this is in contrast to the present study and so are

the findings from a systematic review showing that there is evidence on associations between work environment and nurse-sensitive patient outcomes [22].

This preliminary research will continue after unintended break as a 12-month prospective observational study to determine the association between the practice environment and nurse-sensitive patient outcomes including pressure ulcers, falls, urinary catheter-associated urinary tract infections, and central line catheter-associated bloodstream infections.

CONCLUSIONS


Our study confirmed that the most frequent adverse events in our sample were pressure ulcers and falls. The most frequent HAIs were urinary tract, gastrointestinal tract and surgical site infections. No type of the nursing practice environment affected the prevalence of adverse events and HAIs. Nurses from favorable practice environment reported more adverse events than nurses in unfavorable work environment. To report adverse events and HAIs, it is necessary to support no blame culture in nurse practice environment.


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REFERENCES

- Rafter N, Hickey A, Condell S, et al. Adverse events in healthcare: learning from mistakes. *QJM*. 2015; 108(4): 273-277. doi: 10.1093/qjmed/hcu145.
- Jindrák V, Pratingerová J, Hedlová D. [online]. Praha: National Institute of Public Health; 2012. [cit. 2021-11-14]. Present concept of the prevention and control of health care-associated infections. Part II: The scope, objectives, and methods of surveillance of health care-associated infections at local, national, and international levels. Centre for Epidemiology and Microbiology reports. Available from: http://www.szu.cz/uploads/documents/CeM/Zpravy_EM/21_2012/05_kveten/180_koncept_II.dil.pdf
- System for Reporting Adverse Events [online]. Praha: System for Reporting Adverse Events; 2019 [cit. 2021-9-5]. Adverse events in 2019. Available from: https://shnu.uzis.cz/res/file/analyzy/shnu_data_2019_vysledky.pdf
- Copanitsanou P, Fotos N, Brokalaki H. Effects of work environment on patient and nurse outcomes. *Br. J. Nurs.* 2017; 26(3): 172-176. doi: 10.12968/bjon.2017.26.3.172.
- Al-Hamdan Z, Manojlovich M, Tanima B. Jordanian Nursing Work Environments, Intent to Stay, and Job Satisfaction. *J. Nurs. Scholarsh.* 2017; 49(1): 103-110. doi: 10.1111/jnu.12265.
- Phillips LA, de Los Santos N, Jackson J. Licenced practical nurses' perceptions of their work environments and their intention to stay: A cross-sectional study of four practice settings. *Nurs. Open.* 2021; 8(6): 3299-3305. doi: 10.1002/nop2.1046.
- Aiken LH, Sloane DM, Clarke S, et al. Importance of work environments on hospital outcomes in nine countries. *Int. J. Qual. Health Care.* 2011; 23(4): 357-364. doi: 10.1093/intqhc/mzr022.
- Roche MA, Duffield C, Friedman S, et al. Changes to nurses' practice environment over time. *J. Nurs. Manag.* 2016; 24(5): 666-675. doi: 10.1111/jonm.12371.
- Cho E, Chin DL, Kim S, et al. The Relationships of Nurse Staffing Level and Work Environment With Patient Adverse Events. *J. Nurs. Scholarsh.* 2016; 48(1): 74-82. doi: 10.1111/jnu.12183.
- Choi S, Cho E, Kim E, et al. Effects of registered nurse staffing levels, work environment, and education levels on adverse events in nursing homes. *Sci. Rep.* 2021; 11(1): 21458. doi: 10.1038/s41598-021-00946-8.
- Lake ET. Development of the practice environment scale of the Nursing Work Index. *Res Nurs. Health.* 2002; 25(3): 176-188. doi: 10.1002/nur.10032.
- Lake ET, Friese CR. Variations in nursing practice environments: relation to staffing and hospital characteristics. *Nurs. Res.* 2006; 55(1): 1-9. doi: 10.1097/00006199-200601000-00001.
- Beaton DE, Bombardier C, Guillemin F, et al. Guidelines for the process of cross-cultural adaptation of self-report measures. *Spine (Phila Pa 1976).* 2000; 25(24): 3186-3191.
- Zeleníková R, Jarošová D, Plevová I, et al. Vztah pracovního prostředí sester a nedokončené ošetrovatelské péče – první výsledky výzkumu v České republice. *Zdravotnické listy.* 2021; 9(1): 12-18.
- Joint Accreditation Commission of the Czech Republic [online]. Joint Accreditation Commission of the Czech Republic; 2019. [cit. 2021-9-5]. A new trend in care safety? Proactive risk prevention instead of mere counting of adverse events. Available from: <https://www.sakcr.cz/page/news/245>
- Kang JH, Kim CW, Lee SY. Nurse-perceived patient adverse events and nursing practice environment. *J. Prev. Med. Public Health.* 2014; 47(5): 273-280. doi: 10.3961/jpmph.14.019.
- Aiken LH, Sochalski J, Lake ET. Studying outcomes of organizational change in health services. *Med. Care.* 1997; 35(11): NS6-18. doi: 10.1097/00005650-199711001-00002.
- International Council of Nurses [online]. Geneva: International Council of Nurses; 2012 [cit. 2021-11-5]. Patient safety. Available from: https://www.icn.ch/sites/default/files/inline-files/D05_Patient_Safety.pdf
- World Health Organization [online]. World alliance for patient safety; Geneva, 2005 [cit. 2021-11-25]. WHO Draft guidelines for adverse event reporting and learning system: from information to patient. Available from: [WHO-EIP-SPO-QPS-05.3-eng.pdf](https://www.who.int/eip/spo-qps-05.3-eng.pdf)
- Kalsi J, Arya M, Wilson P, et al. Hospital-acquired urinary tract infection. *Int J Clin Pract.* 2003; 57(5): 388-391.
- Rasmussen K, Pedersen AH, Pape L, et al. Work environment influences adverse events in an emergency department. *Dan. Med. J.* 2014; 61(5): A4812.
- Stalpers D, de Brouwer BJ, Kaljouw MJ, et al. Associations between characteristics of the nurse work environment and five nurse-sensitive patient outcomes in hospitals: a systematic review of literature. *Int. J. Nurs. Stud.* 2015; 52(4): 817-835. doi: 10.1016/j.ijnurstu.2015.01.005.

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