



ORIGINALES

Notification of incidents related to health care in a teaching hospital

Notificação de incidentes relacionados à assistência à saúde em um hospital de ensino

Notificación de incidentes relacionados con la atención a la salud en un hospital docente

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ABSTRACT:

Objective: Analyzing incidents related to health care in a teaching hospital.

Method: A quantitative research carried out based on notifications of incidents carried out between 2016 and 2018. The data were processed in STATA version 12.

Results: The incidence of adverse events was 3.82 per 100 patient-days. The adult hospitalization units were the main notifiers, 57.20%; adult patients, 52.75%; females, 52.9%; blacks, 80.01%; singles, 47.62%; with low or no schooling, 50.91%, were the main ones. The nurses were the main notifiers, 80.38%. Phlebitis, 27.05%; surgeries, 19.20%; and falls, 17.27%, were the most reported incidents, whose damage was classified as mild in 91.52%, but there were three deaths in the period.

Conclusion: The analysis of incidents allows us to highlight the importance of notifications for the planning and implementation of measures that can contribute to the strengthening of the patient safety culture.

Key words: Notification, Adverse events, Patient safety, Teaching hospitals, Nursing

RESUMO:

Objetivo: Analisar os incidentes relacionados à assistência à saúde em um hospital de ensino.

Método: Pesquisa quantitativa, realizada a partir das notificações de incidentes realizadas entre 2016 e 2018. Os dados foram processados no programa STATA versão 12.

Resultados: A incidência de eventos adversos foi 3,82 por 100 pacientes-dia. As unidades de internação para adultos foram os locais com maior ocorrência de incidentes, 57,20%; os pacientes adultos, 52,75%; do sexo feminino, 52,9%; negros, 80,01%; solteiros, 47,62%; com baixa ou nenhuma escolaridade, 50,91%, foram os principais atingidos. Os enfermeiros foram os principais notificadores, 80,38%. As flebites, 27,05%; cirurgias, 19,20%; e quedas, 17,27%, foram os incidentes mais notificados, cujos danos foram classificados como leves em 91,52%, mas houve 03 óbitos no período.

Conclusão: A análise dos incidentes permite destacar a importância das notificações para o planejamento e implementação de medidas que possam contribuir para o fortalecimento da cultura de segurança do paciente.

Palavras-chave: Notificação; Eventos adversos; Segurança do paciente; Hospitais de ensino; Enfermagem.

RESUMEN:

Objetivo: Analizar los incidentes relacionados con la atención médica en un hospital docente.

Método: Investigación cuantitativa, realizada con base en las notificaciones de incidencias realizadas entre 2016 y 2018. Los datos se procesaron en la versión 12 del programa STATA.

Resultados: La incidencia de eventos adversos fue de 3,82 por cada 100 pacientes-día. Las unidades de hospitalización para adultos fueron los lugares con mayor incidencia de incidentes, 57,20%; pacientes adultos, 52,75%; mujeres, 52,9%; negros, 80,01%; solteros, 47,62%; con escolarización baja o nula, el 50,91%, fueron los principales. Las enfermeras fueron los principales notificadores, 80,38%. Flebitis, 27,05%; cirugías, 19,20%; y las caídas, el 17,27%, fueron los incidentes más reportados, cuyos daños fueron clasificados como leves en el 91,52%, pero hubo 03 muertes en el período.

Conclusión: El análisis de los incidentes permite destacar la importancia de las notificaciones para la planificación e implementación de medidas que puedan contribuir al fortalecimiento de la cultura de seguridad del paciente.

Palabras clave: Notificación; Eventos adversos; Seguridad del paciente; Hospitales de enseñanza; Enfermería

INTRODUCTION

Patient safety is a global concern, affecting all health systems in both developed and developing countries⁽¹⁾. In health organizations, such as complex organizations whose zero risk is impossible to obtain, the existence of mechanisms for managing incidents related to health care and minimizing their impacts contribute to the development of reliable/reliable systems⁽²⁾. As a strategy to improve care and care provided, issues related to patient safety have been gaining prominence. Globally, the World Health Organization (WHO) launched, in 2004, the World Alliance for Patient Safety to foster discussions on the subject and to stimulate the development of actions for patient safety and the reduction of adverse events (AE)⁽³⁾.

The approach to patient safety has been emphasized as a pressing need, according to an editorial in The Lancet "Patient safety is not a luxury". This publication reinforces the importance of structuring systems and environments in health services capable of promoting reduction of errors⁽⁴⁾. The WHO infers that, in the world, there is an avoidable adverse event for every 10 patients during the use of health services⁽⁵⁾. An estimated 4.2 million patients worldwide suffer damage or death annually due to unsafe care practices or errors. The annual cost derived from these practices is estimated at US\$ 42 billion, consuming about 1% of global health expenditures⁽¹⁾.

Since safety risks in the care process are inevitable, although partly preventable^(1,5), the role of reporting incidents related to health care, whose primary purpose is to communicate security threats, such as near failures, incidents or adverse events, and the possibility of supporting learning from experience, stands out. A good internal notification system can be used to identify threats to patient safety and ensure that everyone involved is aware of such threats. Thus, notifications are important for monitoring progress in error prevention, to allow the monitoring of safe practices and to improve patient safety^(1,6-8). Notification systems allow the collection of information, analysis and dissemination of lessons learned⁽⁸⁾.

The information obtained from the notifications are determinant for decision makers, responsible for the development and management of safety policies, health professionals and patients⁽⁹⁾, and may support the implementation of organizational improvements^(6,10). Decision-making based on data on incident notifications, then, should be a commitment made by the agents involved in public policies for patient safety⁽²⁾.

Given the importance attributed to the notifications of incidents related to health care for patient safety, it was decided to carry out this study, which aims to analyze incidents related to health care in a teaching hospital.

METHODOLOGY

This is a descriptive and exploratory research with a quantitative approach, carried out from secondary data from notifications of incidents related to health care, referring to the years 2016, 2017 and 2018.

The research was carried out in a large teaching hospital (TH), belonging to the Unified Health System (SUS), member of the Brazilian Hospital Services Company network, located in Salvador, Bahia, Brazil. It is an integral hospital of the Sentinel Hospitals Network of the National Health Surveillance Agency (ANVISA), whose primary objective is to be an active observatory of the performance and safety of products used in health. As such, it collaborates with the notification of adverse events and technical complaints related to products under post-use or post-marketing surveillance in the National Health Surveillance System (NOTIVISA). In addition, it has a structured Patient Safety Center with implementation of the basic patient safety protocols recommended by ANVISA, in addition to monitoring protocols and incidents, and continuing education activities in patient safety.

The hospital has a Hospital Surveillance application (VIGIHOSP) implemented in mid-2015 to receive notifications of incidents and technical complaints related to health care. Since then, it has received notifications from all sectors of the hospital being accessible to all professionals.

Data were collected from August 2019 to March 2020 by a research initiation fellow duly trained and supervised by the researchers responsible. As VIGIHOSP was implemented in the hospital in mid-2015, the research period was determined the years 2016 to 2018, the latter being the full year prior to the preparation of the project. All reports of incidents related to health care performed at VIGIHOSP during the research period were included. Variables related to patients and incidents were

collected, such as: age, race, gender, marital status, level of education, origin, turn of occurrence, professional category of the notifier, nature of the notification (anonymous or identified); date and place of occurrence; type and characteristics of the incident; and degree of damage (mild, moderate, severe, death).

The classification of the degree of damage according to the World Health Organization (WHO)⁽¹¹⁾ was adopted, in: 1) none - there was no consequence for the patient; 2) mild - the patient presented mild symptoms, minimal or intermediate short-term damage without intervention or with a minimal intervention (small treatment or observation); 3) moderate - the patient required intervention, such as the performance of additional procedure or additional therapy, prolongation of hospitalization, loss of function, permanent or long-term damage; 4) severe - necessary intervention to save life, major medical-surgical intervention or caused major permanent or long-term damage; fetal disturbance/risk or congenital anomaly; and 5) death. It should be noted that an incident related to health care is an event or circumstance that could result or that resulted in unnecessary damage to the patient. When such an incident results in damage to the patient, it is called an adverse event⁽¹¹⁾.

The data were analyzed using STATA statistical software version 12 by applying descriptive statistics. The incidence rate of incidents related to health care was calculated by the relationship between the number of incidents reported during the study period, divided by the total number of patients admitted in the same period x 100.

The project complied with the ethical principles of research involving human beings and met the recommendations of Resolution 466/2012 of the National Health Council. The research protocol was approved by a Research Ethics Committee through CAAE NO 09076619.2.0000.0049.

RESULTS

During the research period, 1911 incidents were reported in HE, of which 259 occurred in 2016, 617 in 2017 and 1035 in 2018. The overall incidence of notifications during the study period was 7.94 per 100 hospitalized-day patients, 3.46 in 2016; 7.91 in 2017 and 11.78 in 2018. The main notifying units were adult hospitalization units, with 1093 (57.20%) notifications; operating room, which performed 240 (12.56%) notifications; Adult Intensive Care Unit (ICU), with 203 (10.62%) notifications; and the oncohematology unit, with 169 (8.84%). (Table 1)

Table 1: Characterization of reported health care incidents, according to the place of occurrence. Salvador Bahia Brazil, 2020.

Place of occurrence	N= 1911	%
Adult inpatient units	1093	57,20
Surgery Center	240	12,56
Adult ICU	203	10,62
Oncohematology	169	8,84
Pediatric units	115	6,02
Chemotherapy outpatient clinic	13	0,68
Pediatric ICU	9	0,47
Ophthalmology Unit	7	0,37

Clinic	7	0,37
Hemodynamics	3	0,16
Bioimage	3	0,16
Endoscopy	1	0,05
Hemodialysis	1	0,05
No registry	47	2,46

The sociodemographic characterization of patients who have reported incidents points to mostly adult people, 1,008 (52.75%) and old women, 649 (33.96%); female, 995 (52.9%); self-declared as black, 1529 (80.01%); single, 910 (47.62%); with low or no schooling, 973 (50.91%); and coming from Salvador – Bahia, 1030 (53.90%). (Table 2)

Table 2: Sociodemographic characterization of patients with notification of health care-related incidents. Salvador, Bahia, Brazil, 2020.

Sociodemographic variables	N= 1911	%
Age (in years old)		
0 - 9	111	5,81
10 - 19	92	4,81
20 - 59	1008	52,75
60 or older	649	33,96
No registry	51	2,67
Gender		
Woman	995	52,09
Man	892	46,70
No registry	23	1,20
Race		
Black	1529	80,01
Non-black	277	14,50
No registry	105	5,49
Marital status		
Single	910	47,62
Married / stable relationship	621	32,50
Divorced	80	4,19
Widower	129	6,75
No registry	171	8,95
Schooling		
Elementary	818	42,80
High school	541	28,31
Higher education	113	5,91
Underage out of school	33	1,73
None	155	8,11
No registry	251	13,13
Origin		
Salvador	1030	53,90
Another municipality	770	40,29
No registry	111	5,81

Regarding the characterization of reported incidents (Table 3), the majority occurred during the hospitalization of the individual in the TH, 1827 (95.70%); in the morning shift, 414 (21.66%); with identified notification, 1446 (75.67%); with the nurse

professional being the main notifier, 1536 (80.38%). We highlight the high proportion of lack of registration in the incident shift, 815 (42.65%).

Table 3: Characterization of reported health care-related incidents. Salvador, Bahia, Brazil, 2020.

Incident characteristics	N= 1911	%
Occurrence situation		
Hospitalization	1827	95,70
No registry	32	1,68
Outpatient care	26	1,36
Other	24	1,26
Occurrence shift		
Morning	414	21,66
Afternoon	353	18,47
Evening	329	17,22
No registry	815	42,65
Occurrence origin		
Identified	1446	75,67
Anonymous	461	24,12
No registry	04	0,21
Notifier professional		
Nurse	1536	80,38
Pharmacist	163	8,53
Nursing technician	88	4,60
Physician	67	3,51
Student	27	1,41
Nutritionist	18	0,94
Other	9	0,47
No registry	3	0,16

Regarding the type of incident (Table 4), the highest proportions of notifications were related to phlebitis, 517 (27.05%); surgeries, 367 (19.20%); falls, 330 (17.27%); problems related to the drug chain, 233 (12.19%); skin lesions, 181 (9.47%); and problems with patient identification, 72 (3.77%).

Table 4: Types of health care-related incidents reported. Salvador, Bahia, Brazil, 2020.

Notified incident	N= 1911	%
Phlebitis	517	27,05
Surgery	367	19,20
Falls	330	17,27
Medicines	233	12,19
Skin lesion	181	9,47
Patient identification	72	3,77
Medical-hospital article	33	1,73
Nutritional therapy	32	1,67
Loss of catheter	24	1,26
Blood and / or blood components	8	0,42
Accidental extubation	8	0,42
Medical and hospital equipment	4	0,21

Diagnostic error	2	0,10
Other	100	5,23

Regarding damage, 920 (48.14%) of the incidents were classified as adverse events, with repercussions on the health of individuals. The incidence of adverse events was 3.82 per 100 hospitalized patients/day. The incidents that presented the highest proportion of damage to health were phlebitis, skin lesions, medical-hospital articles and equipment, catheter loss, blood and/or blood components, accidental extubation and diagnostic error, with damage to patients in 100% of cases, being therefore classified as adverse events; nutritional therapy, in 18 (56.26%); falls, in 43 (13.03%); and problems related to the drug chain, with 30 (12.88%) cases.

Regarding the degree of damage resulting from the adverse event (Table 5), the majority had mild damage, 842 (91.52%); 64 (6.96%) caused moderate damage; and three (0.32%) culminated in the death of the individual. The events that presented the highest proportions of damage considered moderate or severe were surgery (36.84%), medical-hospital equipment (25%), medications (20%), accidental extubation (12.50%), falls (11.63%) and skin lesion (8.84%).

Table 5: Degree of damage from reported adverse events. Salvador, Bahia, Brazil, 2020.

Incident	Damage degree N (%)				
	Low	Moderate	Severe	Death	No register
Phlebitis	499 (96,52)	17 (3,29)	-	-	1 (0,19)
Skin lesion	165 (91,16)	15 (8,29)	1 (0,55)	-	-
Falls	38 (88,37)	5 (11,63)	-	-	-
Medical-hospital article	30 (90,91)	2 (6,06)	-	-	1 (3,03)
Medicines	24 (80,00)	4 (13,34)	1(3,33)	1 (3,33)	-
Loss of catheter	22 (91,67)	2 (8,33)	-	-	-
Nutritional therapy	18 (100,00)	-	-	-	-
Blood and / or blood components	8 (100,00)	-	-	-	-
Accidental extubation	7 (87,50)	1 (12,50)	-	-	-
Surgery	7 (36,84)	7 (36,84)	-	-	5 (26,32)
Patient identification	3 (100,00)	-	-	-	-
Medical and hospital equipment	2 (50,00)	1 (25,00)	-	-	1 (25,00)
Diagnostic error	2 (100,00)	-	-	-	-
Other	17(56,67)	10 (33,34)	-	2 (6,66)	1 (3,33)
TOTAL	842 (91,52)	64 (6,96)	2 (0,22)	3 (0,32)	9 (0,98)

DISCUSSION

During the study period, the overall incidence of reports of incidents related to health care was 7.94 per 100 patient-days. Among the reported incidents, 48.14% caused some harm to patients and were thus classified as adverse events. The incidence of adverse events was 3.82 per 100 hospitalized patients. A study conducted in a teaching hospital in Minas Gerais based on spontaneous notifications in an electronic

notification system, over a period of four years, found a similar result, with a prevalence of 33.8 incidents per 1,000 hospitalizations⁽¹²⁾.

These data differ from other Brazilian and international studies regarding the percentage of adverse events among the incidents studied. A study conducted in three teaching hospitals in Rio de Janeiro - RJ showed an incidence of adverse events of 7.6%, with a proportion of 0.8 AE per 100 patient-days⁽¹³⁾. Another study identified a percentage of 7.9%(14); and 8.2%, and 24% of patients suffered between two and five different events⁽¹⁵⁾ In other publications, there is still a higher percentage of adverse events in specialized units, such as ICU, whose incidence was 32.4%, with an average of 2.8 adverse events per 100 patient-days⁽¹⁶⁾ and among hospitalized elderly, with a prevalence of 58.8% and an average of 2.04 events per 100 hospitalizations⁽¹⁷⁾. At the international level, it is noteworthy that in Kenya, a prevalence of 1.4% of adverse events was identified, based on a review of medical records⁽¹⁸⁾; in Canada, a study showed a percentage of AS of 12.5%(19) and in Portugal, the incidence of AE was estimated at 15.3%(20).

It is necessary to recognize that several factors influence the occurrence of AE, such as quantity and quality of available materials and equipment, structural conditions of the service and access to new technologies⁽¹⁴⁾; undersizing nursing staff, training and qualification⁽¹⁴⁾, professional experience time shorter than five years, for lighter incidents and greater than five years for more severe damage⁽¹⁾. The implementation of security policies, on the other hand, favors the identification and notification of incidents, steps necessary to strengthen the security culture.

A study conducted in a university hospital in southern Brazil that has adequate staff dimensioning identified that the occurrence of adverse events was higher than in other hospitals that also have dimensioning within the recommended legislation, thus, it is evident that other factors such as inadequate preparation for surgical procedures and diagnoses, inadequate transportation, insufficient team training also influence the occurrence of adverse events⁽¹⁴⁾.

It was observed that there was an increase in the number of notifications over the years analyzed. In other studies, the same growth trend was also observed with years^(1,6,7,12) It is believed that this increase is due to the dissemination of information about the application used to receive notifications, the implementation of patient safety protocols and the performance of educational activities with the professionals of the organization, when the importance and stimulation of the practice of notification is emphasized. In-service education is also highlighted by other authors who found an increase in the number of notifications correlated to monthly training⁽⁶⁾.

In the on-screen study, the main origins of the notifications were the adult hospitalization units (57.20%); surgical center (12.56%); Adult ICU (10.62%); and the oncohematology unit (8.84%). These data confirm a trend pointed out in the literature regarding the places with higher occurrences of incidents related to health care^(1,6,12,21). The higher incidence in inpatient units may be related to the greater number of beds and, consequently, to the greater number of hospitalized patients. It is also considered the profile of severity, complexity, hemodynamic instability, use of a greater number of medications and greater submission to diagnostic and therapeutic procedures of patients⁽¹⁶⁾, as is the case of the operating room, ICU and oncohematology unit as factors that predispose patients to suffer safety incidents.

The characteristics of the people who suffered some incidents indicate that the elderly group was the second largest (33.96%), behind adults. There was also a highlight for females; self-declared as black, 80.01%; single women, 47.62%; and with low or no schooling, 50.91%. Other studies also show that adults and the elderly make up the age group that suffers the most incidents related to health care^(1,12,15,16,22). There is also a predominance of females^(14,15) and with only elementary school⁽¹⁴⁾. The percentage of self-declaration as belonging to the black race can be justified by the fact that about 80% of the population of the city of Salvador – Bahia is Afrodescendant, the most vulnerable population and that most of them use SUS services, thus coinciding with the origin of hospitalized patients who suffered incidents. Among the reported incidents, 95.7% occurred during hospitalization, which can be justified by the longer length of the patient's stay in the service and thus be more exposed to risk. It is noteworthy that 40.13% of the records were incidents that occurred during the day, mainly in the morning, and can be explained by the greater number of professionals in the services, greater surveillance and greater possibility of identification and notification of incidents. In a study conducted in an ICU of a hospital in São Paulo – SP, the shift of the most reported occurrence was the night (36.8%) and there was a close distribution between the morning and afternoon shifts, but 77.4% of the notifications did not inform the shift of the occurrence, whereas in this research this percentage was 42.65%⁽¹²⁾. At night, there are fewer nursing professionals and the multidisciplinary team in the service, however, the distribution of incidents in this shift was lower. It is understood, however, that it is not always possible to identify the turn of the occurrence of the incident, as is the case of events that result from procedural evolution, such as phlebitis and pressure injury.

Nurses were the highest notifiers, accounting for 80.38% of the total notifications in the three years of the research. This data is confirmed by other authors^(6,7), however, in other publications physicians appear as the largest notifiers⁽²⁾, in addition to administrative assistants, nursing technicians⁽⁶⁾ and pharmacists⁽²¹⁾. It is known that the risks for incidents should be shared among the multidisciplinary team⁽²³⁾, as well as the responsibility for notifications.

The incidents with the highest proportions were phlebitis, 27.05%; those related to surgeries, 19.20%; falls, 17.27%; problems related to the drug chain, 12.19%; skin lesions, 9.47%; and problems with patient identification, 3.77%. Despite the relevance for patient safety and the high proportion found, this incident is not among the most common notifications in health services⁽²⁴⁾. This result leads to the possibility that there may be underreporting of phlebitis, since infusional therapy and the existence of patients with risk factors for phlebitis, such as the elderly, are part of the daily life of health services⁽²⁵⁾. Although phlebitis is considered an adverse event, it is not yet part of ANVISA's basic patient safety protocols. This may be a factor that negatively influences its identification and notification since the adoption of protocols can contribute to the performance of more safe care due to the fact of guiding conducts and failure prevention⁽²⁶⁾.

Regarding incidents related to surgeries, part of them concern the non-follow-up of the safe surgery protocol, indicating that there may be a maturing of the team regarding the concerns with patient safety in the surgical context and thus contributing to the safety culture.

It is observed that the most reported incidents, apart from phlebitis and surgeries, agree with the literature, only with some variations in percentage terms^(12,14,15,17,19-21,27,28). A study conducted in 12 large hospitals in the metropolitan region of Salvador - Bahia reported as most prevalent adverse events pressure injury (88.9%), falls (77.8%), medication errors (75%), unscheduled removal of drains and tubes (42.9%), and failures in patient identification (33.3%)⁽²⁴⁾. In Kenya, a study shows that the most reported events were associated with medications, blood use and medical-hospital equipment⁽¹⁸⁾. In Austria, research indicates that the most reported incidents relate to surgeries (45%), patient identification (12%), errors in drug management (9%), medical-hospital equipment (10%) and communication failures (6%)⁽⁷⁾.

Most incidents (91.52%) resulted in minor damage; events with moderate damage corresponded to 6.96%; the severe were 0.22%; and 0.32% led the patient to death. Other studies indicate the occurrence of 79.6% of mild damage, with temporary effects on patients. Incidents related to the drug chain were more prevalent as well as severe (82%)⁽¹²⁾. Data on reports of adverse events in Indonesia point to the occurrence of 19.71% of mild injuries, 2.19% of permanent injuries and 8.76% of deaths⁽²⁹⁾. A study based on notifications in the NOTIVISA system between 2014 and 2016 identified that, out of a total of 63,933 adverse events related to health care, 417 9 (0.6%) led to death. According to research data, only one Brazilian state did not receive notification of death in the period studied. The incidents were associated with infection related to health care, the administration of intravenous drugs and fluids, the use of blood and blood products, medical articles and equipment, and structural and facility problems⁽³⁰⁾. The World Health Organization recognizes that the occurrence of adverse events is a failure in patient safety and that about 60% of the incidents that occurred could be avoided. Patient safety strategies should be measures capable of preventing risks and reducing the possibility of harm due to health care⁽¹¹⁾. Adverse events impose consequences on patients and health services, such as increased hospital costs with hospitalizations, longer bed stay, additional need for diagnostic and therapeutic procedures, increased consumption of medications, absenteeism at work and risk of premature death⁽²⁰⁾.

This study presents as a limitation the fact that it was performed with data of voluntary notifications made in an electronic system. As such, one cannot rule out the possibility of underreporting and therefore may not reveal the incident panel in its entirety. Another limiting factor is the lack of information on some items, such as the location and shift of the occurrence, data on the characterization of patients and incidents, and the degree of damage. Nevertheless, it is known that voluntary notifications are widespread throughout the world, being one of the most useful methods for generating behavioral changes because it allows learning with one's own mistakes. It is noteworthy that the non-use of notifications with punitive and disciplinary purposes favors the adhering to their practice, as well as the investment in permanent education activities to disseminate safe and necessary health practices to strengthen the culture of patient safety⁽¹²⁾.

CONCLUSION

The analysis of incidents related to health care voluntarily reported over a period of three years showed a general incidence of notifications of 7.94 per 100 patient-days, of which 48.14% caused some harm to patients. The incidence of adverse events was

3.82 per 100 daily hospitalized patients. Phlebitis was the most reported incident, followed by the group of surgeries and falls. Overall, 91.52% of the events caused mild damage, but there were three deaths in the period.

The results found allow us to highlight the importance of voluntary notifications of incidents as one of the factors that contribute to the strengthening of safety programs and culture. Knowledge and determination of the magnitude of incidents and their related characteristics, as well as the analysis of the profile of patients affected, can support local planning and the implementation of various measures, such as educational actions. These can help professionals understand the meaning and importance of notifications, and ultimately favor the improvement of patient quality and safety.

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