

## PATIENT SAFETY: A COMPARISON BETWEEN HANDWRITTEN AND COMPUTERIZED VOLUNTARY INCIDENT REPORTING

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### ABSTRACT

This study's objective was to compare two types of voluntary incident reporting methods that affect patient safety, handwritten (HR) and computerized (CR), in relation to the number of reports, type of incident reported, the individual submitting the report, and quality of reports. This was a descriptive, retrospective and cross-sectional study. CR were more frequent than HR (61.2% vs. 38.6%) among the 1,089 reports analyzed and were submitted every day of the month, while HR were submitted only on weekdays. The highest number of reports referred to medication, followed by problems related to medical-hospital material, and the professional who most frequently submitted reports were nurses in both cases. Overall, CR presented higher quality than HR (86.1% vs. 61.7%); 36.8% of HR were illegible, a problem that was eliminated in CR. Therefore, the use of computerized incident reporting in hospitals favors qualified voluntary reports, increasing patient safety.

**Descriptors:** Reporting. Safety management. Patient safety.

### RESUMO

O objetivo do trabalho foi comparar dois tipos de notificação voluntária sobre incidentes que afetam a segurança dos pacientes, manuscrita (NM) e informatizada (NI) quanto ao número, ao tipo de incidente relatado, notificador e qualidade dos relatos. Tratou-se de um estudo descritivo, retrospectivo transversal. Das 1089 notificações analisadas, NI foram mais frequentes que NM (61,2% vs 38,6%), sendo realizadas em todos os dias dos meses, e as NM apenas em dias úteis. O maior número de notificações referiu-se aos medicamentos, seguidos de problemas relacionados aos artigos médico-hospitalares, e o profissional que mais relatou foi o enfermeiro, em ambos os casos. No geral, NI tinham mais qualidade que NM (86,1% vs 61,7%), sendo que 36,8% das NM eram ilegíveis, problema que foi eliminado com a informatização da notificação. Portanto, o uso de notificações informatizadas sobre incidentes em saúde nos hospitais favorece relatos espontâneos qualificados, ampliando a segurança dos pacientes.

**Descritores:** Notificação. Gerenciamento de segurança. Segurança do paciente.

**Título:** Segurança do paciente: comparação entre notificações voluntárias manuscritas e informatizadas sobre incidentes em saúde.

### RESUMEN

Estudio con el objetivo fue comparar dos tipos de notificación voluntaria de incidentes que afectan a la seguridad del paciente, manuscrita (NM) y computarizada (NC), por las variables: número de notificaciones, el tipo de incidente reportado, el notificador y la calidad de los informes. Este era un estudio descriptivo, retrospectivo, transversal. De un total de 1089, las NC fueron más frecuentes que el NM (61,2% vs 38,6%), notificado todos los días del mes. El mayor número de notificaciones se refiere a los medicamentos, seguidos por problemas relacionados con los medicamentos y las enfermeras han notificado más en ambos casos. En general, NC tenía una calidad superior a la NM (61,7% vs 86,1%), con el 36,8% de NM eran ilegibles, problema que fue eliminado con la informatización. Por lo tanto, el uso de las notificaciones computadorizadas de incidentes en la asistencia en los hospitales favorece informes espontáneos cualificados, y, consecutivamente, una mayor seguridad de los pacientes.

**Descriptores:** Notificación. Administración de la seguridad. Seguridad del paciente.

**Título:** Seguridad del Paciente: comparación entre la notificación espontánea manuscrita y computadorizada de incidentes en la salud.

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## INTRODUCTION

One in each six inpatients is a victim of some type of patient-safety related incident, which are preventable in most cases. In Brazil an incidence of 7.6% of inpatients are affected by adverse events; 66.7% of which are avoidable<sup>(1)</sup>. These incidents should be reported to health service managers so that preventive measures can be implemented.

An incident in the health field is defined as an event with the potential to harm patients<sup>(2)</sup>. Incidents include: no harm events, incidents with harm (adverse event), and near misses, i.e. when an incident could have affected a patient, with harm or not, but was intercepted before it reached the patient<sup>(2)</sup>, also known as potential adverse events<sup>(3)</sup>.

Voluntary reporting consists of health professionals or patients voluntarily communicating adverse events and other incidents. It is the method most used worldwide to collect information about incidents and it becomes more effective with the active participation of employees<sup>(4)</sup>. The main problem for this method, however, is underreporting, which is common in various countries and occurs due to various factors, such as fear, guilt, shame, self-punishment, fear of other people's criticism, and fear of litigation. Difficulties faced when submitting a report such as the extent and nature of what needs to be stated, type of reporting system, difficulty of submitting a report, and existence of incentives or obstacles, are other reasons alleged for underreporting.

Even though the identification of incidents is a challenge, it is essential to improve patient safety. For this reason, efforts to overcome underreporting have resulted in the development of computerized systems<sup>(5)</sup>, such as computerized reporting<sup>(6)</sup>, which managers are increasingly using in health facilities. There are, however, few studies showing the quality criteria of reporting or comparing computerized reporting with handwritten reporting.

Given the previous discussion, this study's objective was to compare two types of voluntary reporting concerning incidents that affect patient safety, handwritten reporting (HR) and computerized reporting (CR), in relation to the number, type of incidence reported, individuals reporting the incidence, and quality of reports.

## METHOD

This cross-sectional, retrospective and descriptive study used a convenience and purposeful sample. The reports received by the Risk Management Service in two quarters of 2010 (April-May-June and September-October-November) were analyzed. These months were chosen because they were preceded by campaigns seeking to encourage reporting. Reports forwarded by email were not included in the study; only reports submitted through the handwritten and computerized systems were analyzed.

The study was conducted in a high-complexity university hospital with 869 beds, the *Hospital das Clínicas*, University of São Paulo at Ribeirão Preto, Medical School (HCFMRP-USP). The hospital is located in the interior of the state of São Paulo, Brazil and has a Patient Safety Committee and a Risk Management Service. Medical prescriptions were computerized in 1998 and different care processes have been computerized ever since. The handwritten reporting method has been used since 2001, but the computerized reporting system, developed by the hospital's information technology team, was implemented in 2010. The system is called the computerized system of risk management and patient safety.

There are specific reporting forms in this system for each type of adverse event or technical complaint. These are composed of both blank spaces and a checklist. The reports are completed and submitted through the web without the need of self-identification. When the process is completed, the user receives a confirmation. The Risk Management Services receives the report immediately, with no intermediaries, and only its staff has access to the system through a login and password.

Reporting forms were classified in terms of number of reports, reason of report, profession of the individual submitting the report, and quality of information. The quality of the reporting forms was assessed according to the following criteria: description of the incident, causality, description of patient or product, readability, and lack of blurry text. An adapted instrument was used to collect data<sup>(7)</sup>. Data were collected and stored in Microsoft Excel 2007 and were descriptively analyzed.

The study was approved the Institutional Review Board (Process No. 4872/2009). It originated from a doctoral dissertation titled: "Handwritten and

computerized incident reporting systems as the basis for patient safety culture,” presented to the University of São Paulo at Ribeirão Preto, College of Nursing<sup>(8)</sup>.

## RESULTS

The sample was composed of 1,089 reporting forms: 421 (38.6%) handwritten (HR) and 668 (61.4%) computerized (CR) reports. Computerized reports were submitted 24 hours a day, everyday of the week and month, though in smaller number during the night and in a greater number during the day, including weekends and holidays. Handwritten reports, however, were submitted only on weekdays. Given the characteristics of the handwritten system, the time when most reporting forms were submitted was not determined.

### Types of incidents reported in both handwritten and computerized reporting forms

Table 1 presents the prevalence of types of incidents reported. In both cases, the highest number of reporting forms referred to medication

therapy, followed by problems related to medical-hospital material.

The low frequency of problems related to medical-hospital equipment, surgery-related incidents, problems related to diagnostic reagent kits, problems related to sanitizers, cosmetics, and personal hygiene products, problems related to vaccines and immunoglobulin, and other incidents related to care process, did not differ when both methods were compared. There was an increase in the prevalence of reports of phlebitis and skin lesions, which went from 8 (1.9%) to 137 (20.5%) and from 5 (1.1%) to 40 (5.9%), respectively, when the computerized system was used. Reporting concerning hemotherapies was reduced to 60 (14.3%) reports.

### Professionals reporting incidents through handwritten and computerized systems

The profiles of the professionals who submitted handwritten and computerized reporting forms were similar. The number and frequency of handwritten and computerized reports according to profession are presented in Table 2.

**Table 1** – Number and frequency of handwritten and computerized reports according to reason. Ribeirão Preto, SP, Brazil 2010.

Reason for reporting	Handwritten		Computerized	
	n	%	n	%
Problems related to the Medication Therapy Process	157	37.2	226	33.8
Problems related to Medical-hospital material	107	25.4	164	24.5
Problems related to hemotherapy	60	14.2	6	0.9
Falls	48	11.4	54	8.0
Phlebitis	8	1.9	137	20.5
Skin lesions	5	1.1	40	5.9
Problems related to Sanitizers, Cosmetics, Personal Hygiene products	14	3.3	13	1.9
Surgery-related incidents	8	1.9	1	0.1
Problems related to Medical-Hospital equipment	3	0.7	5	0.7
Problems related to diagnostic reagents kits	2	0.4	1	0.1
Problems related to Vaccine and Immunoglobulin	0	0	2	0.3
Other incidents related to care processes. E.g., lack of appropriate hand washing; lack of identification of patients and beds; structural problems and organization of flow of patients with the potential to cause incidents.	9	2.1	19	2.8
<b>Total</b>	<b>421</b>	<b>100.00</b>	<b>668</b>	<b>100.0</b>

Source: Risk Management Service, HCFMRP-USP, 2010.

**Table 2** – Number and frequency of handwritten and computerized reporting forms according to profession. Ribeirão Preto, SP, Brazil 2010.

Person submitting the report	Handwritten		Computerized	
	n	%	n	%
RN	301	71.5	512	76.6
Physician	70	16.6	17	2.5
Pharmacist	17	4.0	40	5.9
Administrative officer	9	2.1	29	4.3
Nursing auxiliary	1	0.2	25	3.7
Student	4	0.9	19	2.8
Nursing technician	3	0.7	8	1.2
Pharmacy auxiliary	5	1.2	3	0.4
Physical therapist	1	0.2	2	0.3
Engineer	-	-	1	0.1
Operating room technicians	-	-	1	0.1
Psychologist	-	-	1	0.1
Technologist	-	-	1	0.1
Not identified	9	2.1	-	-
<b>Total</b>	<b>421</b>	<b>100</b>	<b>668</b>	<b>100</b>

Source: Risk Management Service, HCFMRP-USP, 2010.

In both cases, nurses submitted most of the reports. Some professionals such as engineers, psychologists, and operating room technicians did not use handwritten reports but used the computerized reporting system. Others used the computerized report even more, such as nursing technicians, physical therapists, pharmacists, and administrative officers. On the other hand, physicians seem to prefer handwritten reports instead of the computerized ones, since they used the printed reporting forms more often.

### Quality of handwritten and computerized reporting forms

This study defined 17 minimum requirements for a report to be considered of good quality. The quality of both HR and CR were assessed (Table 3).

These data indicate failures in HR since 110 (26.1%) of these were inappropriately classified by the person submitting the report, that is, the individual chose the wrong reporting form or incorrectly checked the incident or technical complaint to be reported. This is the first requirement

to be considered when assessing the quality of a report. In the case of CR, only 58 (8.6%) of the individuals inappropriately classified the type of incident.

A total of 639 (95.6%) CR contained information concerning the severity of the problem reported, while this information was not included in 210 (49.6%) of the HR. Despite this fact, no difference was found between the systems when information concerning the outcome was assessed.

Finally, the quality of reports was assessed in terms of readability and the presence of blurry text. A total of 155 (36.8%) of the handwritten reports were considered illegible and 94 (22.3%) contained blurry text, which considerably hampers understanding of information, and consequently, the analysis of problems and development of strategies to prevent incidents and the recurrence of incidents. Computerized reporting systems eliminate any problems concerning readability and blurry texts, showing an important advantage in relation to the handwritten system, similar to the advantages of electronic prescriptions.

**Table 3** – Assessment of the quality of handwritten and computerized reports. Ribeirão Preto, SP, Brazil 2010.

Reports quality criteria	Handwritten		Computerized	
	n	%	N	%
<b>Description of incidents or technical complaints</b>				
Type of incident or technical complaint properly classified	311	73.9	610	91.3
Contains the severity of problem	211	50.4	639	95.6
Contains information regarding the outcome*	176	62.4	293	69.6
<b>Causality</b>				
Properly informs how the problem occurred	313	74.4	533	79.7
Contains potential causes for the occurrence of problem	106	25.2	260	38.9
<b>Description of patient or professional</b>				
Patient's name or record number	211	74.0	416	97.2
Contains the patient's gender	236	82.8	416	97.2
Contains the patient's age or date of birth	235	82.5	413	96.5
<b>Medical product's description</b>				
Contains the product's name	347	98.9	346	95.5
Contains type of product	259	73.8	336	92.8
Contains product's date of expiration	179	51.0	256	70.7
Contains product's lot number	240	68.4	284	78.4
Contains dose administered or prescribed †	64	57.7	53	79.1
Contains route of administration†	88	79.3	54	81.8
<b>Other relevant information concerning the incident or technical complaint</b>				
Reports when the incident or technical complaint was identified	308	73.3	668	100.0
<b>Other relevant information</b>				
Readable report	266	63.2	668	100.0
Report has blurry text	327	77.7	668	100.0

Source: Risk Management Service, HCFMRP-USP, 2010.

Note: \*It must be reported in the case of incidents but not in case of technical complaints/ †In the cases of incidents related to medication therapy.

## DISCUSSION

By itself, the voluntary reporting method is not the most appropriate to detect incidents in the health field, however, it is essential and valuable for organizational culture concerning patient safety, especially because it reinforces the trust the organization places in its employees<sup>(9)</sup>.

Difficulty in accessing reporting forms, ill-designed forms, lack of clarity about what can be reported, who can report it, to where reports are submitted, whether it is possible to copy such reports, and who has access to reports, are some of

the barriers presented<sup>(10)</sup>. New ways to report incidents, such as the use of computer tools, are being developed in order to avoid barriers to reporting.

An increase in the number of CR in relation to HR, over a period of three months, was observed in this study, which corroborates studies conducted in other countries<sup>(11-12)</sup>.

The higher number of CR is explained by the fact that this method is usually seen by the health staff as free of negative consequences<sup>(12)</sup>. It is possible that a rapid development of adherence to the new method was obtained due to the involvement of professionals in the patient safety program and



because the hospital has already used several computerized systems for more than 12 years, which eases adaptation of people submitting reports through the new method.

In this study, the type of problem most frequently reported is related to the medication therapy process, which is expected since this is in fact the most frequently reported problem<sup>(13)</sup>. This study's results are very similar, in terms of frequency, to those reported by a Spanish study that determined that 37.4% of the reports concerned medication<sup>(14)</sup>.

A Brazilian study conducted in a university hospital of similar size to the one observed in this study indicates that 63% of the reporting forms received by the Risk Management Service referred to medication therapy processes, while material represented 26% of the reasons of reporting and hemoderivatives another 11%<sup>(15)</sup> of the reports. These last results are similar to those found in this study.

Comparison of results concerning reasons of reporting among international and even Brazilian studies is hindered because the types of incidents monitored by each facility vary significantly. Additionally, there are no studies showing the prevalence of incidents according to types of reporting methods (handwritten or computerized). For this reason, this is an innovative study that can contribute to the advancement of knowledge in the field of patient safety, especially to the application of information technology in the health field in detecting passive methods of incident reports and technical complaints.

In regard to the individuals submitting the reports, the results are very similar to various studies addressing voluntary reporting: nursing professionals are those who most frequently submit reports<sup>(15,16)</sup>. Nursing professionals, in addition to being in a larger number in hospitals and as the ones constantly monitoring patients, receive rigorous training concerning the importance of recording the entire care process.

The number of computerized reporting forms submitted by physicians was smaller than those manually submitted. Even though the computerized system is easy to use, physicians reported few incidents: only 1.7% of the incidents were reported by physicians<sup>(17)</sup>. Nurses are more likely to report incidents than physicians and there are various reasons explaining this fact: physicians claim they

do not know how to report incidents, have time limitations, are uncertain about what to report, there is an expectation of guilt or punishment, and a perception that reports of incidents may not result in improvement. The few reports submitted by physicians are probably a result of a series of reasons based on cultural factors, lack of time, fear or lack of awareness<sup>(16,17)</sup>.

Health workers tend to become satisfied with the computerized voluntary reporting system after it is implemented, but researchers state it does not change the frequency of reporting<sup>(18)</sup>. Our results contradict this information, since a larger number of reports were submitted through the computerized system compared to the handwritten system.

Reporting has often been considered a form of accountability, which is also presented as another barrier for voluntary reporting<sup>(18)</sup>. In the studied hospital, before handwritten reports were submitted to the Risk Management Service, they were assessed by supervisors, who would then send the reports to the Head of Nursing. These multiple hierarchical stages in the reporting process may have intimidated the nursing staff, though nursing professionals were those who most frequently reported incidents, since there was an increase in the number of reports submitted by RNs, nursing technicians, and especially by nursing auxiliaries when the computerized reporting forms were assessed.

In this study, the characteristics that hinder voluntary reports are related to HR, because the access to report forms was difficult. There were four different reporting forms and access to these was difficult because they were available on the hospital's intranet together with a list of other documents available for download. After opening the file, the individual needed to print the form, fill it out manually and then submit the printed form to the Risk Management System. This process was not very safe in terms of information confidentiality and could in fact lead to the previously observed reduced rate of reporting.

The computerized system is also available on the intranet, which individuals can access online, but can fill out specific forms online for each incident through an anonymous report, as observed in hospitals of different countries<sup>(4,9)</sup>.

Regardless of the system used, however, reporting forms should contain complete information including: complete description of the event;

product involved in the incident or technical complaint (when appropriate); other products that the patient was using, such as concomitant medication, patient characteristics and clinical conditions, risk factors, and diagnostic exams, among other information relevant to the patient. Even though this information is required, the staff assessing the reports finds many varied terms, a low quality of information, and unclear information about what is being reported<sup>(16)</sup>.

The reports should enable the identification of the chain of events that led to the incident, generating knowledge conducive to implementing effective interventions in order to avoid repeated incidents. Even though studies usually demand greater quality of reporting, there is a lack of studies defining the characteristics of a quality report. This study fills that gap and proposes items to assess the quality of reporting.

This study's results indicate that 176 (62.4%) of the HR and 293 (69.6%) of the CR contained information concerning the outcome of the incident for the patient, while this information was observed in 79% of the reports assessed in another study<sup>(19)</sup>. In the item "details about the event", an American study identified that CR presented a greater level of detail compared to HR and the same was observed in our study concerning this aspect<sup>(20)</sup>.

The patient's name or record number is essential in order to assess the incidents, that is, to assess their clinical conditions, use of concomitant products, procedures to which they were subject, and results of diagnostic exams in patient medical files. A significant change was observed in regard to this important information, since only 211 (74%) of the HR contained the name or record number of patients, while this information was provided in 416 (97.2%) of the CR. Ideally, the patients' information should be presented in 100% of incident reports, even near miss reports. The same is true for incidents and technical complaints that involve products such as medications, because lack of basic information hinders analysis and decision-making.

The name of the product was more frequently reported in HR (347; 98.9%) than in CR (346; 95.5%), though significant improvement was observed for all the other aspects (type of product, expiration date, lot number, dose or route of administration) when CR were assessed. In the studied hospital, information concerning the product's

lot number is sufficient to find the corresponding product, since products are recorded in a computerized system within the material management service. Hospitals in which there is no easy access to product records may face some limitations during investigations and potential actions of the risk management staff may also be limited when data concerning products are not completely reported.

All (100%) the CR recorded the date that the problem, technical complaint or incident occurred; 113 (26.7%) of the HR did not provide this information. There is a specific area in the printed form to provide this information, but in the computerized system this information is mandatory, without which the report may not be submitted. It shows once again that the use of information technology in the health field is advantageous for voluntary reporting.

Even though handwritten reporting is easy to deal with, it disrupts work more, intensifies fear of one being exposed, may hinder quality, hamper the storage of information, may be illegible, compromise files, or harm organization and decision-making<sup>(4,6)</sup>.

Computerized reporting forms, in contrast, enable better systematization of information, assessment, efficient and efficacious data analysis required for the definition of problems and risks posed to health, optimizing the organization of information, and contributing to the production of knowledge concerning health and related issues. Additionally, report submission is immediate and without intermediaries<sup>(4)</sup>.

Computerization of the information process concerning incidents in hospitals seems to favor voluntary reports, optimizing the investigation process and speeding up decisions to improve the safety of patients.

## FINAL CONSIDERATIONS

Because voluntary incident reporting is essential for organizational culture concerning patient safety, it should be of good quality to serve as a source of information in the hospital environment. This study compared the quality of information contained in handwritten and computerized reporting forms of a hospital. This study's results suggest that the implementation of computerized systems is desirable in health organizations seeking to promote patient safety in their work and develop a culture of voluntary incident reporting because

it favors reporting, reduces the time required to submit a reporting form, encourages the development of more effective and faster actions to reduce incidents, risk and harm to patients, improving the safety of health system users .

This study was solely based on documental analysis, which hinders the establishment of hypotheses for the results found. For this reason, further studies addressing the use of CR instead of HR should be conducted. Additionally, the reasons people access computerized reporting systems but do not complete a reporting form and the satisfaction of those using CR instead of HR should also be considered in future research.

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