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Monitoring Preventable Adverse Events and Near Misses: Number and Type Identified Differ Depending on Method Used

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Objectives: This study aimed to investigate how many preventable adverse events (PAEs) and near misses are identified through the methods structured record review, Web-based incident reporting (IR), and daily safety briefings, and to distinguish the type of events identified by each method.

Methods: One year of retrospective data from 2017 were collected from one patient cohort in a 422-bed acute care hospital. Preventable adverse events and near misses were collected from the hospital's existing resources and presented descriptively as number per 1000 patient-days.

Results: The structured record review identified 19.9 PAEs; the IR system, 3.4 PAEs; and daily safety briefings, 5.4 PAEs per 1000 patient-days. The most common PAEs identified by the record review method were drug-related PAEs, pressure ulcers, and hospital-acquired infections. The most common PAEs identified by the IR system and daily safety briefings were fall injury and pressure ulcers, followed by skin/superficial vessel injuries for the IR system and hospital-acquired infections for the daily safety briefings. Incident reporting and daily safety briefings identified 7.8 and 31.9 near misses per 1000 patient-days, respectively. The most common near misses were related to how care is organized.

Conclusions: The different methods identified different amounts and types of PAEs and near misses. The study supports that health care organizations should adopt multiple methods to get a comprehensive review of the number and type of events occurring in their setting. Daily safety briefings seem to be a particularly suitable method for assessing an organization's inherent security and may foster a nonpunitive culture.

Key Words: patient safety, structured medical record review, incidence reporting, daily safety briefings, adverse events

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Monitoring adverse events is clearly important for health care organizations, not only because of the impact they have on patients but also because they can give an insight into quality of care and provide opportunities for learning and improvements. Furthermore, many adverse events that occur are avoidable and are referred to as preventable adverse events (PAEs).[1] Different methods of studying and measuring PAEs have been developed and adapted to different health care contexts, and each method has its own list of strengths and weaknesses.

One method is to review patients' medical records where clues or "triggers" are systematically searched for, which can indicate a possible departure from the normal course of care and thus identify events and working methods that have caused injury.[2] Trained personnel (often a nurse and physician) carry out a structured assessment of a randomly selected sample of records. The structured record review has become the criterion standard for the determination of the frequency of adverse events (AEs).[3] However, medical records do not contain information on everything that happens to a patient. The record is entirely dependent on the awareness and willingness of health care professionals to identify and document the patient's care and treatment accurately and completely. For this reason, it has been highlighted as an imperfect criterion standard.

Another common approach is the use of an incident reporting (IR) system where health care professionals are encouraged to report in writing whether errors have occurred or if there has been a risk of errors occurring.[4] These systems are most often computerized nowadays. The perceived aim of IR is to deepen the understanding of the frequency, patterns, and trends of different types of adverse events and risks of these events and let this act as a warning system. However, in order for this to work well, high quality of feedback given to those reporting the incidents is crucial for enabling learning, encouraging continued reporting, and developing trust in the system.[5] Limitations of the method include underreporting and nonconsensus on what to report.[6,7]

A third approach is daily safety briefings. These are short (15-minute) meetings where issues that have occurred in the last 24 hours such as adverse events and anticipated disruptions in the next 24 hours are shared and a review of steps taken to resolve previously identified issues or resources assigned to correct newly identified issues is carried out.[8] This method uses nonanonymous reporting that stimulates discussions and the development of a common understanding of patient safety.[9] However, nonanonymity requires a supportive climate where everyone involved avoids placing blame on the person who reports the incident.[10] Using templates such as checklists, data collection sheets, definitions of near misses, and adverse events during briefings facilitates clarity, responsibility, and user confidence.[11] The benefits of this method may not always be obvious at first, and getting everyone together and finding time for the meeting can be a challenge. For this reason, leadership commitment is crucial for both establishing the method and seeing that it continues over time.[9]

This study was designed to gain a better understanding of the number and type of existing PAEs and near misses in one Swedish hospital identified by the 3 aforementioned methods: structured record review, the hospital's Web-based IR system, and daily safety briefings. The contribution of daily safety briefings was of particular interest because this method has been less studied than the other patient safety collection methods.

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Context

Structured record review was introduced in Sweden 2007 and is based on the Global Trigger Tool,[12] which has been translated and adapted to a Swedish context.[13] Nowadays, structured record review is an implemented method in the Swedish hospital care and the reviews are reported to a national database, coordinated by the Swedish Association of Local Authorities and Regions.

Reporting PAEs and near misses in health care is mandatory according to the Patient Safety Act 2010:659[14] and is regulated by the National Board of Health and Welfare, Act 2011:9.[15] Starting in the mid-2000s, every county council in the country has therefore implemented Web-based IR systems to gather data of incidents and near misses that have occurred. In combination with the IR system, the hospital involved in the present study uses safety briefings,[16] following a method called the Green Cross. The Green Cross method has been developed at Södra Älvsborg Hospital and has become an established model of IR, spreading nationally and internationally.[17]

AIMS

This study aimed to investigate the extent that PAEs and near misses are identified through the structured record review, Web-based IR, and daily safety briefings methods, and to distinguish the types of events identified by each respective method.

METHODS

Design

This study has a descriptive retrospective design.

Sample and Settings

Data were collected from January to December 2017, from the same patient cohort in a 422-bed acute care hospital in western Sweden. Clinics at the hospital that (*a*) deliver adult (18+ years) somatic inpatient care, (*b*) are covered by the hospital's structured medical record review, (*c*) are using the hospital's Web-based IR system, and (*d*) have implemented the hospital's method for safety briefings were included in the study. Clinics that met these inclusion criteria were the clinics of surgery, orthopedics, obstetrics and gynecology, infection, and rehabilitation. The 5 clinics had a total of 74,193 patient-days (PDs) in 2017. Clinics excluded were the clinics of youth and children's care, emergency care, anesthesia (did not meet criterion a), medicine (did not meet criterion d), and psychiatry (did not meet criteria a or b).

Definition and Categorization

In this article, PAE is defined as it is in the Swedish Patient Safety Act: "suffering bodily or mental injury, illness, or death that could have been prevented if adequate actions had been taken during the patient's contact with healthcare settings."[14] "Near misses" is described as what could have happened to the patient but did not. All events (PAEs and near misses) captured from the 3 different methods are categorized as described into the national *Swedish Handbook of Structured Record Review*[13] (Table 1).

TABLE 1. Categorization, Based on the Swedish Global Trigger Tool, of PAEs Occurred and What Near Misses Could Have Caused the Patient According to the Staff

Allergic reaction
Non–operation-related bleeding
Fall injury
Thrombosis/embolism
Pressure ulcer
Urinary bladder distention
Skin or superficial vessel injury
Hospital acquired infection, including the following:
Central venous line infection
Pneumonia
Postoperative wound infection
Sepsis
Urinary tract infection
Ventilator-associated pneumonia
Clostridium difficile infection
Infection not specified
Complications of surgery and other invasive measures, including the following:
Confusion procedures
Organ injury
Bleeding/hematoma during or after invasive procedure
Reoperation
Other surgical complication
Compromised vital signs
Anesthesia-related injury
Drug-related PAE
Medical device–related PAE
Postpartum or obstetric PAE
Neurological injury
Other, specify

Details of Data Sources

The data collection for this study was based on the hospital's existing resources. The aim of this was to capture the actual outcome that forms the information base for the hospital's patient safety work.

Data Collection With Structured Record Review

The hospital uses the Swedish version of the Global Trigger Tool (S-GTT) for structured record review. It is based on the IHI-GTT version 2007[12] and has been translated and adapted to a Swedish context that is used throughout the country.[13] Global Trigger Tool record review methodology involves a 2-stage process that was followed.[18] First, an experienced registered nurse who has been trained in the method screened records for the presence of triggers and possible AEs. In the second review stage, registered nurses together with a physician assessed the occurrence of AEs. All AEs were categorized according to type, severity, and preventability using the national handbook. A Likert scale is used, with scores ranging from 1 (definitely not preventable) to 4 (definitely preventable). For this study, only AEs defined as preventable (scored 3 and 4) were selected for analysis (PAEs). The S-GTT method does not capture near misses.

As recommended nationally, 15 completed admissions per month were randomly selected in 2017 (n = 180). Of the 180 records reviewed, 98 were from admissions at the included clinics. These 98 admissions generated a total of 654 PDs.

Data Collection From the Web-Based IR System

The county council that the hospital used in this study belongs to uses the system MedControl PRO (Munkeby Systems AB, Malmö, Sweden). All staff members have access to the system, and it is mandatory to use it to report any incidents that occur. When making a report, a staff member gives a brief description and marks if the incident is a work-related injury, patient

complaint, PAE, near miss, or "unspecified." All incidents reported as a PAE and near miss between January 1, and December 31, 2017, were analyzed. To validate the data, authors of this article (S.I., S.N., and U.K.) reviewed all the included reported incidents. Any uncertainties in how to categorize an incident were discussed until consensus was reached, and adjustments were then made if necessary.

Data Collection From Daily Safety Briefings

The hospital used in the study uses the Green Cross method,[16] which combines safety briefings and an IR system. It consists of the following 7 distinct steps, which are described in detail by Källman et al[16]: (1) identification of adverse events and near misses, (2) assessment of seriousness, (3) data collection, (4) IR into the Web-based IR system, (5) patient/relative involvement, (6) improvements of work, and (7) follow-up and learning. Steps 1 to 3 are central and are fulfilled in cross-disciplinary daily audit meetings, that is, a safety briefing, at each hospital unit separately. Registered nurses, assistant nurses, and/or physicians participate, and the briefing is led by the unit manager or another dedicated staff member. At this meeting, the question is asked whether there have been any PAEs or near misses in the previous 24 hours. A general discussion of the incidents identified takes place thereafter and the degree of seriousness is assessed (step 2), which is entered onto the basic Green Cross template, that is, a safety calendar, with the relevant color code for the date concerned: green for no event, yellow for "near misses," orange for PAE, and red for serious PAE. The event is thereafter entered in the appropriate detailed report form. Here, the date, type of incident, and a brief description are given. All events noted in the detailed report form are summarized each month (step 6) to visualize outcome and to identify problem areas. All detailed report forms and monthly summaries completed by the included clinics in 2017 were collected and analyzed for the present study. To validate the data, the author (U.K.) reviewed the detailed report forms. Any uncertainties in how to categorize an incident were discussed with the data collector at the clinic and with the author SN until consensus was reached. Adjustments were then made if necessary.

Data Analysis

The data specified by staff under the "other" category were grouped into subcategories based on the type of event. Data are presented descriptively as number and percentage and as PAEs or near misses per 1000 PDs, the latter to make a comparison between the 3 methods possible. Types of PAEs and near misses are presented if >0.1 per 1000 PDs. Further statistical analysis was not carried out because the number of clinics finally included did not made a statistical comparison between the 3 data sources meaningful.

Ethical Considerations

The study was conducted in compliance with the Declaration of Helsinki and with approval from the Ethical Review Board in Gothenburg, Sweden (no. 069-18). The 3 different sources used in this study form the basis of the hospital's quality assurance for care and can, according to the Swedish Patient Data Act,[19] be equated with quality registers at regional or national level. Accordingly, consent was not obtained for each individual patient or staff member. All clinic heads involved approved the study.

RESULTS

Data Collected Using the Structured Record Review Method

Of the 98 records reviewed, the structured record review identified a total of 13 (13%) PAEs in the clinics included in the study. Once recalculated, this corresponded to a total of 19.9 PAEs/1000 PDs (Fig. 1). The types of PAEs/1000 PDs identified by the structured record review method are presented in Figure 2. Drug-related PAEs were the most commonly identified (6.1/1000 PDs, n = 4) followed by pressure ulcers (4.6/1000 PDs, n = 3), and hospital-acquired infections (4.6/1000 PDs, n = 3).

Data Collected Using the IR System Method

In total, 896 AEs were reported in the included clinics using the IR system, of which 257 (29%) were PAEs. This corresponds to 3.4 PAEs/1000 PDs (Fig. 1). Fall injuries were the most frequently reported PAEs (1.4/1000 PDs, n = 103), followed by pressure ulcers (0.8/1000 PDs, n = 59), and skin or superficial vessel injuries (0.4/1000 PDs, n = 27; Fig. 2). Of the 896 incidents reported, 600 (67%) were reported as near misses, yielding a figure of 8.1 near misses/1000 PDs in total. The most commonly reported near misses were categorized as "other" (3.3/1000 PDs, n = 245), followed by fall injury (2.2/1000 PDs, n = 163) and drug-related near misses (1.5/1000 PDs, n = 114; Fig. 3A). The most specified near misses in the category "other" were delayed care (1.3/1000 PDs, n = 97), lack in documentation (1.1/1000 PDs, n = 60), and

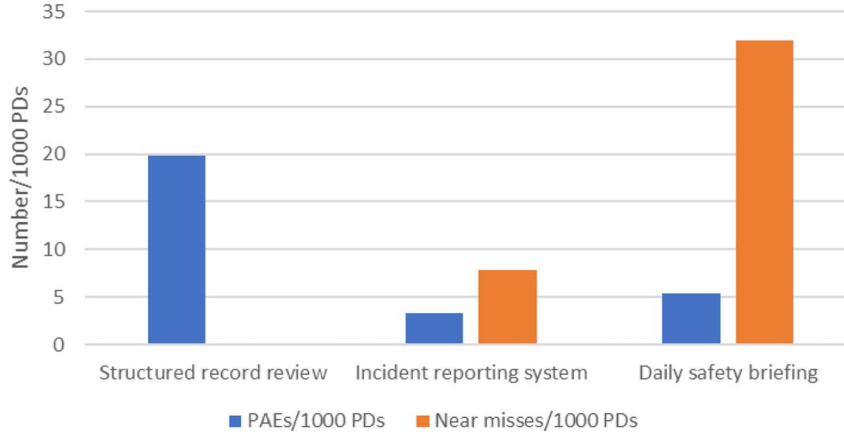
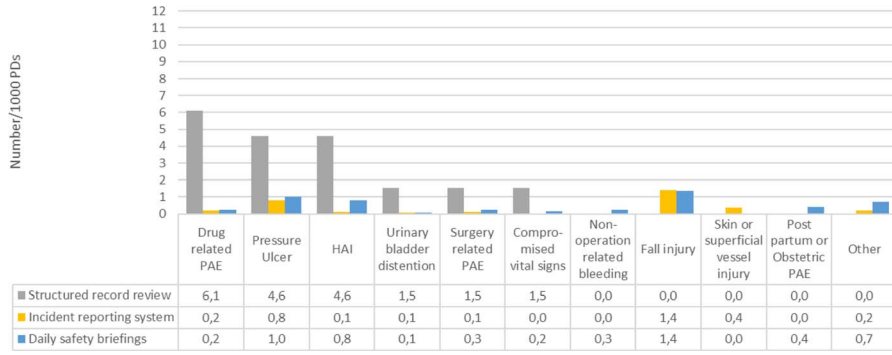


FIGURE 1. Number of PAEs and near misses per 1000 PDs identified in total for 1 year (2017) by the 3 different methods: structured record review, IR system, and daily safety briefings.



	Drug related PAE	Pressure Ulcer	HAI	Urinary bladder distention	Surgery related PAE	Compro-mised vital signs	Non-operation related bleeding	Fall injury	Skin or superficial vessel injury	Post partum or Obstetric PAE	Other
Structured record review	6,1	4,6	4,6	1,5	1,5	1,5	0,0	0,0	0,0	0,0	0,0
Incident reporting system	0,2	0,8	0,1	0,1	0,1	0,0	0,0	1,4	0,4	0,0	0,2
Daily safety briefings	0,2	1,0	0,8	0,1	0,3	0,2	0,3	1,4	0,0	0,4	0,7

FIGURE 2. Distribution of the most common types of PAEs per 1000 PDs identified by 3 methods: structured record review, IR system, and daily safety briefings, respectively. *The structured record review method excludes pressure ulcers of category 1.

shortcomings in procedure, treatment, and care (0.7/1000 PDs, n = 55; Fig. 3B).

Data Collected Using the Daily Safety Briefings Method

The daily safety briefings method captured 1965 reported incidents. Of these, 401 (20%) were documented as PAEs. This corresponds to 5.4 PAEs/1000 PDs (Fig. 1). Fall injuries were the most frequently reported PAEs (1.4/1000 PDs, n = 101), followed by pressure ulcers (1.0/1000 PDs, n = 77) and hospital-acquired infection (0.8/1000 PDs, n = 59; Fig. 2).

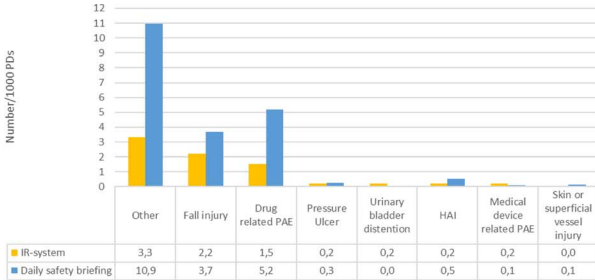
The remaining incidents captured by the safety briefings (86%, n = 1564) were categorized by the staff as near misses, corresponding to 31.9 near misses of PAEs/1000 PDs. The most commonly reported near misses were categorized as "other" (10.9/1000 PDs, n = 812), drug-related PAEs (5.2/1000 PDs, n = 386), and fall injuries (3.7/1000 PDs, n = 274; Fig. 3A). The most common specified near misses in the category "other" were lack of care space (3.8/1000 PDs, n = 284), delayed care (1.7/1000 PDs, n = 129), and lack in communication and information (1.7/1000 PDs, n = 126; Fig. 3B).

DISCUSSION

This article demonstrates how different methods of identifying the number and type of PAEs and near misses can produce different information in the same hospital. In hospital clinics included in this study, the following methods were primarily used to monitor PAEs: structured record review, Web-based IR system, and daily safety briefings. Data collected using the structured record review method indicate that many PAEs go unobserved in daily care, which indicates underreporting. On the other hand, the methods Web-based IR system and daily safety briefings capture PAEs and near misses that structured record reviews do not and give a better picture of the safety issues frontline staff are confronted with. These discrepancies and other aspects will now be discussed further.

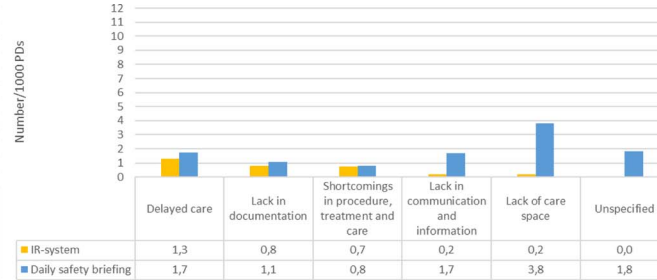
The structured review of medical records has long been argued to be the criterion standard for determining the frequency of AEs, including PAEs.[3] Classen et al[20] found, for instance, that the IHI-GTT method captured almost 10 times more adverse events than voluntary reporting, which is in line with the present study; the S-GTT identified up to 5 times more PAEs than the IR system did. However, the record review methodology, here S-GTT, only assesses a small number of medical records each month, and such a small sample does not give an accurate picture of the safety of care in an organization.[21] This study confirmed that. For instance, many fall injuries were identified by both the daily safety briefings and the IR system, but no falls were identified from the medical record reviews in the included clinics. The different approaches give different information, and as stated previously,[3,22] it has been suggested that multiple methods should be adopted to get a comprehensive review of patient safety in an organization. For a smaller hospital, like the one the present study was based in, the structured record review method, in this case S-GTT, did not give a sufficient basis for detecting areas to focus on.

In Sweden, as in many other countries,[23] it is mandatory for health care workers to report events that have resulted in a PAE, or that risked doing so, into an IR system. The information collected at Green Cross safety briefing is not enough to fulfill this obligation in Sweden. Thus, the Green Cross method includes a step where the event must also be registered in the hospital's Web-based IR system. Our results indicate that this step is not always made because many events are discussed and noted in connection to the meeting (step 3 in the Green Cross method), but less



	Other	Fall injury	Drug related PAE	Pressure Ulcer	Urinary bladder distention	HAI	Medical device related PAE	Skin or superficial vessel injury
IR-system	3,3	2,2	1,5	0,2	0,2	0,2	0,2	0,0
Daily safety briefing	10,9	3,7	5,2	0,3	0,0	0,5	0,1	0,1

A



	Delayed care	Lack in documentation	Shortcomings in procedure, treatment and care	Lack in communication and information	Lack of care space	Unspecified
IR-system	1,3	0,8	0,7	0,2	0,2	0,0
Daily safety briefing	1,7	1,1	0,8	1,7	3,8	1,8

B

FIGURE 3. A, Distribution of the most common types of PAEs that near misses could have caused the patient, reported by the staff in the IR system and during daily safety briefings, respectively. B, describes the kind of events behind the category "other" depending on the reason of near misses. The distribution is calculated per 1000 PDs. HAI, hospital-acquired infection.

are registered in the IR system. Other studies have suggested that this may be due to reasons such as the staff not prioritizing the extra step of making a report if they consider the problem easily resolved,[24] the IR system may not be considered user-friendly,[25] or the staff may feel that too much data are collected.[26] As found in previous studies, daily safety briefings have a positive impact on the reporting rate.[27] This might be due to the method not being seen as time-consuming and that it is simple to use.[9] Thus, it would be beneficial if a method such as the Green Cross method could be further developed so it fulfills all the requirements of an IR system.

The type of PAEs and near misses reported at daily safety briefings and entered in the IR system is quite interesting. Pressure ulcers, fall injuries, and drug-related near misses were commonly reported, which is not surprising because these kinds of events are easily detected and so obviously did, or could have, happened. The most common near misses were, however, those falling into the category "other" that consists of events that could have caused the patient's suffering due to how care is organized. These are events that were not identified by the record review method, but it is important that they are detected and acted on to keep the organization within a so-called safety space.[10] The safety space is a natural extension of the resistance-vulnerability continuum, and an organization's position within the safety space is determined by the quality of the process used to combat its operational hazards. Following proactive process measures, such as communication, routines, and documentation, in combination with negative outcome measures, is a prerequisite for being able to assess an organization's inherent security. Both the IR system and daily safety briefing methods seem to meet these prerequisites, the latter in particular. In addition, the number of events reported as "other" indicates that the staff members are observant of patients' suffering in relation to their situation. This aspect of care and patient safety is not captured at all when using the structured record review method, which objectifies the patient as it has been developed to detect only physical PAEs. The IR method and daily safety briefings, on the other hand, are more person-centered and consider each individual's experience of the situation.

A nonpunitive culture is fundamental to the successful reporting of incidents. Fewer incidents will be reported, with fewer lessons learned, in organizations where those making the reports are blamed or shamed for the incident.[10] Regarding daily safety briefings, one could imagine that it would be difficult to report negative events in front of everyone, but this does not seem to be the case. More events were reported at the daily safety briefings than in the IR system, and it is possible that the implementation of daily safety briefings such as the Green Cross method may foster a nonpunitive culture. This theory is supported by an interview study where staff shared their experiences of using the Green Cross method; staff members described how they actively tried to avoid placing blame on each other and instead worked on creating a situation where it is acceptable to mention one's own as well as others' involvement in near misses and PAEs.[9] Further studies support that the implementation of daily safety briefings helps to develop a safe culture of awareness of patient safety issues, where nonpunitive responses to errors are an important dimension.[14,28]

Because patient records are usually digitalized nowadays, attempts have been made to incorporate automatic e-triggers into the system instead of relying on manual record reviewing only. The use of e-triggers has shown promising results and can be a feasible approach used to identify AEs and save time and at the same time enable sample sizes to be increased.[29,30] The development of automatic trigger identification systems, which assess triggers in real time to mitigate the near misses, can be a powerful future tool for health care organizations in combination with daily safety briefings.

This study should be read in view of certain limitations. First, the number of clinics included was too small to make statistical comparisons between the methods meaningful. However, at present, not enough many clinics in the hospital have implemented daily safety briefings, which is why we chose in advance to describe the results only descriptively. Second, the study compiled a small number of records when using the S-GTT. We could have increased the number of items reviewed, but because the attempt was to reflect outcome data for a medium-sized hospital based on national instructions, we considered that it was not relevant. Third, the other 2 methods (IR system and daily safety briefings) are built on self-reported figures. We cannot guarantee that events noted by the staff really were PAEs or near misses, according to the definition used in this study. To reach the highest validity possible, we checked the collected data, and when we agreed it was needed, we made some categorization corrections (PAE, near misses, or neither). Finally, it is not clear whether the results of this study can be generalized and applied to other hospitals and other health care settings. In smaller or larger hospitals and in those with other reporting cultures, results might have been different. The same applies to health care organizations in other areas and other countries; however, it is important to pay attention to and understand the different outcomes of the methods, and the systems and methods included in this study are used by many health care organizations.

CONCLUSIONS

In this study we can conclude that the methods structured record review, IR system, and daily safety briefings give different outcomes regarding number and type of PAEs and near misses and thus contribute with different patient safety information. The structured record review method captures PAEs that are not necessarily observed by health care staff in their daily work. The IR system and daily safety briefing methods, on the other hand, reflect on the safety issues that frontline staff are confronted with and are more person-centered methods that consider each patient's experience of the situation. This supports the suggestion that health care organizations should adopt multiple methods to get a comprehensive review of the number and type of events that occur in their setting. The daily safety briefings method, such as the Green Cross method, seems to be a particularly suitable method for assessing an organization's inherent security. The combination of its simplicity and the promotion of a nonpunitive culture may be the reason why more events were reported in the daily safety briefings than in the IR system.

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