Reporting and classification of patient safety events in a cardiothoracic intensive care unit and cardiothoracic postoperative care unit

Patricia A. Nast, BSN,^a Michael Avidan, MD,^b Carolyn B. Harris, MPH,^a Melissa J. Krauss, MPH,^a Eric Jacobsohn, MD,^b Ann Petlin, RN, MSN,^c W. Claiborne Dunagan, MD,^a and Victoria J. Fraser, MD^a

**Additional material
is available online.**

Objectives: The objective was to evaluate a new mechanism for reporting and classifying patient safety events to increase reporting and identify patient safety priorities.

Methods: A voluntary patient safety event reporting system accessible by all health care workers was implemented in the Cardiothoracic Intensive Care and Post Anesthesia Care Units. Information collected included patient identifiers; date, time, and location of report and event; type and description of event; and severity score. Narrative descriptions of events were analyzed and coded to describe when in the care process the event occurred, what occurred, and a causal classification of why the event occurred.

Results: A total of 163 reports describing 157 events were received. These included 121 events reported from the intensive care unit (25.3 reported events per 1000 patient-days), a 3-fold increase compared with the preexisting on-line reporting system. A total of 113 reports (69%) came from nurses, 31 from physicians (19%), and 10 from other staff (6%). A majority of events (85, 54%) reached the patient but caused no harm. Multiple causes were identified for the majority of events. The most frequent causes were related to human factors (48%) and organizational factors (34%).

Conclusions: Health care workers were willing to use the patient safety event reporting system, which yielded a broad range of patient safety data. Patient safety events are multifaceted and often have multiple causal factors. Application of a causal classification model for patient safety event coding in the intensive care and preoperative and postoperative care units is feasible and facilitates local communication of important event-related information.

From the Department of Internal Medicine, Division of Infectious Diseases,^a Department of Anesthesiology and Division of Cardiothoracic Surgery,^b Washington University School of Medicine, and Department of Nursing, Surgical Services Division,^c Barnes-Jewish Hospital, St Louis, Mo.

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Address for reprints: Patricia A. Nast, BSN, RN, Washington University School of Medicine, Department of Internal Medicine, Campus Box 8051, 660 S. Euclid Ave, St Louis, MO 63110 (E-mail: pnast@im.wustl.edu).

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The Institute of Medicine's report,¹ *To Err Is Human: Building a Safer Health System*, focused attention sharply on medical error. The conclusion that more Americans may die as a result of medical errors in hospitals than from injuries sustained in motor vehicle accidents is alarming,^{1,2} but others suggest that harm resulting from medical errors may even be underestimated by the Institute of Medicine.³ Although studies specific to the intensive care unit (ICU) setting have used different terms and measurements for patient safety events, they indicate that errors and other patient safety events are common in this setting.⁴⁻⁶

In the complex ICU environment patients are at higher risk for errors; thus, patient safety reporting systems and effective analyses of ICU events are important parts of an organization's efforts to improve patient safety.⁷ Recent recommendations for patient safety reporting systems call for voluntary, confidential, nonpunitive systems that are easy to use, include near misses, identify causative factors, and use the information to prevent errors and improve patient safety.^{1-4,8,9} Additional

studies are essential to help guide the development of medical error and patient safety event reporting systems.

We hypothesized that a new mechanism for reporting and analyzing actual and potential patient safety events, accessible to both physicians and hospital staff, would increase reporting of events and identify patient safety priorities. To test this hypothesis, we developed and implemented a simple patient safety event reporting tool to encourage reporting of medical errors, near misses, and risky situations, along with a coding system to classify text descriptions of events and causes of events. This study was conducted in the spirit of the Institute of Medicine's recommendation that voluntary reporting of errors, including those that result in harm as well as near misses, should be integrated into standard medical practice.^{1,3}

Materials and Methods

Study Setting and Patients

Barnes-Jewish Hospital is a 1371-bed teaching hospital affiliated with Washington University School of Medicine, serving eastern Missouri and southwestern Illinois. This study was conducted in the hospital's 17-bed Cardiothoracic Intensive Care Unit (CTICU) from January 6, 2003, to December 31, 2003, and the 9-bed Cardiothoracic Post Anesthesia Care Unit (CTPACU) from June 4, 2003, to December 31, 2003. The CTPACU includes preoperative "holding area" beds as well as postoperative recovery beds for inpatient and outpatient procedures. Both areas serve adult patients undergoing cardiac and thoracic surgery, with multidisciplinary teams providing patient care under the supervision of intensivist physicians. The standard nurse to patient ratio is 1 nurse for every 2 patients, but a 1-to-1 ratio is adopted for unstable patients.

Nurses are the primary users of the hospital's preexisting Risk Management Online Event/Incident Entry system, recording self-reported events and events reported by physicians and other staff. The on-line system was originally designed to provide information for risk management, although the data have also been used to improve patient safety. Reporters select from a predefined list of events and incidents, such as "lab report delayed" or "missing sponge," and may also type in a narrative description of the event. These reports are not anonymous, and some types of incidents are required to be reported. Access to computers used to enter reports is not entirely private in most locations, and patient care areas that do not have access to the on-line system must use a paper form instead.

Study Design and Data Collection

General description. The CTICU was 1 of 4 critical care areas selected to participate in this study of a brief, anonymous reporting form. Implementation in all areas occurred over a period of 6 months after initial pilot testing in the medical ICU. A description of the study design and reporting methods was previously published by Osmon and colleagues.¹⁰ This study was developed as a result of interviews with nurses, physicians, and pharmacists, and subsequent focus groups with nurses and physicians. The interviews and focus groups addressed health care professionals' perspectives on error reporting in hospitals. Barriers to reporting were identified, including difficulties using the preexisting on-line sys-

tem at Barnes-Jewish Hospital. Possible ways to increase reporting were also identified and included use of computerized systems, simplified event reports, and other potential reporting methods. Two main objectives were identified for this study: to provide a mechanism for physicians to report medical errors, near misses, and risky situations, and to provide new knowledge that would lead to improvements in patient safety.

Study implementation. Approval for this study was obtained from the Washington University Medical Center Human Studies Committee. The hospital's Medical Executive Committee also approved this study as a patient safety/quality improvement project as part of the peer review process. Monthly summaries of all patient safety reports were provided to the Cardiothoracic Services Quality Improvement Committee to facilitate the identification of system improvements and other opportunities to prevent patient safety events.

Any physician or staff member with access to the participating critical care areas could submit a SAFE Reporting Form for any patient safety event. Patient safety events were defined as any situation or event that harmed or had the potential to harm a patient, resulted in a near miss, or created a risky situation. There were no limitations on what type of patient safety events could be reported. The reporting form was designed to be easy to complete and could be carried in a pocket or on a clipboard until needed. Data fields on the reporting form included broad categories for types of events (eg, medication and equipment/product), which were adapted from the preexisting on-line event/incident reporting system. General definitions and examples are listed in Table 1. Free-text fields allowed the reporter to describe what happened, any perceived causes of the event, and any actions taken to address or resolve the matter.

Two items on the form comprised a severity scale to assess potential risk or injury to the patient and how the event affected patient care. Reported severity was corrected in some cases after review by at least 1 registered nurse on the study team. During the course of the study, we solicited anecdotal comments from physicians and staff to identify barriers to reporting and obtain feedback on the reporting form/process. The reporting system to be implemented differed from the hospital's on-line system in that all health care workers had easy access to the reporting system, reporting forms could be carried easily and completed quickly in any location, reporting was completely voluntary, and reports could be submitted anonymously.

Analysis

A comparison of preimplementation and postimplementation reporting rates was evaluated in the CTICU. A method for coding all event descriptions was developed. Reported patient safety event narratives were coded by a core group of researchers who met regularly to reach consensus on coding of the more challenging events. Each narrative was reviewed to determine when the event occurred in the care process (care process step), what occurred (brief event description), and why the event occurred (causal classification). Each text description for an event could have multiple codes for "when," "what," and "why." Standardized "when" and "what" codes were developed from the study data and an analysis of the hospital's existing reporting system taxonomies. "What" codes were separated into roots (eg, medication) and

TABLE 1. General descriptions, examples, and frequency of types of events

Event type	Description	Examples	n (%)
Medication	Events related to prescribing, dispensing, or administering medications	Wrong or omitted dose, contraindicated drug	47 (29.9)
Test, treatment, procedure	Events related to any tests other than laboratory tests, treatments, or any procedures other than surgical procedures performed in the operating room	Delayed x-ray films, physical therapy, and so forth; incorrect invasive line insertions or dressing changes; inappropriate patient transfer	33 (21.0)
Equipment/product	Events related to the functioning, use, and availability of any equipment or products	Broken beds, chairs, or tables; use of incorrect tubing; ventilator failure/malfunction	17 (10.8)
Laboratory	Events related to diagnostic or other laboratory tests	Delayed or missed test results, wrong test ordered or requested, incorrect patient identification, mislabeled or wrong specimen container used	9 (5.7)
Surgery	Events related to any surgical procedure including preparation, conduct of procedure, and immediate postoperative care	Omission of preoperative test or procedure, delayed surgical intervention, procedural errors, delayed identification of postoperative complications	9 (5.7)
Behavioral/psychiatric	Events related to behavior or psychiatric status of patient, visitors, or caregivers	Combateness or self-injury, elopement, intentional or persistent failure to follow policy	4 (2.5)
Blood products	Events related to prescribing, dispensing, or administering blood products	Wrong blood type, mislabeled product, incorrect patient identification	4 (2.5)
Fall	Any witnessed or unwitnessed fall	—	1 (0.6)
Other	Events that did not fit into any of the categories above	—	33 (21.0)
Total for all event types	—	—	157 (100)

branches (eg, wrong dose) for ease of coding. “Why” codes were based on an extension of the Medical Version of the Eindhoven Classification Model. Researchers received orientation to this causal classification model with the Medical Event Reporting System for Transfusion Medicine Reference Manual Version 3.0.¹¹ This reporting system was successfully used by Callum and colleagues⁸ to classify near-miss and actual transfusion-related errors. The Eindhoven category extensions for our study included specific examples for each Eindhoven code and whether the cause was definite, probable, or possible. The category extensions were developed to improve coding consistency; examples are shown in Table 2.

Data were entered into Microsoft Access (Microsoft Corp, Redmond, Wash), cleaned, and transferred to SPSS version 12.0 (SPSS Inc, Chicago, Ill) for analysis. Reporting rates are presented as the number of events reported per 1000 patient days or the number of events reported per 100 admissions. The chi-square test was used to compare categorical variables. All tests were 2-tailed.

Results

Event Reporting

During the study period, caregivers submitted 163 reports on 157 events. The reports identified 103 different patients;

20 patients (19%) were identified in more than 1 event. The median number of days from hospital admission to the first event was 3 days (range, day –1 to day 70). The average patient age at admission was 59 years (range 20-94 years), and 57 patients (55%) were male. A total of 121 events were reported from the CTICU (25.3 reported events per 1000 patient days, or 11.3 reported events per 100 admissions). This represented a 3-fold increase in reporting compared with on-line system reporting during the 12-month preintervention period (8.5 events per 1000 patient-days) (rate ratio 3.01, 95% confidence interval 2.10-4.34, $P < .001$). The CTPACU reported 36 events during 7 study months (1.7 events per 100 admissions). Data for CTPACU events in the on-line system were reported together with other postoperative care units, preventing direct comparisons with that system.

In regard to event location, 105 events (67%) occurred in the CTICU, 13 events (8%) occurred in the CTPACU, and 39 events (25%) occurred in other areas before the patient's arrival or return to the CTICU or CTPACU. Of the 39 events that occurred in other areas, 7 (18%) occurred in the

TABLE 2. Example classification extensions of Eindhoven codes

Code	Short text	Long description	Extension
Technical factors			
TD	Design	Failure due to poor design	Handwritten orders Need to assist ordering process with patient-specific decision support Poorly designed computer software Equipment design confusing/inadequate False alarm rate too high Health care provider can draw up too much medication Sound-alike drugs Need bar-coding
Organizational factors			
OP	Protocols/procedures	Failures related to the quality and availability of the protocols (too complicated, inaccurate, unrealistic, absent, poorly presented)	Protocol too complicated Rounds ordering process not well-defined Inadequate/missing protocol Defense function failures for multichannel pumps
Human factors			
HRC	Coordination	Lack of task coordination within the organization or team	Second clinician thought first clinician was handling Poor communication between clinicians Patient status declining, no one responded Poor coordination of patient transfer between areas/facilities High workload this shift

operating room and 7 (18%) occurred in the preoperative assessment area. Most events reported by the CTICU occurred in the CTICU (105/121, 87%), whereas most events reported by the CTPACU occurred in other areas before the patient's arrival (23/36, 64%) ($P < .001$). Although the reporter's identity was optional, 128 reports (79%) included the reporter's name and 154 reports (95%) included the reporter's job description: 113 nurses (69%), 31 physicians (19%), and 10 other staff (6%). There were only 7 completely anonymous reports (4%) (no name or job description indicated), and these were received during the first 6 months of the study.

Types of Events and Severity

The most frequently reported types of events included medication-related events (47, 30%) and test, treatment, or procedure-related events (33, 21%) (Table 1). Although a majority of reported events reached the patient but caused no harm (85, 54%), approximately a quarter documented some level of temporary harm (34, 22%). Temporary harm varied widely and included events such as skin tears and pressure ulcers in intubated patients, patient self-extubation or catheter dislodgment requiring sedation and reinsertion of the endotracheal tube and/or central venous catheter, and changes in respiratory or cardiovascular status requiring life-sustaining treatments (eg, following the wrong medication/

route/dose or a delay in identifying or responding to a monitor alarm). No reported events contributed to permanent harm or death. Twenty-three risky situations (15%) and 15 near misses (10%) were reported (Table E1). All reports of risky situations were submitted by nurses. A majority of events had no effect (87, 55%) on patient care; 3 events (1.9%) were unclassifiable in the "effect on care" portion of the severity scale (2 staffing concerns and 1 event requiring a change from general to local anesthesia) (Table E1). During the study period, the hospital's on-line system documented 54 additional events reported by the CTICU. The majority caused no harm (20, 37%) or documented temporary harm (18, 33%).

Classification of Events

When the event occurred in the care process (care process step). A total of 168 "when" codes were applied to 157 events: The majority (147, 94%) occurred during a single care process step. Patient safety events that occurred during a procedure were most common (41/168, 24%), followed by events during administration of a treatment or medication (20/168, 12%) and events during passive care (15/168, 9%) (Table 3). Passive care was defined as any period during which no health care provider was interacting with the patient.

What occurred (brief event description). A total of 192 codes describing what occurred were assigned to 157 events: a single code was used to describe 129 events (82%). More than 1 code was used to describe 28 events (18%). Root codes (eg, medication) and branch codes (eg, wrong dose) for all brief event descriptions are presented in Table E2. Overall, the most common brief event description was inappropriate procedure (33/192, 17%), followed by wrong dose of medication (17/192, 9%) and missed assessment (15/192, 8%). Examples of events involving inappropriate procedures included (1) an inpatient brought to the preoperative holding area with false teeth still in place and (2) an inadvertent insertion of a central venous catheter into the subclavian artery of a patient with a possible bleeding diathesis.

Cause of event (causal classification). A total of 430 causes were identified for 157 events; 25 events (16%) had 1 cause, 47 events (30%) had 2 causes, 46 events (29%) had 3 causes, and 39 events (25%) had 4 or more causes. Of these causes, 74 (17%) were classified as definite, 55 (13%) as probable, and 301 (70%) as possible. The largest proportion of event causes were thought to be human factors (205/430, 48%) (Table 4). The most common human factors were slips (76/205, 37%) such as forgot, distracted, or read or wrote incorrectly, followed by task coordination failures (43/205, 21%) such as poor communication. Organizational factors comprised 34% (144/430) of the causal codes, with failures related to protocols or procedures being the most common organizational factor (48/144, 33%), followed by incomplete or inadequate transfer of knowledge (41/144, 29%). Although the most common causes were human factors, only 14% (29/205) of these contributed to events with harm. Approximately 22% (32/144) of organizational factors, 27% (15/56) of technical factors, and 40% (10/25) of other factors contributed to patient harm ($P = .005$).

Discussion

This study suggests that instituting a voluntary, accessible, anonymous, and nonpunitive event-reporting system results in increased reporting of patient safety events, which are common in the intensive care setting. As others have pointed out during the last decade, the exact frequency and extent of actual errors or patient safety events in different health care settings is unknown.^{12,13} In our study, both physicians and staff members reported patient safety events. A majority of reporters provided their name, indicating that health care workers in this intensive care setting were willing to be identified and participate in examining patient safety events. This was also reported by Osmon and colleagues¹⁰ for the medical ICU. Nonetheless, barriers to reporting remain. For example, our research coordinators were aware of unreported events during the course of the study. Although we did not investigate reporting barriers,

TABLE 3. When the event occurred in the care process (n = 168)

"When" code	n (%)
Procedure	41 (24.4)
Administering treatment or medication	20 (11.9)
Passive care*	15 (8.9)
Ordering	12 (7.1)
Labeling	11 (6.5)
Transcription	11 (6.5)
Preoperative assessment	10 (6.0)
Transfer	10 (6.0)
Dispensing	10 (6.0)
Housekeeping	9 (5.4)
Assessment	3 (1.8)
Rounds assessment	3 (1.8)
Transport	3 (1.8)
Laboratory resulting	3 (1.8)
Activities of daily living	2 (1.2)
Preparing	2 (1.2)
Waiting room or waiting for care (outpatient areas)	1 (0.6)
Documentation	1 (0.6)
Specimen collection	1 (0.6)

*Passive care was defined as any period during which no health care provider was interacting with the patient.

some physicians and nurses verbalized that they were not sure what to report, that they did not have enough time, or that they forgot to report. This highlights the need for ongoing education and support to facilitate reporting by nurses, physicians, and others who provide patient care. Another commonly cited and important barrier to comprehensive reporting is fear of blame, embarrassment, and litigation.^{14,15} It is likely that there will be ongoing reluctance to report events while there is a perception that the risks of litigation and punishment are high. We did not directly address this effect in the current study.

Of the categories reported in this study, events related to medications, tests/treatments/procedures, and equipment/products were reported most frequently, jointly constituting more than 60% of all reports. It is difficult to compare these results with other studies because of differences in methods and definitions, but it appears that events within these 3 categories are common.^{4,13,16} In this study, a notable proportion of events resulted in patient harm and additional tests and treatments, some of which were considered life-saving interventions, underscoring the importance of error prevention. Medication and test/treatment/procedure-related events were the 2 most frequently reported types of events contributing to patient harm in both the study reporting system (32% and 29%, respectively) and the on-line reporting system (26% and 30%, respectively).

This study also suggests that standardized classification of patient safety events, including errors, near misses, and

TABLE 4. Causal classification codes (n = 430)

Eindhoven causal code	Definite causes (n = 74) n (%)	Probable causes (n = 55) n (%)	Possible causes (n = 301) n (%)	Total causes (n = 430) n (%)
Human factors	35 (47.3)	35 (63.6)	135 (44.9)	205 (47.7)
Slip	11 (14.9)	24 (43.6)	41 (13.6)	76 (17.7)
Coordination	2 (2.7)	3 (5.5)	38 (12.6)	43 (10.0)
Intervention	11 (14.9)	4 (7.3)	20 (6.6)	35 (8.1)
Verification	10 (13.5)	4 (7.3)	14 (4.7)	28 (6.5)
Monitoring	1 (1.4)	0 (0.0)	12 (4.0)	13 (3.0)
Knowledge	0 (0.0)	0 (0.0)	6 (2.0)	6 (1.4)
Qualifications	0 (0.0)	0 (0.0)	4 (1.3)	4 (0.9)
Tripping	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Organizational factors	13 (17.6)	10 (18.2)	121 (40.2)	144 (33.5)
Protocols/procedures	4 (5.4)	1 (1.8)	43 (14.3)	48 (11.1)
Transfer of knowledge	6 (8.1)	0 (0.0)	35 (11.6)	41 (9.5)
Culture	1 (1.4)	6 (10.9)	33 (11.0)	40 (9.3)
Management priorities	2 (2.7)	3 (5.5)	10 (3.3)	15 (3.5)
External	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Technical factors	17 (23.0)	9 (16.4)	30 (10.0)	56 (13.0)
Design	12 (16.2)	8 (14.5)	18 (6.0)	38 (8.8)
Materials	2 (2.7)	0 (0.0)	6 (2.0)	8 (1.9)
External	2 (2.7)	1 (1.8)	3 (1.0)	6 (1.4)
Construction	1 (1.4)	0 (0.0)	3 (1.0)	4 (0.9)
Other	9 (12.2)	1 (1.8)	15 (5.0)	25 (5.8)
Patient-related factors	3 (4.1)	1 (1.8)	13 (4.3)	17 (4.0)
Unclassifiable	6 (8.1)	0 (0.0)	2 (0.7)	8 (1.9)

risky situations, is feasible in the intensive care setting. Coding of the text data proved useful in understanding reported events from a systems perspective. For example, although a small proportion of events occurred during passive care, most of these involved equipment and products used in patient care, and nearly half contributed to temporary harm. This information allowed the Quality Improvement Committee to identify opportunities for improvement and to assign individuals to investigate and institute changes in the patient care process. However, the classification and coding process proved to be resource-intensive, requiring additional data collection for some events (medical record review, observation of patient or environment, or interviewing health care workers) and regular meetings to develop the coding system and establish consensus.

Few studies thus far have reported on causal classification of errors in ICUs. Callum and colleagues⁸ used the Medical Event Reporting System for Transfusion Medicine to report and classify all transfusion-related errors and near-misses within a teaching hospital. Our study differs from Callum and associates' study in that we used a locally developed reporting system and focused on reporting and classification of all types of patient safety events in a cardiothoracic intensive care environment. Both studies used

the Eindhoven causal classification model and revealed the same order of frequency for all 4 causal categories: human factors, organizational factors, technical factors, and patient-related factors. Multiple causal codes were found for most events in both studies. Although the causal classification of events was sometimes time-consuming and difficult, progressively less time was needed to evaluate and code the event descriptions as the Eindhoven category extensions were developed. The extensions were important to ensure consistency of causal coding. Although a majority of causes were considered possible, rather than probable or definite, the information was useful in identifying possible trends and areas requiring investigation. Further study of the extension codes will be needed to determine the overall feasibility and usefulness of collecting more detailed cause data. In this study, classification of the care process step, brief event description, and cause of the event provided a practical structure for communicating data to the Quality Improvement Committee with a summary of classification coding for each type of event.

This study has several limitations. First, we do not know with certainty exactly which factors contributed to the increase in reporting. Reporting of risky situations and near-misses, in addition to actual events or errors, was encour-

aged in the study. Study staff visited the 2 units daily in the first few weeks, and regularly during the remainder of the study, providing educational materials and in-services. Reporters may have preferred the study reporting form because of limitations of the preexisting on-line system. Another important factor that may have contributed to increased reporting is the Hawthorne effect.^{17,18} This study was conducted in 1 ICU and 1 postanesthesia care unit for patients undergoing cardiothoracic surgery at a large, urban academic medical center, and thus our results may not be generalizable to other hospitals and intensive care settings with different patient populations, resources, and environments. We also did not limit the types of events that could be reported, and a free-text narrative format was used for the description of events. This made it difficult to categorize some events and make direct comparisons with other studies.

One of the strengths of this study is the health care workers' willingness to report patient safety events and use the information for the purpose of preventing future medical errors and patient harm. Additional studies are needed to determine whether preventive measures in the intensive care setting reduce patient harm or the number of patient safety events. The aim in reporting and analyzing patient safety events is to identify aspects of practitioner practice or system problems that increase the likelihood of errors.¹⁹ This knowledge could inform education programs and guide institutions in prioritizing system improvements in the intensive care environment. Dedicated resources for this study allowed for ongoing support and education of health care workers, and the development and implementation of a standardized system for the classification of patient safety events. Participation of both the CTICU and the CTPACU revealed events that may be unique to those areas, the cardiothoracic preoperative assessment area and operating rooms, the cardiothoracic surgery floor, and other areas and departments of the hospital, representing the entire patient care continuum in cardiothoracic surgery. Future studies are needed to evaluate patient safety programs that support multidepartment, multidisciplinary patient safety reporting and collaboration.

Conclusion

Instituting a voluntary, accessible patient safety reporting system with support measures for front-line physicians and staff demonstrated health care workers' willingness to use the system and yielded a broad range of useful patient safety data pertaining to the entire patient care continuum in cardiothoracic surgery. Analysis of these data indicates that patient safety events are multifaceted and often have multiple causal factors. Application of the Eindhoven causal classification model as part of a standardized system for patient safety event coding in the intensive care setting is

feasible and facilitates the local dissemination of important event-related information, enhancing patient safety and quality improvement. In our view, this is important to enable the rational allocation of resources to improve patient safety and has relevance for other intensive care settings.

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TABLE E1. Severity scale

Harm scale rating	n (%)
Risky situation	23 (14.6)
Near miss	15 (9.6)
No harm event	85 (54.1)
Event with harm:	n (%)
Temporary harm	34 (21.7)
Permanent harm	0 (0.0)
Event resulting in death	0 (0.0)
Total	157 (100)
Effect on patient care	n (%)
Care not affected	87 (55.4)
Increased level of monitoring or observation	31 (19.8)
Additional testing required	13 (8.3)
Additional medical or surgical treatment	17 (10.8)
Life-sustaining treatment/intervention	6 (3.8)
Unclassifiable*	3 (1.9)
Total	157 (100)

*See "Results" section for an explanation of unclassifiable events.

TABLE E2. Brief event description (n = 192)

"What" root	n (%)	"What" branch	n (% of root)
Procedure	52 (27.1)	Inappropriate procedure	33 (63.5)
		Delayed procedure	7 (13.5)
		Unnecessary risk in procedure	6 (11.5)
		Missed procedure	4 (7.7)
		Incomplete procedure	1 (1.9)
		Clinician disagreement or lack of consensus	1 (1.9)
Medication	52 (27.1)	Wrong dose	17 (32.7)
		Missed medication	8 (15.4)
		Wrong drug	7 (13.5)
		Contraindicated medication	5 (9.6)
		Extra medication	4 (7.7)
		Mislabeled	2 (3.8)
		Wrong solution	2 (3.8)
		No medication prescribed	1 (1.9)
		Wrong frequency	1 (1.9)
		Wrong route	1 (1.9)
		Wrong method	1 (1.9)
		Incompatible mixture	1 (1.9)
		Clinician disagreement or lack of consensus	1 (1.9)
		Adverse event	1 (1.9)
		Failed/malfunctioned equipment/product	9 (30.0)
Equipment or product	30 (15.6)	Unavailable equipment/product	5 (16.7)
		Dislodged equipment/product	5 (16.7)
		Inappropriate equipment/product	3 (10.0)
		Unnecessary risk	3 (10.0)
		Misuse of equipment/product	2 (6.7)
		Inadequate equipment/product	1 (3.3)
		Wrong frequency	1 (3.3)
		Wrong solution	1 (3.3)
		Missed assessment	15 (75.0)
		Inadequate assessment	2 (10.0)
Assessment	20 (10.4)	No assessment	1 (5.0)
		Delayed assessment	1 (5.0)
		Adverse event	1 (5.0)
		Mislabeled	9 (60.0)
Identification	15 (7.8)	Unnecessary risk	4 (26.7)
		Inaccurate identification	1 (6.7)
		Wrong patient	1 (6.7)
Treatment or test	6 (3.1)	No treatment/test	2 (33.3)
		Missed treatment/test	2 (33.3)
		Delayed treatment/test	2 (33.3)
Documentation	4 (2.1)	Unavailable documentation	2 (50.0)
		No documentation	1 (25.0)
		Incomplete documentation	1 (25.0)
Transport	4 (2.1)	Delayed transport	2 (50.0)
Reporting	3 (1.6)	Unnecessary risk	2 (50.0)
		No reporting	2 (66.7)
Transfer	2 (1.0)	Wrong solution	1 (33.3)
		Delayed transfer	1 (50.0)
		Unnecessary risk	1 (50.0)
Fall	1 (0.5)	Unassisted fall	1 (100.0)
Admission	1 (0.5)	Delayed admission	1 (100.0)
Other	2 (1.0)	Unnecessary risk	2 (100.0)