Surveillance: A Strategy for Improving Patient Safety in Acute and Critical Care Units

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Surveillance is a nursing intervention that has been identified as an important strategy in preventing and identifying medical errors and adverse events. The definition of surveillance proposed by the Nursing Intervention Classification is the purposeful and ongoing acquisition, interpretation, and synthesis of patient data for clinical decision making. The term surveillance is often used interchangeably with the term monitoring, yet surveillance differs significantly from monitoring both in purpose and scope. Monitoring is a key activity in the surveillance process, but monitoring alone is insufficient for conducting effective surveillance. Much of the attention in the bedside patient safety movement has been focused on efforts to implement processes that ultimately improve the surveillance process. These include checklists, interdisciplinary rounds, clinical information systems, and clinical decision support systems. To identify optimal surveillance patterns and to develop and test technologies that assist critical care nurses in performing effective surveillance, more research is needed, particularly with innovative approaches to describe and evaluate the best surveillance practices of bedside nurses. (*Critical Care Nurse.* 2012; 32[2]:e9-e18)

Critical and acute care nurses play a pivotal role in ensuring patients' safety. One intervention that is integral to patients' safety is surveillance. The definition of surveillance proposed by the Nursing Intervention Classification is "the purposeful and ongoing acquisition, interpretation, and synthesis of patient data for clinical decision-making."[1] The Nursing Intervention Classification also provides a second definition for the intervention surveillance: safety, "the purposeful and ongoing collection and analysis of information about patients and their environment for use in promoting and maintaining patient safety."[1] The term monitoring is not included in the Nursing Intervention Classification system because it is not considered an intervention, rather a function performed by nurses as part of the assessment process. The term surveillance is often used interchangeably with monitoring, but surveillance differs significantly from monitoring in purpose and scope. Although monitoring is a key activity in the surveillance process, monitoring is necessary but insufficient for conducting surveillance.

Nursing interventions, particularly surveillance, have been recognized as playing a role in both the early detection of complications and in the identification, interruption, and correction of medical errors.[1-10] Despite this recognition, the actual process of surveillance and its effect on patients' outcomes have not been studied. The purpose of this article is to (1) describe surveillance as an intervention for improving patients' safety, (2) compare the processes of surveillance and monitoring, (3) discuss the potential impact of surveillance on preventing adverse events and medical errors, (4) suggest practical approaches for improving nursing surveillance at the bedside, and (5) identify areas of future research related to surveillance.

Background

Medical errors and adverse events are not uncommon in acute and critically ill patients.[6,7,10,11] Hospitalized patients in the United States are estimated to have more than 1 million injuries as a result of medical errors and adverse events each year.[11] Many of these preventable errors and adverse events result in severe disability or death.[12]

Reducing errors and adverse events depends on accurate and timely evaluation of patients and intervention, which includes assessing the patient's risk of both preventable and nonpreventable complications developing. The process of evaluating the patient and assessing risk is often challenging because of the nature of an acutely or critically ill patient's illness, combined with the hectic hospital environment. As stated about the acute and critical care environment, "There are too many data for one person to process effectively."[13]

Surveillance has gained renewed attention in recent years with increasing recognition of the nurse's role in patient safety. Nursing surveillance can decrease adverse outcomes for patients not only by decreasing the number of adverse events, but also by preventing and recovering medical errors. That is, surveillance can be used to determine a patient's risk of an adverse event developing and to identify the early stages of a potentially serious adverse event. An event becomes adverse when it results in unintended harm to a patient by an act of omission or commission rather than by the patient's condition or underlying disease.[2]

The surveillance process can also be used to identify medical errors, defined as the failure of a planned action to be completed as intended or use of the wrong plan to achieve an aim (see sidebar). Medical errors also include errors of omission, that is, an unplanned action that should have been completed.[3] Although the surveillance process has theoretical benefits for assessing risk, recognizing errors, and reducing adverse events, no studies to date have evaluated the impact of bedside nursing surveillance on patients' outcomes.

On the other hand, practicing nurses in both critical care and

> ### Definitions
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> Surveillance—The purposeful and ongoing acquisition, interpretation, and synthesis of patients' data for clinical decision making[1]
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> Monitoring—An assessment process in which the clinician observes, measures, and records patients' data
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> Failure to rescue—The failure to recognize and intervene with serious complications that could result in death (eg, sepsis and pneumonia)[14,15]
>
> Medical error—The failure of a planned action to be completed as intended or use of the wrong plan to achieve an aim[3]
>
> Recovery of error—The process of identifying, interrupting, and correcting medical errors before they result in an adverse event[16]

emergency department settings have reported using surveillance as an important strategy to promote patients' safety by identifying medical errors and preventing adverse outcomes for patients.[6-10] Most studies on risk assessment in hospitalized patients have been at the organizational or unit level, for example, surveillance efforts related to nosocomial infection.[17] Similarly, organizational characteristics that enhanced nursing surveillance, as measured by the Hospital Nurse Surveillance Capacity Profile, were significantly associated with higher quality care and fewer adverse events.[18]

The effect of nursing surveillance on patients' outcomes has been indirectly examined in several studies conducted to evaluate the impact of

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Table 1 Comparison of surveillance and monitoring

Criteria	Surveillance	Monitoring
Component of nursing process	A nursing *intervention* Classified by the Nursing intervention Classification System The intervention, surveillance, involves a variety of nursing activities including monitoring[1]	A nursing *assessment* Not included in the Nursing Intervention Classification System
Purpose	Purpose is the early identification of risk and the need for intervention *and* to alert nurses to both anticipated and unanticipated changes in patient's condition Goal directed, based on patient's risk and current status[1]	Purpose is to alert nurses to both anticipated and unanticipated changes in patient's condition
Approach	Nurse *systematically* and *selectively* attends to factors in an appropriate sequence and at the correct time depending on specific needs of patient[1]	Nurses engage in a generic approach that is applied to all patients regardless of diagnosis typically as part of unit standard (eg, monitoring vs every 2 h)
Data sources and analysis	Diverse data sources are used, including the patient's family and environment Includes ongoing data analysis to support clinical decision making[1]	Data are primarily physiological Data may be analyzed only as needed; for example, if a change arises in the patient's condition

nurse staffing on patients' outcomes.[14,15] The results of these studies suggest that nursing surveillance significantly influences the occurrence of adverse events. For example, nurses were suggested to play a critical role in "rescuing" patients from complications that could result in death.[14,15] Indeed, a higher proportion of hours of care provided by registered nurses was associated with lower rates of "failure to rescue" patients from death due to pneumonia, sepsis, shock, cardiac arrest, and bleeding in the upper part of the gastrointestinal tract.[14] Similarly, nurses played a role in decreasing patients' mortality rates, suggesting that "nurses constitute the surveillance system for early detection of complications and are in the best position to initiate actions that minimize negative outcomes for patients."[4(p1617)]

CASE STUDY

Mrs C, a 62-year-old woman with a history of smoking and diabetes, came to the emergency department with abdominal pain and fever. A ruptured appendix was subsequently diagnosed, and she was transferred to the operating room for an emergency appendectomy. After an uneventful surgical procedure, Mrs C recovered in the postanesthesia care unit and was transferred to the intermediate care surgical unit.

On postoperative day 1, Mrs C was experiencing pain that restricted her ability to take deep breaths or move around freely. Her vital signs were heart rate 85/min, blood pressure 110/70 mm Hg (mean arterial pressure 83 mm Hg), respiratory rate 22/min, and oxygen saturation as measured by pulse oximetry (SpO_2) 95% on 2 L oxygen. On postoperative day 2, Mrs C became increasingly agitated, writing notes to her husband that she couldn't breathe. Mrs C's heart rate had increased to 120/min, blood pressure to 140/90 mm Hg (mean arterial pressure 77 mm Hg), respiratory rate to 36/min, and her SpO_2 had decreased to 89%. Findings on physical examination and laboratory values suggested acute respiratory failure. These findings included use of accessory muscles and blood gas values as follows: pH 7.30, $PaCO_2$ 65 mm Hg, and PaO_2 60 mm Hg. Mrs C was intubated and transferred to the intensive care unit (ICU), where she was stable for the first 12 hours.

By postoperative day 3 (day 1 in the ICU), Mrs C's condition had deteriorated. She had become increasingly short of breath, was overbreathing the ventilator, and now had a productive cough. Her vital signs were as follows: body temperature 38.8°C, heart rate 110/min, respiratory rate 26/min, blood pressure 80/60 mm Hg (mean arterial pressure 47 mm Hg), and SpO_2 86%. The patient's fraction of inspired oxygen (FIO_2) was set at 40% despite an order to increase the FIO_2 to maintain SpO_2 greater than 90%.

Nursing surveillance and risk assessment were not measured directly in these studies,[4,14,15] but the association of higher "failure-to-rescue" rates and more adverse events with fewer hours of nursing care suggests that evaluation of patients and nursing interventions were insufficient to prevent adverse outcomes. The Agency for Healthcare Research and Quality has quantified the failure to rescue definition as: Deaths per 1000 discharges with complications potentially resulting from care in patients age 18 to 74.[19]

Although nurse staffing ratios and hours of care have been widely studied, the relationship between hours of care and patients' outcomes is complex and cannot be attributed to any 1 variable.[20] A variety of factors, including organizational characteristics and a nurse's surveillance skills are likely to affect the nurse's ability to prevent adverse events.

The high acuity of critically ill patients, coupled with the complexity of the clinical environment, demands implementing and evaluating innovative approaches to providing safe patient care. The lack of a systematic and purposeful approach to evaluating patients and the environment is inefficient, ineffective, and costly. Effective surveillance processes could help bedside nurses and organizations to efficiently and accurately identify patients who are at risk for potential adverse events and medical errors.

Surveillance vs Monitoring

Surveillance is a complex intervention that is principally distinguished from monitoring by its intent and scope (Table 1). Monitoring of patients is an essential, but not the only, component of surveillance, which is a markedly more involved process. Surveillance is a systematic and goal-directed process focused on early identification of risk and the need for intervention. This process includes identifying at-risk patients, promptly identifying potential adverse events, as well as preventing and recovering (identifying, interrupting, and correcting) medical errors. The monitoring process centers largely on observing, measuring, and recording physiological parameters such as vital signs and laboratory values. In contrast, surveillance data include not only physiological data but also the integration of information from family members, members of the health care team, medical databases, and clinical support systems.

Surveillance includes both collecting and analyzing data. The nurse collects relevant data over time, which is then interpreted in the context of the "big picture." Information obtained during the surveillance process is synthesized and shared with other members of the interdisciplinary health care team.

Mrs C's white blood cell count was 15 000/μL, an increase of 10 000/μL from the preceding day. Mrs C's husband was so concerned about his wife's condition that he spent the night at her bedside holding her hand and crying.

The patient's physiological status was conveyed to the oncoming nurse by the nurse going off duty, who had monitored and documented Mrs C's vital signs and physiological changes every 2 hours per the unit standard. No mention was made of Mrs C's husband's anxiety about the changes in his wife's condition.

Immediately after receiving report, the nurse coming on duty entered Mrs C's room and noted the look of exhaustion on the face of Mrs C's husband. The nurse conducted a focused assessment, paying particular attention to the patient's pulmonary status. She checked the ventilator settings and glanced up at the suction cannister, noting the color and amount of secretions in the canister. The nurse noted that the FIO_2 had remained at 40% despite a decrease in the SpO_2 to 86% and an order to increase the FIO_2 to maintain the SpO_2 at greater than 90%. The nurse also communicated with Mrs C's husband, who was concerned about his wife's increasing anxiety during the preceding 12 hours.

The nurse then reviewed Mrs C's history, vital signs, and laboratory values. Based on the nurse's findings, particularly the mean arterial pressure of 47 mm Hg and the body temperature of 38.8°C, the nurse determined that the patient was at high risk for sepsis developing and needed immediate intervention, including an increase in FIO_2 and possible changes in other ventilator settings. The nurse then called the patient's physician to notify him of the patient's deteriorating condition and the possible need for initiating early, goal-directed therapy for sepsis. In this scenario, the nurse caring for the patient used the surveillance process not only to determine that her patient was at risk of sepsis developing (an adverse event), but also to identify that oxygen was being administered at an incorrect level (a medical error).

Surveillance demands that the critical care nurse selectively attend to both patient and environmental factors, in an appropriate sequence, and at the correct time. When surveillance is effective, the nurse will pick up early changes in the patient's condition or omissions in the treatment plan. If surveillance is ineffective, a nurse may miss a trend in a relevant sign or symptom; for example, that early sepsis is developing in a patient.

In the case study (see shaded box), the nurse was conscientiously monitoring and recording physiological parameters but did not recognize that the patient's history and vital signs (in particular the low mean arterial pressure and increased body temperature) were consistent with the potential for sepsis developing.[21] Early recognition of a complication such as sepsis is needed for timely treatment leading to good outcomes for the patient.[21,22] In addition, failure to survey the environment resulted in the failure to detect an error in the amount of oxygen being administered to the patient and to register the husband's concern about changes in his wife's condition.

A Model for the Nurse's Role in Surveillance and Preventing Adverse Events

Critical care nurses at the bedside are uniquely positioned to decrease the occurrence of both preventable and nonpreventable adverse events that may adversely affect patients' outcomes.[22] Examples of preventable adverse events include medication and other treatment errors, equipment errors, and procedure-related errors. In the case study, a preventable error was the patient's
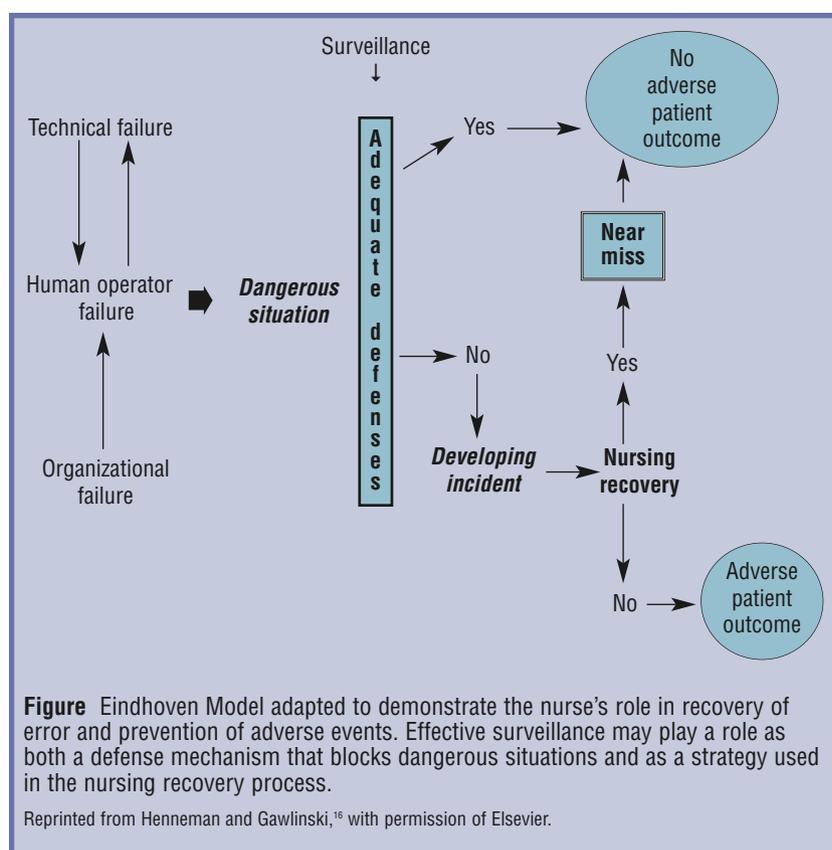

Figure Eindhoven Model adapted to demonstrate the nurse's role in recovery of error and prevention of adverse events. Effective surveillance may play a role as both a defense mechanism that blocks dangerous situations and as a strategy used in the nursing recovery process.

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incorrect F_{IO_2}. An example of a nonpreventable adverse event in the case study was sepsis occurring after an unpredictable injury.

The patient safety movement has emphasized reducing preventable adverse events arising from medical errors. Preventable adverse advents were traditionally addressed by focusing on individual mistakes; errors and adverse outcomes are now generally accepted to result not solely from human error, but also from system failure.[3] In particular, preventable adverse events are believed to result from latent, systemic deficiencies in complex care-delivery systems.[23,24]

The nurse's role in preventing medical errors from adversely affecting patients has been described in several models that recognize the systemic and human factors leading to

situations that may become adverse events.[16,25] One model, adapted from the Eindhoven Model of error recovery,[26] holds that the key to averting adverse outcomes for patients is the use of "defense" mechanisms that recognize and interrupt dangerous situations[16] (see Figure). An example of such a defense mechanism in clinical settings is nurses' systematic surveillance of patients. Thus, effective surveillance may serve as both a defense mechanism to block dangerous situations and a strategy to recover errors.

Methods to Improve Bedside Surveillance

Much attention in the bedside patient safety movement has focused on efforts to implement structures and processes that ultimately improve the surveillance process.

These structures and processes include surveillance checklists, interdisciplinary rounds, clinical information systems, and clinical decision-support systems. Each example represents an organizational or system factor that could prevent the development of a dangerous situation as described in the modified Eindhoven Model.[16] In addition, using these structures and processes allows nurses at the point of care multiple opportunities to recover errors before they harm a patient.[16] See Table 2 for examples of ways to integrate surveillance activities into routine nursing responsibilities.

Surveillance Checklists

Surveillance checklists may guide bedside nurses in the surveillance process and cue them to risk factors associated with certain high-frequency complications (eg, post-operative complications). These checklists would include evidence-based risk factors that could lead to adverse events such as sepsis, pneumonia, and bleeding in the upper part of the gastrointestinal tract. In fact, using checklists effectively decreases the occurrence of common, costly, and potentially lethal adverse events such as catheter-related bloodstream infections in the ICU.[27]

Medication surveillance checklists, such as those that use a head-to-toe or systems-based approach to collecting a medication history would help nurses by offering cues to avoid adverse events associated with omitting important medications. Indeed, using these checklists has been suggested to help teach nursing students and to cue even experienced nurses to commonly omitted medications, such as eye drops and inhalers.[28] (See Table 3 for an example of a checklist for change-of-shift report.)

Interdisciplinary Rounds

Nurses conduct surveillance by actively participating in rounds with the interdisciplinary team. These rounds allow nurses and other team members to disseminate information they have gathered and analyzed, thus contributing information and their unique perspective. One unique benefit of bedside rounds is performing real-time surveillance of both patients and their environment. In addition, bedside rounds increase the opportunity to involve patients and their family members in surveillance. Although bedside rounds are perceived as time-consuming, they take no more time than "sit down" or other rounding formats.[29,30] Family-centered rounds, common in pediatric units, are perceived by members of the health care team as fostering communication among team members and increasing family members' involvement and understanding.[29]

Clinical Information Systems/ Clinical Decision-Support Systems

Current methods of delivering patient care rely heavily on humans recognizing and interrupting incidents that could harm patients rather than using processes that systematically reduce dangerous situations from happening in the first place.[16,24,25] High-risk patients in high-risk environments such as ICUs require implementation of mechanisms to identify risk factors and alert clinicians to possible adverse events. These mechanisms could be categorized according to the adapted Eindhoven Model as human and technical factors that prevent errors from reaching the patient or system defense mechanisms that prevent a dangerous situation from reaching the patient.[16]

Clinical information systems/ clinical decision-support systems are examples of information-technology systems that can assist critical care nurses in the surveillance process.[29,31,32] Clinical decision-support systems are designed to aid clinical decision making by allowing clinicians to match the characteristics of an individual patient to a computerized clinical knowledge base and by presenting patient-specific assessments or recommendations to the clinician or patient for a decision. These technologies gather and present clinical information in an organized way, providing the nurse with a more efficient way to analyze data. Clinical support systems also aid the surveillance process by providing information on patient-specific safety issues such as allergies.

Barriers to Effective Surveillance

Effective nursing surveillance can be hindered by many systemic and human factors. Systemic factors include poor staffing, inadequate resources, poor collaboration among members of the health care team, failure to include the patient and the patient's family in decision making, and underuse of existing technology. Human factors include nurses' education and skills to perform the surveillance process. Nurses, particularly novice nurses,

Table 2 Examples of ways to integrate surveillance activities into routine nursing responsibilities

Nursing responsibilities	Surveillance activities
Awareness of available resources	Survey unit environment, noting noise and activity level. Note the members of the nursing and support staff you will be working with. Determine the physician(s) responsible for your patients and obtain their contact information.
Preparing for a new admission	Use admission checklist to organize pertinent and critical data. Determine patient's health risk(s)[1]/risk for injury (eg, obstructed airway) and potential for immediate emergent intervention (eg, intubation). Survey patient's environment for availability and functioning of essential equipment: suctioning equipment, hand-held resuscitation bag, crash cart, defibrillator, monitor, and cables. Obtain key information from emergency department, operating room, or other unit/source about patient's basic condition/needs (eg, emergent situation requiring admission, operative procedure, significant medical history, medications, intravenous access). Secure human and equipment resources (eg, respiratory therapist for intubated patient requiring ventilator; infusion pumps, chest tube suction, cooling/warming blanket, blood warmer, air mattress) as needed.
Admitting patient	Prioritize actions according to patient's status. Ask patient (or patient's family if patient is unable to answer) for his/her perception of health status.[1] Ask patient (or patient's family) about recent signs, symptoms, or problems.[1] Apply appropriate monitoring devices, eg, electrocardiogram (ECG) cables, pulse oximeter, noninvasive/invasive blood pressure monitoring, end-tidal carbon dioxide monitor. Select appropriate indicators for monitoring patient's condition.[1] Obtain baseline vital signs, labs, ECG, other tests as ordered or per unit standard. Initiate routine skin surveillance in high-risk patients.[1] Analyze physician's orders along with patient's status to ensure safety of the patient.[1]
Obtaining patient's history on admission	Patient's history may be abbreviated initially and then expanded as patient's condition stabilizes and/or more information becomes available from other sources (eg, patient's family, medical record). Identify and flag any gaps in patient's data to be addressed later (eg, medication history, social history).
Performing physical assessment on admission	Prioritize actions depending on patient's status.[1]
Responding to emergencies	Immediately assess airway, breathing, and circulation. Institute appropriate treatments by using standard protocols.[1] Initiate patient-specific interventions depending on patient's condition and plan of care (eg, be aware of plan of care for patients with a do-not-resuscitate order).
Shift report/handoff	Use shift report/handoff checklist to ensure that all key areas of the patient's/family's condition and needs are covered. Perform focused and succinct "bedside checks" with nurse going off duty—paying particular attention to potentially subjective assessments such as neurological status. Survey the environment; verify that critical equipment is set at rates matching physician's orders (eg, intravenous infusion rates, ventilator settings, oxygen flow rates).
Initial assessment/evaluation of patient on shift	Physical assessment 　Obtain vital signs as appropriate.[1] 　Conduct physical assessment based on priority needs of patient. Report abnormal findings and new changes to physician. 　Note type and amount of drainage from tubes and orifices and notify the physician of significant changes.[1] Laboratory values 　Review patient's baseline laboratory values (eg, elevated white blood cell count with infection, high $Paco_2$ with respiratory failure). 　Assess trends and evaluate pertinent laboratory values. Communicate with physician about abnormal values or trends and need for more laboratory tests. Psychosocial assessment 　Note patient's coping strategies and patient's interaction with patient's family. Evaluation 　Compare current status with previous status to detect improvements and deterioration in patient's condition. 　*Continued*

Table 2 *Continued*

Nursing responsibilities	Surveillance activities
Initial assessment of environment on shift	Assess availability of critical equipment such as suction and other airway management equipment and hand-held resuscitation bag. Confirm presence and functioning of patient-specific equipment such as correct size tracheostomy tube with obturator.
Initial assessment of patient's family on shift	Obtain information in report about key family members, family spokesperson, and family's needs related to patient's illness and hospitalization. Note presence or absence of family members in patient's room. Monitor coping strategies used by patient's family.[1]
Ongoing assessment and monitoring	Select appropriate patient indicators for ongoing monitoring, depending on patient's condition[1] (eg, end-tidal carbon dioxide monitoring for patient being weaned off of mechanical ventilation). Retrieve and interpret laboratory data; contact physician as appropriate.[1]
Responding to alarms (eg, ventilator, monitor)	Use standardized initial approach to all alarms: assess airway, breathing, and circulation. Conduct focused assessment of alarm situation based on patient's condition. Troubleshoot equipment and systems to enhance acquisition of reliable patient data.[1]
Medication administration	Monitor vital signs as needed to track the effects of administered medications. Withhold medications as needed depending on patient's condition and notify physician.
Transporting patient	Determine patient's needs for transport. Determine if patient's condition allows transport (risk/benefit). Communicate concerns about transport to the physician. Organize and obtain necessary resources for transport depending on patient's needs. Organize transport time (nonemergent cases) on the basis of unit staffing/available resources.
Collaboration with team members	Collaborate with physicians, nurses, other providers and support staff as needed.[1]

Table 3 Example of completed checklist for use during nursing change-of-shift report to assist with surveillance process[a]

Criteria	Significant information/changes
Significant history	Diabetes, smoking, ruptured appendix
Vital signs	↓ Blood pressure, ↑ heart rate, ↓ Spo_2
Neurological	Agitated, no sleep
Respiratory (Fio_2, ventilator settings, breath sounds)	Coarse breath sounds Overbreathing ventilator
Cardiac	Sinus tachycardia Hypotension
Laboratory results	White blood cell count ↑ to 15 000 from 10 000 cells/μL
Gastrointestinal	
Genitourinary	
Integumentary	Diaphoretic
Intravenous fluids	
Vasoactive/Other intravenous infusions	
Pain	None
Family issues	Distraught husband, concerned about changes in wife's condition
Resuscitation plans	

Abbreviations: Fio_2, fraction of inspired oxygen; Spo_2, oxygen saturation as measured by pulse oximetry.
[a] Examples of significant information/changes relevant to case study.

may be so overwhelmed with tasks and time constraints that they cannot attend to the "big picture," which effective surveillance requires.[33]

Resources such as time and access to data are critical to performing comprehensive assessments. Nurses who are distracted, interrupted, or responsible for nonnursing functions are unlikely to have adequate time to devote to the surveillance process.[34] Collaboration with other members of the health care team, including the patient and the patient's family, influence patients' outcomes, potentially via the impact of collaboration on effective surveillance.[35] Unit structure or policies that inhibit collaboration, such as restrictions on family visiting or the absence of nurses from daily rounds, may seriously impede the surveillance process and adversely affect patients' outcomes. The effects of rounds and

other unit structures and processes have not been well studied.

Surveillance depends on nurses being able to access data from multiple sources. Nurses can be supported in conducting surveillance by many existing technologies, such as bedside monitors and computerized information systems with trending functions. However, bedside nurses may be unaware of such capabilities or not know how to use them for maximal benefit. This failure to leverage available technologies can serve as a barrier to an otherwise effective surveillance process.

Future Research

To optimize current surveillance practice, research is needed to describe effective surveillance processes and to evaluate the impact of effective surveillance on patients' outcomes, including the prevention of adverse events and medical errors. Insight into effective surveillance will require both qualitative and quantitative studies on the processes used by nurses as they systematically evaluate and analyze data on patients and their environment.

Research on surveillance will require innovative approaches that allow more precision than current methods such as observing or videotaping surveillance processes. Eye-tracking is a current technology that has been used successfully in engineering and other sciences, for example, to study behaviors of automobile drivers during risky traffic situations.[36]

Eye-tracking technology allows researchers to track nurses' actual eye movements during the surveillance process to identify the data to which a nurse selectively attends and the sequence in which the nurse attends to those data. Understanding the selective attention processes used by nurses can provide unprecedented insight into the surveillance process. Eye-tracking technology has been used in a simulated clinical setting to evaluate nurses' ability to recognize errors in patient identification.[37]

Summary

Surveillance is an important strategy used by nurses to improve patients' outcomes, particularly their safety. Patients in critical and acute care settings are at risk for medical errors and adverse events, making effective surveillance even more imperative in these settings.[6] Although surveillance has been identified as an important nursing intervention to prevent medical error and adverse outcomes, no studies have described effective surveillance patterns or the effect of surveillance on patients' outcomes. Thus, no evidence base is available to guide nurses in performing this critical and potentially lifesaving process.

Nurses play a pivotal role in influencing patients' outcomes, prompting recommendations by the Institute of Medicine to redesign the nursing work environment.[23] This call for a redesign focuses specifically on reducing errors and adverse events associated with the failure of effective surveillance.[23,24] The Institute of Medicine's report calls for the implementation of safety "bundles" that include components such as work processes and organizational culture. The interventions described here, such as checklists and interdisciplinary rounding, are examples of these components that could improve surveillance and ultimately increase patients' safety. **CCN**

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