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Nursing Care Techniques and Vital Parameter Monitoring For Patients Undergoing Procedure and Medical Treatment

Dr. Alicia Ford[1], Dr. Colin Stevens[2]
[1]Faculty of Nursing, University of Northampton, Northampton, United Kingdom
[2]Faculty of Nursing, University of Northampton, Northampton, United Kingdom
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Abstract

In both medical and surgical practice, timely identification of patient deterioration is key, and rapid response systems (RRS) have been shown to play a central role in patient safety. Vital sign assessment is the foundation of clinical instability recognition, which allows prompt interventions that potentially prevent negative events, such as cardiac arrest, unplanned intensive care unit (ICU) hospitalization, and death. The article discusses the significance of regular vital sign observations, with an emphasis made on the parameters that are best predictive of patient deterioration, which include heart rate, blood pressure, respiratory rate, oxygen saturation and temperature. Nursing actions that follow RRS triggers include bedside evaluation, escalation, oxygen, fluid resuscitation and multidisciplinary coordination. A combination of the evidence-based practice with the standardized scores on early warnings could potentially allow nurses to act promptly and reduce the time spent on response and improving patient results. To justify the relevance of nurses in patient safety within an acute care environment, a correlation between the close monitoring of vital signs and the timely nursing action will be implemented.

Keywords: ***Vital signs, Nursing interventions, Rapid response system, Patient deterioration, Medical-surgical patients, Early warning scores, Patient safety, Clinical monitoring.***

1.Introduction

The healthcare environment of hospitals has changed dramatically over the last few decades, and patient safety has become an essential issue that leads to system-wide shifts in clinical practices. Timely identification of clinical deterioration and responding to it appropriately in hospitalized patients is one of the most significant challenges in healthcare institutions around the globe. The implications of this dilemma extend to the patient outcomes as well as the performance and viability of the whole healthcare system. Clinical deterioration is a gradual worsening of the physiological condition of a patient that, when not identified or appropriately addressed, may result in severe adverse outcomes such as cardiac arrest, unplanned intensive care unit hospitalization, and avoidable mortality.

The nature of contemporary healthcare settings and the pace of their working processes, the acuity of patients, and multiple competing claims on clinical resources have led to the emergence of methodical strategies of patient observation and quick response strategies. Nurses, due to the direct and continuous contact with patients, hold a special and key role in this system of safety. They are much more than mere vital sign monitors but rather advanced clinical evaluators, interpreters of physiological information and decision-makers on when and how to intensify care given to the increasingly failing patients(1).

The traditional ways of addressing the issue of clinical deterioration tended to render the process of clinical deterioration identification highly reliant on unofficial communication patterns and personal clinical judgment, posing risks of latency in detecting deterioration in patients and unequal reactions with regard to patients. The latter has lead to the proliferation of rapid response systems (RRS) as evidence-based interventions that seek to develop standardized and systematic strategies to recognize and address clinical deterioration. Such systems generally utilize objective thresholds that respond to abnormalities of the vital signs and clinical observations, and activate pre-programmed response measures, such as increased monitoring or activation of medical emergency personnel.

But the application and functionality of such systems are highly reliant on the front line clinicians who would be required to identify patterns of deterioration, to correctly observe patient physiology and to make the right decisions regarding care escalation. Literature has continuously shown that, although rapid response systems have the potential to enhance patient outcomes in a well-developed implementation, the outcomes are highly contingent on knowledge, skills, and decision-making of bedside nurses. This dependence underscores the importance of

detailed insight into how nurses in actual clinical settings cope with deteriorating patients beyond compliance measures to consider the entire range of nursing interventions to act in response to clinical deterioration.

The healthcare environment in Australia offers one of the most relevant areas to study such dynamics due to the national standards of recognizing and responding to clinical deterioration and the pervasive use of standardized rapid response systems in acute care hospitals nationwide(2). The National Consensus Statement and National Safety and Quality Health Service Standards have provided expectations regarding the frequency of vital sign monitoring, the protocols to be followed when an escalation occurs and the response of the organization to the deteriorating patient. These policy systems provide a natural experimental design in the investigation of the translation of evidence-based guidelines to practice and clinical outcomes in the real world of patient care.

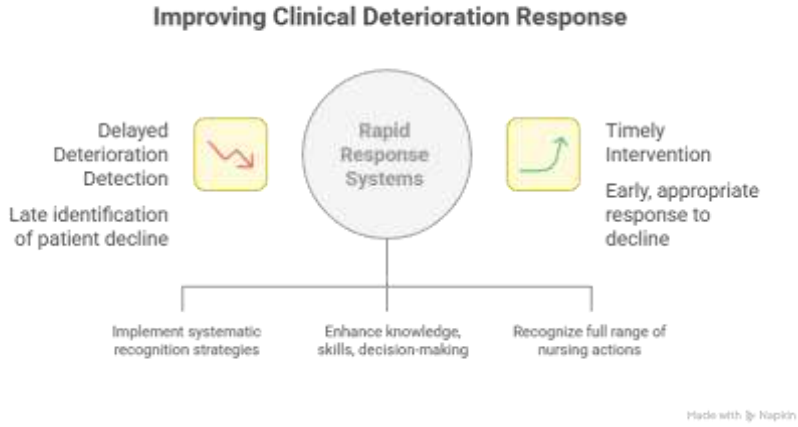

FIGURE 1 Improving Clinical Deterioration Response

The current medical literature indicates a large gap between policy expectations and clinical reality in dealing with deteriorating patients. Whereas much of the existing literature has concentrated on the adherence of nurses to mandatory vital sign documentation and the rate of activation of a rapid response system, only a small proportion of the literature has been dedicated to comprehending the entire spectrum of nursing interventions that are used to manage clinical deterioration. This knowledge gap is especially troublesome considering that the reactions of nurses to deterioration frequently go far beyond mere compliance with escalation protocols to include a complex set of autonomous nursing interventions aimed at stabilizing a patient and avoiding further deterioration.

These nursing interventions have clinical implications that cannot be stressed. In most instances, timely nursing measures taken when initial signs of deterioration are identified could help to avoid further physiological decompensation, which can lead to intense interventions or emergency team actions. Nevertheless, such preventive interventions are poorly conceived and reported both in clinical practice and in the research literature. Not only is this gap in knowledge a missed opportunity to use patients in a better way, but a failure to recognise and validate the advanced clinical reasoning and intervention knowledge that nurses bring to the task of managing deterioration. Moreover, other aspects of nursing interventions that precede, accompany, or may displace formal activation of the response system may be inadvertently downplayed by the emphasis on rapid response system activation as the main gauge of an appropriate response to deterioration. This limited perspective may miss the multifaceted decision-making processes that nurses use in management of declining patients, such as when immediate care is better than escalation, when two or more interventions are needed at the same time, and how to balance conflicting clinical needs(3).

Other areas of nursing research that overlap with the literature on clinical deterioration response include the scope of practice in nursing, autonomy of the nursing profession, and the role of nursing in patient outcomes. With the growing focus on interprofessional collaboration and team-based care in healthcare systems, the analysis of the unique roles in clinical deterioration management that nurses play is likely to become critical in streamlining care delivery models and in allowing all members of the team to practice within the scope of their professional competence.

An additional complication of this area of research is that clinical deterioration is expressed differently in different patient groups, clinical conditions, and care environments. What would be considered proper nursing intervention in a post-surgery patient with hypotension may be vastly different than the intervention required in a medical

patient with respiratory compromise. These nuances are critical to understanding how to design specific educational interventions, optimize clinical guidelines, and assist nurses in making complex clinical decisions when time pressure is a factor.

2.Research Problem and Significance

The essential research question discussed in modern deterioration management literature is the significant gap between the developed clinical guidelines on patient deterioration identification and the practical implementation of those guidelines in the real-life health care facilities. Although decades of research have been dedicated to the development of evidence-supported rapid response systems and an entire body of clinical guidelines, healthcare institutions are still reporting alarming levels of failure to save the life of a worsening patient, which may indicate that existing strategies are not broad enough or sufficiently enforced.

The more common paradigm of traditional research in this area has been to quantify conformity to particular elements of deterioration management protocols, specifically the frequency of vital sign documentation and the activation rate of a rapid response system. Although these measures can help us gain a good understanding of some of the aspects of system performance, they cannot give us the full picture of how nurses in clinical practice take care of deteriorating patients. This limited attention has left knowledge gaps with respect to the scope of nursing interventions used to respond to clinical deterioration, decision-making processes through which intervention is selected, and the extent to which these interventions can affect patient outcomes.

Such gaps in knowledge are far beyond an academic concern as they may directly affect patient safety, quality of care, and system effectiveness. Nurses can use effective interventions to avoid taking on more serious physiological compromises during the early stages of the deterioration process, which may help them avoid intensive care interventions, emergency team responses, or other expensive escalations of care. Nevertheless, without in-depth knowledge of these interventions and how effective they are, healthcare systems may not be able to streamline their deterioration management guidelines or provide nurses with sufficient support to employ the best practices(4).

Existing healthcare policy frameworks such as those developed by the Australian Commission on Safety and Quality in Health Care recognize the pivotal role of nursing in deterioration management but offer little specification of the scope of nursing interventions that need to be provided when patients experience clinical deterioration. This policy gap indicates the larger research gap, leaving the nurses with a scenario in which they mostly have to use their experience, with the help of informal knowledge, instead of evidence-based guidelines in their decision-making in relation to intervention implementation.

What makes this research problem even more challenging is that clinical deterioration is heterogeneous between different patient groups and in different clinical settings. The pattern of deterioration in a post-operative patient might not be the same as that observed in a medical patient with a chronic illness and the response that the nurse provides to these conditions can also vary. The extent and speed of deterioration can also affect the nature of interventions that are applicable and the time at which they can be undertaken. It is critical to learn these differences so that new approaches can be designed to address the unique aspects of managing deterioration and be customized to the circumstances of a particular clinical setting.

The other important dimension of this research problem is associated with the organizational and systemic processes that impact the capacity of nurses to take relevant interventions as a consequence of clinical deterioration. Staffing levels, skill mix, resource availability, and organizational culture are all factors that can influence the interventions that nurses can implement and the time in which they can respond to deterioration. Studies that do not consider such contextual factors can result in research findings that are hard to apply to practice.

The importance of these research gaps can be explained by the increasingly appreciated fact that patient safety does not solely lie in the existence of the right systems and protocols but also in the availability of the knowledge, skills, and resources needed by frontline clinicians to apply these systems in practice. With the ongoing struggle of healthcare systems to provide care to more and more acute patients, limited resources, and nurse workforce pressures, the need to maximize the value of bedside nurses in deterritorialization prevention has only become more urgent.

Moreover, the present emphasis on activation of a rapid response system as the main measure of adequate response to deterioration can unintentionally introduce perverse incentives that will not encourage nurses to apply other potentially useful interventions. When organizational measures and quality indicators rely more on the rates of

escalation than on other deterioration management elements, nurses will experience pressure to invoke rapid response teams in cases where independent nursing intervention may be more suitable or effective.

An additional issue that complicates the research problem is that clinical deterioration is frequently a gradual process that does not always fit into the binary trigger thresholds commonly used in rapid response systems. Nurses can identify nuanced changes in patient status that lead to objective changes in vital signs, and their actions at such initial stages of decline could be especially significant in terms of averting further development of such a state into a worse condition. However, all these preliminary interventions are ill-documented and researched insufficiently, leaving the gaps in knowledge about their prevalence, nature, and effectiveness(5).

3.Methodology and Research Approach

The modern studies on the topic of nursing interventions in clinical deterioration management need advanced methodological tools that are capable of achieving complexity of clinical practice in the real world and at the same time ensuring scientific quality. The problems of researching nursing practice in acute care setting require a close attention to data collection procedures, data measurement procedures and data analysis techniques that can give significant information on how nurses really deal with patients that are getting worse.

Retrospective chart review methodology is considered to be one of the most frequently used methods in this research area and has a range of benefits that it can allow examining high volumes of cases, objective clinical data, and allows studying the trends of practices in the long run. This methodology, however, also has severe limitations that should be carefully taken into account when interpreting the findings of the research. The practice of documentation differs significantly between institutions, units and individual practitioners, and presents the possibility of systematic bias in the nature of interventions that are documented in medical records.

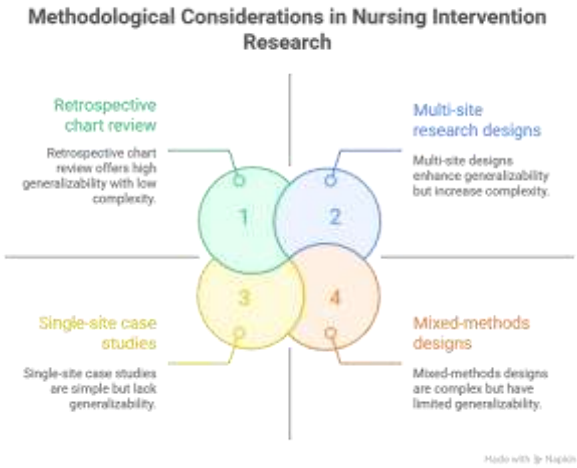

FIGURE 2 Methodological Considerations

Another fundamental methodological issue in this field of study is in selecting valid outcome measures. The traditional indicators, including the rate of activation of a rapid response system or compliance with vital sign documentation are valuable yet offer limited information on nursing practice. More detailed models demand the elaboration of intervention taxonomies which must be comprehensive in recording the totality of nursing activity, yet sufficiently specific to allow meaningful analysis of practice patterns and their association with patient outcomes.

Multi-site research designs have significant benefits in terms of investigating nursing interventions in clinical deterioration management, especially in the context of increasing the generalizability of results and addressing organizational and contextual influences that can impact practice patterns. Multi-site designs, however, are also more complex in terms of data standardization, inter-rater reliability, and consideration of site-specific differences in policies, resources, and practice cultures.

The time vagaries of research on clinical deterioration and interventions by nurses pose their own methodological dilemmas, which must be given due attention(6). The process of deterioration is often dynamic as well, occurring within hours or days, and nursing interventions can be introduced at various points within the process. Research designs to capture such temporal relationships must factor in the sequence and timing of various interventions in relation to deterioration identification, escalation decision making, and patient outcomes.

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The data collection procedures should be modeled in a way that guarantees consistency and reliability among the various sites and among data collectors, but be practical within the limitations of clinical settings. This usually demands extensive data collector training, elaborate data collection guidelines and continuous quality control measures to ensure data integrity during the study period. Electronic data collection tools can be used to increase the quality of data and provide real-time monitoring of data collection process and quality.

Inter-rater reliability is a very important issue in research which depends on chart review or any other type of subjective data abstraction. The proper development and maintenance of sufficient inter-rater reliability involves high costs in terms of training and pilot testing and continuous observation during the data collection process. The nature of clinical documentation and the possibility of ambiguity in the classification of interventions require especially stringent methods of reliability testing and maintenance.

The statistical analysis methods have to be chosen to focus on the hierarchical nature of hospital-based data, patients are nested within units, units within hospitals. Multilevel modeling techniques can be used to explain the effects of clustering and explore both individual-level and organizational-level variables that can affect nursing practice patterns. Moreover, when nursing interventions are analyzed, there are often a number of related outcomes that can be analyzed using complex methods of analysis to prevent an inflated Type I error rate.

Combining quantitative and qualitative methods provides a prospect of deeper knowledge of nursing interventions in the field of clinical deterioration management. Whereas quantitative methods may yield information about the frequency and patterns of interventions, qualitative methods may shed light on decision-making processes and situational influences on nursing practice. Mixed-methods designs may capitalise on the advantages of each method and mitigate their respective weaknesses.

Longitudinal research designs offer the challenges and opportunities to study nursing intervention to addressing clinical deterioration management. Although longitudinal designs might be useful to understand the development of practice patterns with time and the effects of interventions on patient outcomes, they are also associated with significant resource investments and can be complicated by policy, staff, and organizational changes in the study period(7).

Ethics in this field of research can be very sensitive to privacy and confidentiality of the patient, especially in research involving vulnerable groups or clinical scenarios. The institutional review board approval procedures should be keen to strike a balance between the potential benefits of research findings and privacy risks, and data management processes should regard patient information protection as necessary in the process of carrying out the research.

Another methodological consideration is the selection of adequate comparison groups, especially when the research is conducted to determine the effectiveness of various nursing interventions. Both historical controls and concurrent controls across units or institutions and before-and-after designs each have their own unique strengths and limitations that should be weighed carefully with the purpose of the research and the constraints on its feasibility.

4.Current Findings and Clinical Implications

Recent studies on nursing interventions in management of clinical deterioration have made a number of interesting conclusions with far-reaching implications on clinical practice, healthcare policy and research topics. These results dispel accepted notions regarding the nurse handling of deteriorating patients and the complexity of nursing decision-making in acute care settings.

The most important discovery made in recent studies is that there is a huge gap between the expectations in policy regarding escalation of care and the current patterns of clinical practice. Research indicates that large percentages of patients who qualify on objective bases to activate a rapid response system, fail to receive relevant escalation as per laid down guidelines. But these very studies also demonstrate that when there is no formal escalation, nurses oftentimes apply alternative interventions, all of which implies that the lack of escalation may not always be a manifestation of poor patient care(8).

The records of nursing interventions in reaction to clinical deterioration indicate more complex and more comprehensive patterns than were previously identified. The range of interventions that nurses employ to treat deteriorating patients is vast and includes simple comfort interventions, as well as complex clinical evaluations and treatment interventions. These interventions are so common and diverse that it becomes clear that the contributions of nursing to deterioration control lie far beyond mere adherence to escalation guidelines.

The evidence of research shows that some forms of clinical deterioration have a higher probability of elicitation of escalation responses than others and that some are more likely to be addressed by independent nursing action. As an example, worsening of cardiovascular parameters including blood pressure abnormalities and cardiac rhythm abnormalities seems more likely to trigger formal escalation, whereas respiratory and neurological changes might be more readily addressed using nursing interventions without escalation.

The time interval associations between the nursing intervention and the escalation decision make some essential patterns that can be used to infer what nursing decision-makers can do. Where escalation occurs, implementation of nursing interventions is far more likely to be made, which suggests that escalation decisions may act as triggering events towards more comprehensive nursing reactions. But to be able to sequence these relationships over time, more research is needed in order to establish the patterns of causation.

It seems that patient characteristics have an impact not only on the kind of nursing interventions applied but also on the probability of the escalation. Emergency admissions, in particular, can be linked to a different pattern of interventions than elective admissions, possibly due to patient acuity differences, nurse experience with patient circumstances, or the presence of other resources to deal with the deterioration.

The nature of the organizational environment in which nursing care is provided seems to play an important role in determining the pattern of interventions, but it is not yet fully known what particular mechanisms organizational factors have on practice. The differences between institutions, between units, and between shifts imply that structural and cultural variables are significant contributors to the nursing reaction to clinical deterioration.

There are also a few crucial implications of these research findings in clinical practice. First, they indicate that existing practices on evaluating and enhancing deterioration management might require expansion beyond mere emphasis on escalation compliance to include all nursing interventions. Such a broader view might guide more inclusive quality improvement programs and performance measurement programs.

Nursing education and professional growth can also be implicated in the findings. Knowledge of the variety of interventions that nurses use in working with deteriorating patients can support curriculum development, competency tests, and continuing education courses. Secondly, the complexity of nursing decision-making that has been exposed in such studies implies that deterioration management education must prioritize clinical reasoning and decision-making abilities over protocol adherence.

Healthcare policy-wise, the findings indicate that the existing national guidelines and standards might require updating to more accurately reflect the nature of nursing practice and offer more detailed guidance on what should be done about various forms of clinical deterioration in terms of appropriate nursing intervention. Policy models that emphasize escalation behaviors above all other useful nursing interventions, or do not fully acknowledge the contributions of nursing to patient safety, can inadvertently devalue other beneficial nursing interventions or overlook the full contributions of nursing to patient safety(9).

These findings have important organizational implications as well. Health facilities might be forced to rethink how they can assist nurses to handle clinical deterioration such as resources, training, and decision support tools. Furthermore, quality improvement initiatives might require a revision to appreciate and harness the entire spectrum of nursing actions as of deterioration management instead of dwelling on the narrow scope of escalation percentage.

The implications of such findings on research methodology and future research priorities, are also important. The nature of nurse interventions demonstrated in the literature indicates that future research might require a more advanced method of research to represent the comprehensive nature of nursing practice. The correlations among nursing interventions and patient outcomes are also a promising field to study in the future.

These findings have clinical implications beyond the academic community to include the direct care and safety implications of the findings on patient care. Knowledge gained by understanding how nurses deal with deteriorating patients can be used to design more effective support systems, decision-making tools, and practice guidelines that can improve patient outcomes and assist nurses in delivering high-quality care.

5.Conclusion

The developing conceptualization of the nursing interventions in the management of clinical deterioration conveys certain valuable opportunities in the context of further research that could contribute to the dissemination of knowledge in the specified area on a significant scale and improve the patient care outcomes. These research areas

include methodology modifications, theory construction as well as practice that may, in combination, change the way health care systems address deterioration management.

A second major future research interest is more detailed methodological techniques that can explain the complexity of nursing intervention in addressing clinical deterioration. Conventional chart review methods can be important, but they might overlook critical areas of nursing decision-making and intervention prescribing that are not regularly captured. In future research, direct observation methods, real-time data collection methods, and other emerging applications of technology might be required to provide a more detailed description of the nursing practice.

Another significant area of research priority is the creation and testing of comprehensive taxonomies of the nursing interventions in clinical deterioration. The lack of a consistent categorization and measurement of nursing interventions in a body of research impedes current research and hinders the synthesis of results and the development of evidence-based practice guidelines. More rigorous research and more effective practice improvement initiatives could be based on systematic efforts to develop and validate intervention taxonomies.

A longitudinal study on how nursing interventions, clinical deterioration, and patient outcomes are temporally related is one of the most promising sectors to explore in the future. Knowledge of the effects of various interventions on deterioration trajectories, and patient outcomes across time might offer key evidence to inform nursing practice and aid clinical decision-making. This type of research would also help to shed light on how nursing interventions can impact patient outcomes.

The intersection of modern analytical tools, including machine learning and artificial intelligence algorithms, provide some indication of opportunities in the future of research in this area. Such methods may be capable of revealing additional trends in nursing intervention data that are not obvious using conventional analytical tools and offer new insights into the best intervention strategies and how they relate to patient factors and clinical conditions.

Future research should also focus on developing decision support tools and interventions that will maximise the contribution of nursing towards the management of deterioration. This can include clinical decision support systems, educational interventions and organizational changes that will help nurses more effectively recognize and address clinical deterioration. Strict testing of these interventions by randomized controlled trials may offer valuable practice evidence.

Another significant research direction is the study of nursing interventions in various groups of patients and in various clinical situations. Majority of the available studies have been undertaken on general medical and surgical populations, but deterioration management might demand different strategies when applied in special populations, including pediatric patients, critically ill patients, or patients with certain chronic illnesses. Awareness of these differences may be used to design more specific deterioration management strategies.

Studies focusing on the cost-effectiveness of various nursing interventions to clinical deterioration may be valuable in informing policy and resource allocation choices in health care. Knowledge of the economic consequences of various intervention plans might enable healthcare systems to streamlines their efforts to alleviate deterioration and manage costs and efficiency.

Another potential but under-researched direction in research is the incorporation of patient and family perspectives into nursing clinical deterioration interventions research. Applying knowledge of patient and family perceptions and experiences of nursing interventions in the presence of clinical deterioration may offer useful information to support patient-centered care and communication during such critical stages of patient management.

The organizational and systemic determinants that affect the clinical deterioration nursing interventions should also be studied in the future. This may incorporate research on staffing model, skills mix, organizational culture, and resource presence and their influences on the patterns of nursing practice. The organizational policies and practices based on this understanding of these relationships may help in maximizing the role of nursing in the process of deterioration management.

Theory development that has the potential to explain and predict clinical deterioration nursing interventions is a promising area of future research. The existing literature has been highly theoretical and has failed to provide insight into the mechanisms underpinning nursing practice and formulate specific interventions that can enhance practice.

In short, nursing intervention research within the framework of clinical deterioration management is a complex and dynamic sphere of healthcare research with extensive implications on patient safety, quality of care, and health

system performance. Though great progress has been achieved in the frequency and nature of nursing interventions in this area, it has left some gaps of information that still need to be filled through further research.

The results of modern study discredit the classical ideas of nursing role in the management of deterioration, and underline the richness and the complexity of nursing intervention in care of the patient in critical stages. These lessons can serve as valuable stepping stones in creating more effective strategies to assist nurses in dealing with clinical deterioration and in utilizing evidence-based practice changes to improve patient outcomes.

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Conflicts of interest

The authors have no conflicts of interest to declare

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