Implementation of Crew Resource Management: A Qualitative Study in 3 Intensive Care Units

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Objectives: Classroom-based crew resource management (CRM) training has been increasingly applied in health care to improve safe patient care. Crew resource management aims to increase participants' understanding of how certain threats can develop as well as provides tools and skills to respond to such threats. Existing literature shows promising but inconclusive results that might be explained by the quality of the implementation. The present research systematically describes the implementation from the perspective of 3 trained intensive care units (ICUs).

Methods: The design of the study was built around 3 stages of implementation: (1) the preparation, (2) the actions after the CRM training, and (3) the plans for the future. To assess all stages in 3 Dutch ICUs, 12 semistructured interviews with implementation leaders were conducted, the End-of-Course Critique questionnaire was administered, and objective measurements consisting of the number and types of plans of action were reported.

Results: The results categorize initiatives that all 3 ICUs successfully launched, including the development of checklists, each using a different implementation strategy. All ICUs have taken several steps to sustain their approach for the foreseeable future. Three similarities between the units were seen at the start of the implementation: (1) acknowledgment of a performance gap in communication, (2) structural time allocated for CRM, and (3) a clear vision on how to implement CRM.

Conclusions: This study shows that CRM requires preparation and implementation, both of which require time and dedication. It is promising to note that all 3 ICUs have developed multiple quality improvement initiatives and aim to continue doing so.

Key Words: crew resource management, patient safety, implementation, intensive care unit, quality improvement, medical team training, evaluation, implementation leaders, behavioral change

Abbreviations: CRM = CREW RESOURCE MANAGEMENT, CUSP = COMPREHENSIVE UNIT-BASED SAFETY PROGRAM, ECC = END-OF-COURSE CRITIQUE, IC = INTENSIVE CARE, ICU = INTENSIVE CARE UNIT

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Crew resource management (CRM) has been increasingly applied in health care to improve safe patient care. It consists of a team training that was developed in the aviation field and aims to increase participants' understanding of how certain threats, such as miscommunication, can develop as well as provides tools and skills to respond to such threats. The focal point of the training is nontechnical skills, such as communication, teamwork, leadership, situational awareness, decision making, and problem solving. These nontechnical skills complement the technical abilities and contribute to safe and efficient task performance.

At long last, CRM should be embedded in the organizational culture as a way of doing things.

The findings of evaluations of CRM as a classroom-based training are promising but inconclusive with regard to behavioral change. For instance, McCulloch and colleagues found an increase in the use of nontechnical skills for nurses but not for anesthesiologists or surgeons. Rabol et al recommend more qualitative research to get a deeper insight into why these mixed results occur.

The effects of CRM—and interventions in general—are determined by the persuasiveness of its program, as well as the quality of the implementation. Therefore, the quality of the implementation might explain the mixed results of CRM.

To date, implementation has never been the main focus of CRM evaluation research. It has mainly been described alongside the quantitative results in 2 ways. It has been described, first, as a predefined part of the training, expressed in the Methods section. For instance, Stead et al state that the implementation of CRM comprises 3 phases: site assessment, training, and sustainment. Second, it has been described by discussing the main barriers and facilitators perceived by the researchers while conducting their study. Morey et al, for example, stress that support from management was a prime facilitator in the implementation of CRM.

Although both ways of describing the implementation yield valuable information, they do not depict the whole process of implementation and overlook the underlying vision, structure and follow-up. An exception is the study by Marshall and Manus, in which they described the important characteristics, goals, changes, barriers, and facilitators for each participating department. They did not, however, distinguish different phases of implementation.

The present research systematically describes the implementation from the perspective of 3 trained intensive care units (ICUs) based on interviews with implementation leaders. The choices, rationales, and consequences that played a role in the implementation process will be assessed, whereas existing system change frameworks present in each unit will be used to characterize the implementation in each ICU. In this way, we aim to gain insight into contextual factors influencing the effects of CRM and to present practical examples to readers interested in the implementation of CRM. In addition, increased understanding of the implementation process of CRM in 3 ICUs might help explain the effects of CRM. In short, the present study takes a first glance at the implementation of CRM.

METHODS

Design and Setting

The design of the study was built around 3 stages of implementation: (1) the preparation, (2) the actions after the CRM training, and (3) the plans for the future. To assess all 3 stages,
The medical staff of the ICUs to until 5 of which the present research is a part. This provided and adapted for www.journalpatientsafety.com © 2014 Lippincott Williams & Wilkins “as well as previous CRM

...2 consecutive days from 9 PM. Because a maximum of 15 participants per session had been set, several trainings were organized to include all members of the IC staff. Two ICUs received 4 sessions, and 1 ICU received 6. In total, 14 CRM sessions were organized to include all members of the ICU staff. Two ICUs received CRM training with 3 comparable ICUs in a controlled trial with 1 premeasurement and 2 follow-up measurements. The trial aimed to assess all levels of the Kirkpatrick evaluation framework for training programs (reaction, learning, behavioral change, and organizational impact). The study was approved by the Ethical Committee of the VU Medical Center. Participation was confidential, and all gathered data were stored entirely anonymously.

Intervention: CRM Training

The CRM training was classroom based and consisted of 2 consecutive days from 9 AM until 5 PM. Because a maximum of 15 participants per session had been set, several trainings were organized to include all members of the IC staff. Two ICUs received 4 sessions, and 1 ICU received 6. In total, 14 CRM sessions were organized, and in such a way that each discipline was represented during the sessions, guaranteeing a multidisciplinary audience. Each ICU was trained separately.

The training aimed at improving patient safety on all fronts of the ICU by increasing awareness regarding the threats of unsafe behavior on the individual, team, and organizational level. Subsequently, the participants were stimulated to develop ways to recognize these threats and to prevent negative consequences on each of these levels. These solutions were continuously recorded during the 2 days of training by means of writing down concrete plans of action. An example of an action on the team level is to explicitly appoint a coordinator of the day to improve and clarify leadership, teamwork, and communication.

The ICUs were free to choose how they wished to organize their implementation of CRM and the plans of action that were formulated during the training. The 2 CRM instructors were available as consultants for a period of 1 day after the ICU had been trained. It was up to the ICU to decide on how to use this help (e.g., get organized, implement changes, reiterate theory). Furthermore, ICUs were encouraged to form a CRM change team. A detailed description of the training can be found in Kemper et al.

Measurement and Participants

Interviews

Twelve semistructured interviews were conducted to assess the progression of the implementation process. These interviews were held at 3 moments in accordance with the 3 stages of implementation: (1) just before the CRM training, (2) 4 to 6 months after the training, and (3) approximately 15 months after the training. The content of the interviews was based on the phases of Grol and Wensing’s implementation model. The first interview focused on the “orientation” phase, the first phase of the model, which included a raised awareness and interest for the intervention. The second interview focused on “change”—phase 4 of Grol and Wensing—in which CRM is tried or used. Objective data on the types and numbers of changes that were implemented were recorded and categorized for each ICU. The third interview focused on maintenance—the fifth phase of Grol and Wensing—in which the integration into the daily routine and sustainment of CRM are the central themes. The phases of insight and acceptance—phases 2 and 3 of Grol and Wensing—were not used for the interviews because these are part of the CRM training, rather than part of its implementation by the ICUs. All interviews were conducted and transcribed by the first author.

The participants were all implementation leaders in each phase of the implementation, being identified through the various contact moments related to the starting up of the study. For the preparation phase, the pioneers were interviewed. These were the persons who first brought up the topic of CRM and convinced staff and management to train the whole ICU. When the pioneers were not responsible or involved with the further implementation of CRM, a second interview was conducted with the person who had in fact prepared the implementation. For the stage after CRM training and plans, the chair of the CRM change team or the person responsible for the implementation of CRM projects was interviewed. Some persons fulfilled several of these roles (e.g., pioneer and chair of the change team) and were therefore interviewed several times. In total, 12 interviews were conducted with 8 persons (Table 1). Besides implementation leaders, regular participants were initially interviewed as well. The forthcoming information was, however, too detailed and intertwined with specific initiatives that it lost its value to describe the general implementation. Therefore, these interviews were not continued and not included in the present study.

The interviews were digitally recorded and were worked out as chronological narratives, which were then presented to the interviewed persons, so-called respondent validation, to minimize a biased interpretation of the interviewer. The narratives were then split up and categorized into the relevant stage of the implementation process, followed by a further subdivision across the topics within each stage (Table 1). The topics were based on aspects of the implementation model of Grol and Wensing and related implementation literature as well as previous CRM evaluations.

End-of-Course Critique

The reaction of the participants was assessed using the mean score on the End-of-Course Critique (ECC). All participants were asked to fill out the ECC at the end of the training. The ECC was originally developed by Grogan and colleagues and adapted for use in the ICU. It measures the reaction immediately after the training, expressed as the extent of the perceived relevance and utility of the specific topics covered in the CRM training (e.g., “The session about ‘Human Factors’ was relevant and useful”). The ECC consists of 14 statements that are to be rated on a 5-point scale, varying from “strongly disagree” to “strongly agree.”
In line with Kotter’s framework, the change team thor-

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Within this approach, implementation of CRM for a large part into the Comprehensive Unit-based Safety Program (CUSP) explicitly chose to integrate CRM for high-risk situations that were identified during the training. To develop these checklists, ICU B developed several checklists for standard operating procedures and handovers. The commitment of the staff to the intervention is essential. In the eyes of the implementation leaders of ICU C, the CRM training elicited this kind of commitment. Especially, the development of a mutual CRM vocabulary helped the staff to express and address issues of quality and safety themselves. Besides allocating structural time to elaborate ideas, there was no structured guidance regarding which issues, derived from the plans of action or newly developed, should be chosen. Furthermore, no change team was put together to aid the implementation.

TABLE 2. Responses of the Participants of All ICUs to the Aspects of the Preparation Stage (1) as Described in Table 1

| Key Words of Table 1 | ICU A | ICU B | ICU C |
|----------------------|-------|-------|-------|
| Interest             |       |       |       |
| First contact        | When approached for participating in the present study | Within the study of anesthesiology and through a TeamSTEPPS seminar | Familiar with CRM through international conferences |
| Why useful           | Quality receives structural attention within the team of ICU physicians | Quality receives structural attention within the team of ICU physicians | Quality receives structural attention within the team of ICU physicians |
|                      | Openness for new (safety) initiatives | Openness for new (safety) initiatives | Openness for new (safety) initiatives |
|                      | Personal interest of ICU physicians | Personal interest of ICU physicians | Personal interest of ICU physicians |
|                      | Experience with the rapid response teams revealed problems with communication. CRM was a possibility to address this issue. | Consensus existed that multidisciplinary communication could be improved. | Consensus existed that culture regarding teamwork and flexibility needed to be optimized within the ICU. |
| Process              |       |       |       |
| Green light          | Convincing the relevant stakeholders came down to 1 question: “What is the added value of CRM?” | The medical manager and the team of ICU physicians were instantly enthusiastic. | CRM was very quickly perceived as a sound solution for the problems as described above. |
|                      | First, the ICU physicians had to be persuaded, followed by the ICU management, the board, and the ICU staff. The first group was the hardest, and a decision had to be forced. | The board and the quality department of the hospital were informed but not involved. | ICU physicians, cluster management, and board of directors were directly supportive. |
| Embedding            | CRM was additional to the normal educational activities at the ICU. | CRM was the theme of the annual ICU training program, which normally comprises 2 days too. | CRM was additional to the normal educational activities at the ICU. |
| Preparation          | Practical issues (e.g., dates) were discussed with the CRM trainers. | Two informational meetings were organized to inform staff and to invite them for the change team. | Two information meetings were organized to inform the ICU staff. |
|                      | The change team was formed. | An ICU with experience with CRM was visited. | |
| Barriers and facilitators before |       |       |       |
| Barriers             | The costs for the training and staff hours during the training | The costs for the training and staff hours during the training | The costs for the training and staff hours during the training |
|                      | Organizational hassles | Low expectations resulting in difficulties in motivating people. | |
|                      | Limited evidence of the effectiveness of CRM | | |
| Facilitators         | Structural time to initiate quality initiatives such as CRM | Being a pioneer | Innovation grant for receiving CRM training |
|                      | Quick support from the ICU management | | Existing interest in (patient) safety/quality |
|                      | | | Supportive reaction of colleagues |

Implementing small adjustments, so-called quick wins, such as an extra whiteboard and the mounting of photos, to pave the way for larger projects. Intensive care unit B started with the implementation of some of the easier initiatives that were mentioned in the plans of action. Their further implementation was characterized by a focus on the development of checklists for high-risk situations that were identified during the training. To develop these checklists, ICU B explicitly chose to integrate CRM for a large part into the Comprehensive Unit-based Safety Program (CUSP). The CUSP has been successfully applied in the ICU. Intensive care unit B used the CRM training to educate the staff on safety science, which was the first step of their CUSP program. With the use of a prospective risk analysis method, ICU B developed several checklists for standard operating procedures and handovers.

The implementation by ICU C can be characterized with the social movement approach. Within this approach, implementation is an unstructured, self-organizing, and auto-catalyzing process. The commitment of the staff to the intervention is essential. In the eyes of the implementation leaders of ICU C, the CRM training elicited this kind of commitment. Especially, the development of a mutual CRM vocabulary helped the staff to express and address issues of quality and safety themselves. Besides allocating structural time to elaborate ideas, there was no structured guidance regarding which issues, derived from the plans of action or newly developed, should be chosen. Furthermore, no change team was put together to aid the implementation.
TABLE 3. Summary of the Plans of Action That Were Mentioned by All ICUs

| Unit | Team | Individual |
|------|------|------------|
| Transparent and clear (joint) decision making of the management | Creating situational awareness, for instance, by applying time-outs | Giving feedback to each other regardless to whom |
| Structuring and facilitating (in terms of finance and time) change | Better utilization and more open morning rounds | Developing nontechnical skills, such as assertiveness or being a better team player |
| More incident reports with feedback about these reports | Appointing responsibility/leadership around the bed | |
| Creating an open culture, for instance, by introducing an evaluation of the day | Creating leadership and clarity in acute situations | |
| Optimal work space and equipment with corresponding education about its use | | |
| Appointing a coordinator of the day with a clear job description | | |
| Structuring handovers internally and externally | | |

Although the ICUs differed in how they organized their changes, some resemblances were found. All ICUs used the plans of action as a starting point for change after the CRM training. After prioritizing and categorizing, these plans formed the input for the first initiatives. An overlap in themes was seen with regard to the implemented changes. All ICUs revised the role of the coordinating nurse and developed checklists, for instance, for the transport of a patient.

An important barrier, mentioned by all ICUs, was the lack of implementation knowledge and skills. For instance, how do you get and keep the staff involved, especially the less “CRM-enthused” part? This might explain why some initiatives were not well received, despite the bottom-up approach of the training, or perhaps the development of “implementation fatigue” played a role.

Plans: Maintenance

Intensive care units A and B indicated that they continued working with their change teams as a structural part of their unit. The goal of ICU A was to change the safety culture, whereas ICU B wanted to continue the development of checklists for high-risk situations. Intensive care unit C wanted to integrate the CRM mechanism of recognizing risks and addressing them, as a “normal” way of doing things, rather than as a “special” project. There were no concrete plans to structurally sustain CRM in ICU C. The results are summarized in Table 5.

DISCUSSION

The results of the present study demonstrate that all 3 ICUs successfully launched several initiatives, each using a different implementation strategy. Furthermore, all ICUs have taken several steps to sustain their approach for the foreseeable future. Despite the variety in strategies, 3 similarities can be seen between all 3 implementation processes that were crucial at the start of the implementation. First, all units reported problems with communication during the orientation phase. This acknowledgment of a performance gap is an indication that the participating ICUs, or at least the pioneers, possess a sense of urgency to change. This is an important first step for further implementation. Second, all ICUs allocated structural time for quality improvement before CRM and for change after CRM. Third, despite having different strategies, all units had a clear vision regarding their goals and strategies concerning CRM.

All ICUs indicated that they would use the plans of actions that were formulated during the CRM training as a starting point for their follow-up initiatives. The role of the coordinating nurse and the development of checklists are themes that recur in each ICU and are in line with CRM topics such as leadership and standardized communication.26 All ICUs mention the costs of CRM and a lack of implementation expertise as important barriers during the orientation and the change phase, respectively. The fact that CRM was perceived by the implementation leaders as a new and promising way to improve patient safety, as well as educating the whole staff, were regarded by all 3 ICUs as facilitating factors to receive CRM training. Finally, all ICUs reacted very positively in the ECC.

The flexibility of the CRM follow-up initiatives provides opportunities but also creates pitfalls. An advantage of the flexibility is that the initiatives can be tailored to the specific situation and can be integrated in existing programs. For instance, Tapson et al.27 used CRM training to successfully enhance the appropriate use of venous thromboembolism prophylaxis in surgery. A pitfall of the flexibility is that a large number of CRM initiatives can be overwhelming and may lead to implementation exhaustion. Box 1 presents suggestions proposed by the implementation leaders to get the best out of the initiatives.

The diversity in follow-up initiatives could explain the mixed results of classroom-based CRM training on a behavioral level as reported by Rabol et al.2 First of all, as a result of the diversity, it is possible that an outcome that is used in an evaluation is not applicable for each site that is being studied. For instance, the use of a checklist is an often-used endpoint in CRM evaluation.5 When applied to the present study, we probably would have found a large effect in ICU B, a small effect in ICU A, and no effect in ICU C. This exemplifies the difficulty in defining an outcome that is applicable in all units, especially when the evaluation is designed even before the training, in accordance with scientific discourse.

Second, it can be questioned whether behavior in general is likely to change as a direct result of diverse, smaller interventions within the evaluation period of 1 year. It can be argued that these initiatives influence behavior by changing the safety culture. When the implementation of CRM initiatives is perpetuated over time, it will change the way people think about issues regarding safety and quality. This resonates in the social norms, which partly determine behavior.28 Behavioral change through culture takes much longer than 1 year; for instance, in aviation, it took approximately 40 years to gradually, but steadily, establish the safe culture that exists today.29 However, once established, the change will be very robust.

**Text Box 1**

Suggestions of the participating ICUs

- Be ready to solve problems, not just to identify them
- Get advice from implementation experts
- Formulate end goals and evaluate them
- Start directly after the CRM
- Schedule enough time in advance
- Be aware that CRM can easily lose momentum
TABLE 4. Responses of the Participants of All ICUs to the Aspects After the Training as Described in Table 1

| Key Words of Table 1 | ICU A | ICU B | ICU C |
|----------------------|-------|-------|-------|
| **Approach** | | | |
| **Vision** | CRM was perceived as a continuous project that generated new quality improvement initiatives or enriched existing ones. | CRM was integrated as part of a CUSP. | CRM was a start to integrate quality initiatives as a normal part of the daily work. |
| Change agent(s) | A multidisciplinary change team of 6 persons: Experienced nurse (chair) IC physician Inexperienced nurse CCU nurse IC coordinator Implementation expert (6 sigma) | A multidisciplinary change team of 9 persons: 5 nurses 2 IC managers 1 IC physician 1 clinical psychologist | The manager of ICU stimulated and facilitated all CRM initiatives. |
| Involvement | Frequent feedback at staff meetings | No information | Time and space that were reserved for CRM could be used by everyone. |
| Follow-up process | | | Elaborated projects were discussed during staff or ICU meetings. |
| 1. Formulated a mission and vision of the change team. | 1. List of top 5 CRM initiatives was composed on the basis of the plans of action formulated during the CRM training. | Flash cards were produced with the main lessons of the CRM training as reminders. |
| 2. Created support from management by formally writing down tasks and goals. | 2. When applicable, these projects were directly implemented (3/5). | 1. The plans of action from the CRM training were prioritized and categorized by the ICU manager and stored in a “CRM map” on the computer. |
| 3. Created wide support by involving everybody. | 3. Risk analysis of the remaining projects (2/5): | 2. The plans of action were elaborated during “CRM shifts.” Every month, 3 CRM shifts were scheduled in the planning. Everybody was able to pick projects from the CRM map. There were no obligatory topics because it was believed that important themes would manifest themselves. |
| 4. Organized the CRM training. | a. Risk analysis | b. Identify major problem areas (“black slopes”) |
| 5. Worked out the plans of action that were formulated during the training: prioritizing and formulating implementation plans (e.g., goal, costs, planning) for each plan. | c. Develop a checklist for these slopes | 3. Integration of “CRM initiatives” with the normal ways of doing things, through reserving the time and space. |
| 6. Started with some smaller, more “easy” projects | | |
| 7. Followed by: implement new things, organize a feedback training, keep emphasizing the role of the change team | d. Implement the checklist for each slope. | |

(Continued on next page)
On the basis of the present study, we are unable to recommend one implementation strategy over the other. Although the ICUs share some similar initiatives (e.g., role of the coordinating nurse), the execution was always a bit different. Therefore, we could not compare the ICUs on the same endpoints and make valid assumptions on which strategy led to the best results. In addition, it can be questioned whether 1 implementation strategy would have led to similar results in all ICUs. The ICUs chose their strategy on the

| Key Words of Table 1 | ICU A | ICU B | ICU C |
|----------------------|-------|-------|-------|
| Changes              |       |       |       |
| Formal               | Red Alert flowchart for acute situations | Directly implemented projects (that did not need an extensive preparation): | Finished and ongoing projects: Reinstall the meeting between the coordinating nurse and the IC physician |
|                      | Stating early goals during the morning round | Task description for the coordinating nurse | Streamline flow of the “blood-type” patients |
|                      | Photo of the person in charge on the door of the patient rooms | Moment of debriefing at the end of the day shift | Protocol for transport |
|                      | Extra whiteboard | Optimize incident reports | Decreasing self-extubation Patient meetings |
|                      | Checklist for the coordinating nurse | Implemented checklists following the risk analysis (see “follow-up process”) Handover (e.g., operating theater to ICU) Standard procedures (e.g. transport) | Enhancing coherent medical policy |
| Informal             | Patient safety was discussed much more | The debriefing was well received, very open, and constructive. Better teamwork between coordinating nurses | Most items from the plans of action were “soft”/informal, such as enhancing mutual communication. These things are not concrete, although they were perceived to be improved, especially the mutual understanding and communication between disciplines. |
|                      | Situational awareness was more accurate (e.g., more anticipation: Is everything present?) | The phrase “we are going to solve this CRM-wise” was often heard. | |
| Barriers and facilitators after |       |       |       |
| Barriers             | Too many small/easy projects resulted in implementation fatigue | A prospective risk analysis was time consuming. The attendance in the project groups was sometimes low | The CRM shifts are not very popular. |
|                      | Limited know-how regarding implementation (especially with regard to multidisciplinary interdepartmental aspects) | Feedback to the whole staff was time consuming. New employees were not (yet) trained. | |
|                      | Too much encouragement from the change team had a negative effect. | The large number of initiatives resulting from the training Projects groups add to the “normal” workload. | Not every initiative is well received. These initiatives are being left in abeyance for the time being. |
| Facilitators         | The biggest opponents were actively involved in the project; this convinced them about the importance of these projects. A limit to the amount of CRM initiatives | Getting all disciplines in 1 room at the same time. A checklist “sells itself.” | CRM training was very positively received by the staff. |
|                      | Formally writing down tasks and goals of the change team (was especially relevant when management changed) | Video reflection was used to create awareness of the importance of the checklists. | Getting to know each other in a different setting Mutual CRM vocabulary |
|                      | The inclusion of an implementation expert in the change team | That the whole (multidisciplinary) staff received CRM training and the positive reaction to it | |
|                      | The use of existing project groups | Support of ICU management | The way CRM teaches you to reflect on your own functioning. CRM had a catalyzing effect on existing project groups. |

CCU, coronary care unit.
basis of a clear vision on what they wanted to achieve with CRM. Therefore, the strategies were highly dependent on the context to which they were applied. Existing literature also shows that context is an important aspect when determining which implementation strategy should be favored. However, more research on this topic would be an interesting venue for future studies.

**Limitations**

The present article is an exploration to qualitatively study the implementation process of CRM. The number of ICUs is limited; therefore, the results should be considered preliminary. In addition, the interviewees were all actively involved with CRM; therefore, their perception might be slightly positively biased. To counteract this bias, the interviews were focused on objective results, such as which projects were actually implemented.

The external validity is limited by the number of ICUs that participated in the present study. Because this study was conducted as part of a larger effectiveness study, it was bound to counteract this bias, the interviews were focused on objective results, such as which projects were actually implemented. The external validity is limited by the number of ICUs that participated in the present study.

Furthermore, participating in the effectiveness study required organizational and financial commitment, reflecting a willingness to receive CRM. This willingness should be taken into account when considering the external validity.

**CONCLUSIONS**

This research shows that CRM requires preparation and implementation, both of which require time and dedication. Consequently, it involves more than 2 days of training. The study illustrates that, despite the differences in vision concerning how to approach CRM, all 3 ICUs in the current research developed and implemented their own locally owned initiatives. The multitude and diversity in initiatives reflect the catalyzing effect of CRM on new and existing quality initiatives. Furthermore, it indicates that CRM helps participants to recognize, address, and handle safety issues. Finally, the diversity in initiatives may help explain the mixed results in outcomes in the present CRM evaluation research.

The results of the present study suggest that units that are considering CRM should base their strategy on a clear vision. The implementation strategy should probably be close to their own previous experience with the implementation of other projects. Structural time should be made available for preparation and implementation. The implementation should be tailored to the specific situation, depending on what goals are to be achieved using CRM.

All in all, it is promising to note that all 3 ICUs in the current research, despite their own barriers, visions, and strategies, developed multiple quality improvement initiatives and aim to continue doing so.

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