Cover Page

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Title of Submission:

Increasing Rapid Response Team Utilization Proves to be a Successful Strategy to Improve Patient Safety by Reducing Code Blue Rates and Code Mortality.

Areas of Focus:
Patient Safety, Quality Improvement

Executive Leader Brief Statement:
Douglas G. Merrill, MD MBA, Chief Medical Officer and Senior Associate Dean for Quality and Safety, UC Irvine Health

Changing culture in an academic medical center to move care decisions toward standardized and multidisciplinary models, away from autonomous, physician-only paradigms, is a challenging endeavor. Nonetheless, such change is critical to the creation of a Highly Reliable Organization, providing the safest possible environment for patients despite the high risk that their medical conditions engender. This better state is only accomplished through continuous self-assessment and re-invention, driving change to always favor wider collaboration in error detection, prevention and system design.

This initiative, and its remarkably positive outcomes described below, embodies the effort to change a culture in the most difficult scenario: an institution whose outcomes are good and which is populated by experts. Through the dint of collegial, multi-disciplinary teamwork in strategic design and tactical execution, these providers have created a system in which patients are far safer than before and have laid the groundwork for ongoing and future models of cultural change here. Both these immediate and the anticipated long-term outcomes that their work has and will support are salutary. As such, I am proud to support them for your consideration in regard to the Vanguard Award.

Executive Summary

A popular strategy to reduce preventable in-hospital cardiac arrests and improve patient safety is the use of rapid response teams (RRTs). UC Irvine Health recognized an opportunity to improve its utilization of this valuable resource, and thereby, improve patient safety. Supported by executive leadership, a multidisciplinary educational campaign and code simulation training program was developed to achieve this goal. We focused on early recognition of patient destabilization and standardization of our activation responses. Since our project began, there has been a dramatic increase in RRT utilization (Figure 2), and a subsequent decrease in both the overall code blue rate and the non-ICU code blue rate (Figure 3). We have also recorded an increase in overall code blue survival. The key to achieving this success was a cultural shift in how we approach acute changes in patient condition and RRT activation. Challenging the traditional autonomous model of decision-making and hierarchical physician notification system, replacing it with coordinated teamwork and rapid resource deployment, has improved patient safety, as evidenced by the drop in both code blue rates and increased survivability.

Background and Relevance:

Hospitals across the nation continue to pursue proven strategies to lower hospital mortality rates, and reduce patient morbidity. Rapid Response Team (RRT) deployment is a recognized strategy to improve patient safety and achieve these goals. This strategy was identified by the Institute for Healthcare Improvement (IHI) in its *Saving 100,000 Lives Campaign* as a winning approach and is well supported by the scientific literature (1-3).

These rapid response teams (RRTs), once alerted, work to proactively intervene on behalf of acutely decompensating patients to prevent further patient deterioration. Patients are at particularly high risk for unrecognized and untreated decompensation if admitted to non-intensive care unit (ICU) settings, where resource availability and staffing levels or expertise may delay recognition of instability (10). It is well documented that a period of "pre arrest" often precedes a code blue event (4,5). It is during this period of time, often 8 hours or more before an arrest, when physiologic derangements are often present, that targeted interventions and resuscitation can prevent full code events (5,6). But how does an institution increase the awareness of these subtle signs of decompensation in order to promote earlier action by its healthcare providers?

In 2012, as part of our quality and safety improvement strategy, we performed an intense review of our RRT and code blue data, by unit. We discovered both a lack of documentation of the events and a low rate of deployment of the RRT: there were only 3 in January of 2013 and very few calls at all in 2012. In addition, the rate of non-ICU code blue events was a relatively high 3.32 codes per 1000 patient discharges (6,7).

In an effort to improve the efficacy of our emergency response teams, we formed a Lean Six Sigma (LSS) team to come up with a strategic plan for improvement. We surveyed healthcare staff to discern the primary drivers of low utilization rates for our RRT. We learned communication and lack of leadership were perceived as the greatest barriers to successful emergency response calls. Also in that survey, we learned that 64% of respondents, which included both nurses and physicians, had never activated a rapid response. They were unfamiliar with the specific criteria to activate the RRT. They instead relied on paging the on call resident, often a junior member of the patient care team, to address sudden changes in a patient condition, unless a full code blue was initiated. This hierarchical system of physician notification, which often exists in academic environments, can lead to delayed decision-making (9). These delays prolonged the amount of time it took to get the appropriate resources to those patients in need of aggressive intervention or reevaluation. We recognized that changing this encultured reticence to "go around" the primary team, in order to rapidly deploy resources where needed, would be necessary to improve patient safety.

Scope and Strategies:

In an effort to improve our utilization of the RRT throughout the hospital, we began a multidisciplinary educational campaign targeted at all healthcare providers. Nurses received clinical updates on RRT utilization rates and rapid response policy changes. Thank you notes were sent to all individuals that activated a rapid response and no call was considered inappropriate or a "false alarm" (11). Activation criteria were revised based on research in early warning systems (5,6) and shared with all patient care providers. We included a "gestalt" criteria, in additional to the physiologic parameters, thereby empowered our staff to activate the RRT if they were concerned about the stability or safety of a patient regardless of whether that patient met any other markers (8). Patients and their visitors were permitted to call for a RRT, using the same operator driven process used by staff. The updated RRT criteria were discussed in nursing morning huddles and practice councils. Physician leaders on the LSS team visited all major departments, discussing RRT activation criteria and changes, as well as current utilization data, with front line physicians. We made substantive changes to the emergency response procedures based on our staff survey, including the simplification of the RRT paging system for activation and identification of key responders with code stickers, such as TEAM LEADER and ICU RN, which were added to code carts.

One of the most impactful strategies for RRT improvement was multidisciplinary simulation training on emergency responses. We brought together nurses, residents, students, pharmacists, and respiratory therapists to engage in joint code simulation sessions, in an effort to improve team communication during these events. We focused less on ACLS algorithms and more on effective communication and team work in a simulated chaotic environment. Since we began, we have trained more than 150

participants with 100% of trainees reporting that it was a positive team building experience; 100% also felt that the team simulation training was relevant to their practice. We continue to offer monthly simulation training sessions.

During this project, the Critical Events Management Team reviewed all incident reports related to RRT activations. A dedicated analyst created and maintained a dashboard of relevant data from emergency responses and tracked Rapid Response and Code Blue rates, for both ICU and non-ICU patient care areas (Figure 2).   Individual providers were given feedback related to RRT calls. This feedback not only highlighted that all calls are reviewed, but reinforces the concept of universal utilization when activation criteria are met.

Challenges:

Standardizing response team activation for critical events and improving communication between primary care teams and our RRT were unique challenges in this project. The Acute Response Committee, which oversees the code blue team and RRT, promoted the uniform activation of the RRT as soon as a patient met any of the new criteria (Figure 1). Rapid Responses were to be initiated prior to paging the primary care team, which was our biggest hurdle and represented a major cultural shift within the organization, where a hierarchy of resident and attending physician notification has existed for so many years. Eliminating this hierarchy, inherent in many academic institutions, would reduce the time it took it took to get critical care resources to the patient's bedside (9). We also standardized the approach to decompensating patients, reducing physician autonomy in favor a coordinated team response and evaluation.

Results:

Since we began our work late in 2012, we have dramatically increased the number of RRT calls in our institution. This team now responds to nearly 40 calls per 1000 patient discharged, compared to 3/1000 discharges in 2012. Despite the increased volume, our response times remained less than 5 minutes for rapid response calls.

Not only has RRT utilization dramatically increased, but we have also seen a decrease in overall arrests per 1000 discharges and improved survivability. Prior to initiating our project in 2012 and creating a robust data repository, the rate of code blue was approximately 6.33 per 1000 discharges. In 2014, there were 5.14 arrests/1000 discharges, and by 2015 that number had decreased to 4.65 (Figure 3a). We have also seen a reduction in the number of codes that occur in non-ICU settings. In 2012 we had 3.32 non-ICU codes per 1000 discharges, and by 2015 we averaged 1.61/1000 discharges, which is a nearly 50% reduction (Figure 3b). This change in non-ICU arrests is typical of the impact of increased deployment of RRTs and represents an improvement in patient safety. Earlier recognition of decompensation and assessment by the RRT resulted in timely interventions to stabilize the patient and frequently a move to a higher level of care.   We have not simply shifted codes to our ICUs, though; we have increased code blue survival rates as well. In 2014, 20% of patients survived a code blue, and in 2015 that number had increased to 32%. We are optimistic that the survival rate will be even higher in 2016, as it is 41% through the first four months.

The most outstanding achievement of this project has been the cultural shift in the way we identify and respond to those patients at risk for decompensating. Nurses are more in tune to early warning signs of destabilization; they understand the need to bring critical care resources to the patient's bedside more urgently. Our staff has moved towards RRT activation first, and then paging the primary teams second. By reducing the amount of time it takes to recognize these patients and intervene, we improve our patients' chances of survival and can move them to a higher level of care. Primary teams accept and support the RRT, recognizing that RRT involvement reduces unnecessary delays. This change in culture is part of a two-fold effort that is typically related to increased quality of care and patient safety: reduction in autonomy among physicians in favor of team-based care and the institution of standard algorithms of care. To change years of practice habits, and have all healthcare providers move towards a common goal in the interest of improving patient safety and quality of care, has been a tremendous achievement. This multidisciplinary group success was only achieved through the vigorous support of all players – from the executive team, through unit managers, and especially from the front line staff.

Sustainability and Scalability:

Due to this shift in the culture of safety within our organization, where nurses and staff are supported and empowered to call RRT earlier and more often, we anticipate that the improved utilization rates will persist. To reinforce this change, we continue to review all incident reports related to RRT calls and provide individuals feedback when warranted. All non-ICU code blue events are reviewed to determine if the patient met criteria for a rapid response prior to the code blue event, and if so, provide feedback to the patient care team. We continue to hold multidisciplinary simulation sessions on code training, and have expanded these efforts to all medical and surgical residents in the PGY-2 year. The Graduate Medical Education Office also continues to provide periodic RRT updates through a series of mini emails targeted at quality and safety updates.

Lessons Learned:

A robust RRT program can reduce mortality and code blue events. The How-to Guide for Rapid Response Team implementation by the IHI has a wealth of useful information (11). Even if a RRT already exists in an institution, but is underutilized, this guideline can improve the functionality of the team. When cultural change is needed to move a patient safety initiative forward, progress can be slow, but it is sustained. A cultural shift in practice needs to be supported from the top down, with an involved and dedicated leadership team. Education, positive reinforcement, and feedback are all essential elements of a successful program. Promoting the detection of early warning signals is another very important aspect of a successful RRT.   Interventions need to occur during the pre-arrest time period: during those precious few hours when signs of destabilization begin, but when aggressive resuscitation can reverse the trajectory (5,6). To ensure that users will activate the RRT again, a high tolerance for "false alarms" must be accepted (11). Likewise, it is important for RRT members to respond with a positive attitude when called and to reinforce the benefits of this resource. When the institution moves towards team-based care, with multidisciplinary communication and standardized algorithms during critical events, in-house code events can decrease and outcomes can improve. Safety and quality of care improve, especially in these situations were patients are at their most vulnerable.

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Figure 1. Rapid Response Activation Criteria

Respiratory Parameters

        Difficulty Breathing – new onset

        Rate > 35 or < 8

        SpO2 < 85% on supplemental oxygen

        Threatened airway

Cardiac Parameters

        Systolic Blood Pressures < 80 or > 200

        Heart Rate < 40 or > 140

        Symptomatic dysrhythmia

Neurologic Parameters

        Seizure

        Change in LOC

        New onset loss of movement or weakness of legs, arms, or face

Pain

        Chest pain – new onset

        Uncontrolled pain

Uncontrolled Bleeding

Decreased Urine Output < 30 cc/hr

Other

        Staff concern or worried about patient

        Continued patient deterioration despite treatment

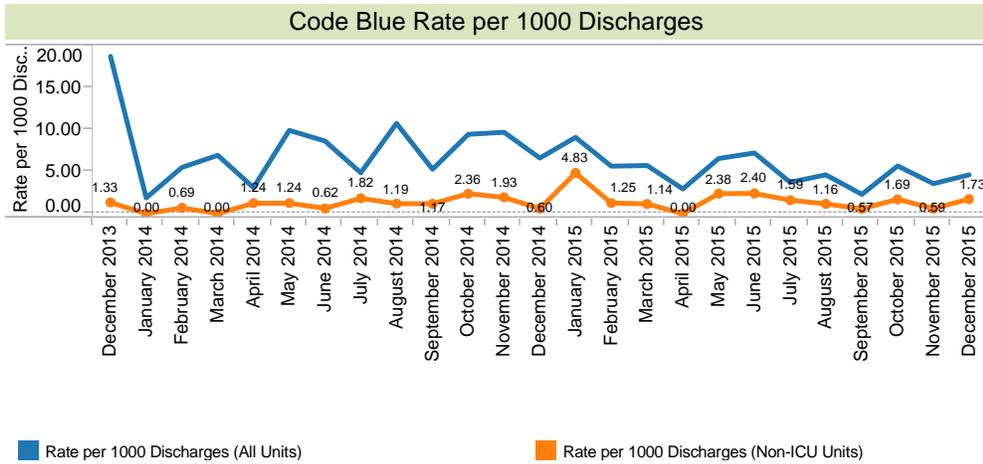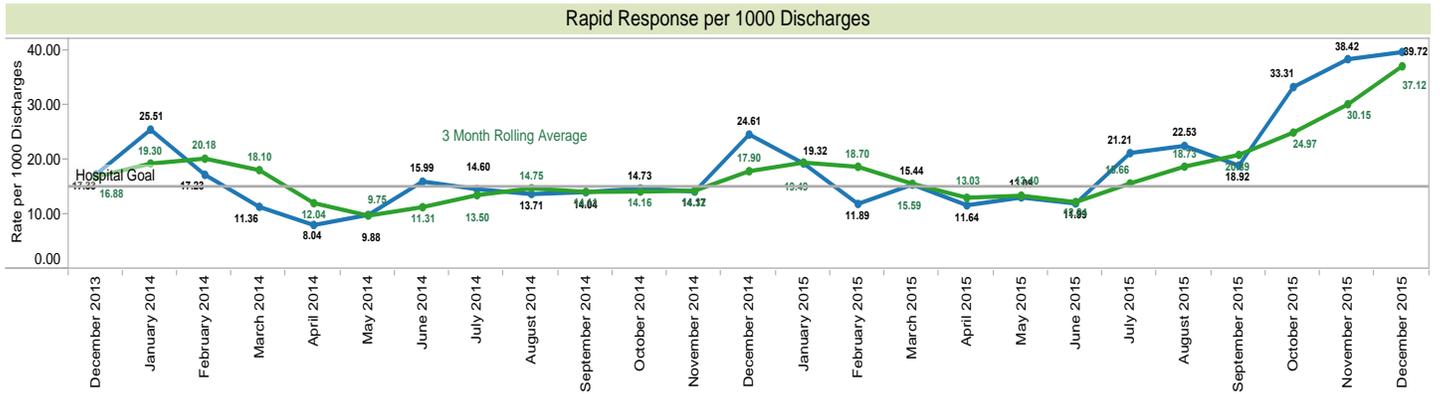**Figure 2.** RRT Utilization and Code Blue Dashboard

Rapid Response per 1000 Discharges

Code Blue Rate per 1000 Discharges

■ Rate per 1000 Discharges (All Units) ■ Rate per 1000 Discharges (Non-ICU Units)

Figure 3a. Code Blue Rates per 1000/Discharges (all areas)

Code Blues/1000 discharges

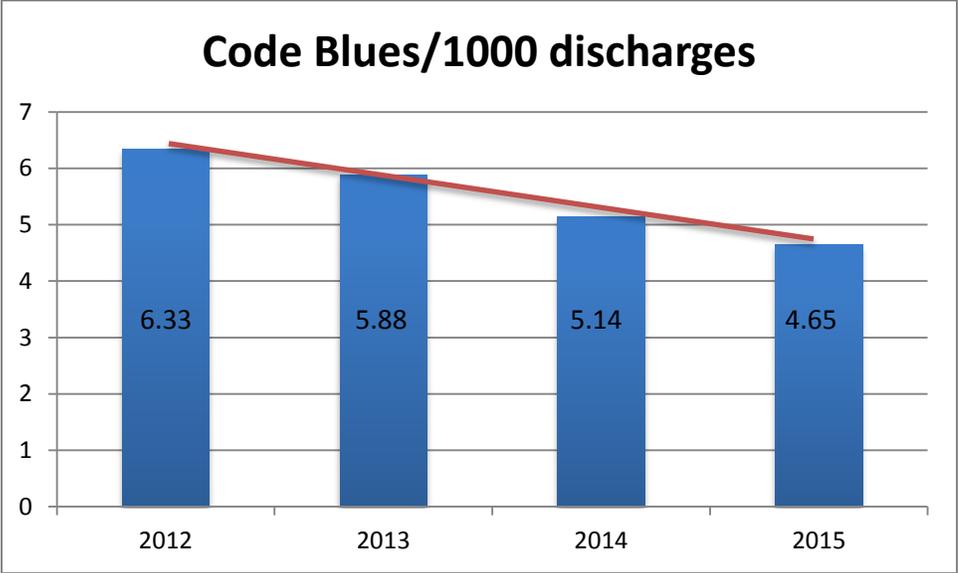| Year	Value
2012	6.33
2013	5.88
2014	5.14
2015	4.65

Figure 3b. Non-ICU Code Blue Rate per 1000/Discharges

Non-ICU Code Blues/1000 Discharges