Do Rapid Response Teams Work?
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Introduction

Do rapid response teams work? Broadly, yes. More accurately, yes . . . but not in a vacuum. How can this be stated with such certainty while still being highly controversial? The proof is in the results achieved at the University of San Diego Medical Center (UCSD).

In 2007, UCSD implemented an innovative program called Advanced Resuscitation Training, or ART. ART takes a new approach to resuscitation and thus rapid response by creating a framework that includes thorough training and defined roles and responsibilities for health care providers. Challenges and obstacles to success are tackled head-on through the use of data, education, debriefing, and the principles of cognitive psychology. This edition of Code Communications will explore the history of rapid response programs, some of the hurdles hospitals face when trying to execute a successful rapid response system, and how UCSD has overcome these challenges and the corresponding improvement in patient survival.

History of Rapid Response Systems

In November 1999, The Institute of Medicine (IOM) published an alarming report called, To Err is Human: Building a Safer Health System (Figure 1), looking at the state of the health care system. An IOM committee concluded that in the United States at least 44,000 people, and perhaps as many as 98,000, die in hospitals each year as a result of preventable medical errors.¹ The authors of the report suggested that these preventable medical errors cost between $17 billion and $29 billion per year nationwide.

It was with the launch of the 100,000 Lives Campaign in 2005, by the non-profit Institute for Healthcare Improvement (IHI), that the term rapid response team (RRT) became commonplace within hospitals throughout the United States. The goal of the campaign was to significantly reduce morbidity and mortality in American health care, as identified by the IOM report. More specifically, the IHI tried to answer the question, “Could the implementation of proven best practices in hospitals throughout the country save 100,000 lives from unnecessary medical injuries in 18 months?” The answer was a resounding yes. On June 14, 2006, the IHI announced that in the 18-month time frame, more than 122,300 lives were saved.² While the validity and data collection methods of this initiative have been called into question, the IHI was successful in drawing attention to the value of the role of a rapid response team and the potential benefits obtained by implementing an early responder system.

The publication of the Joint Commission National Patient Safety Goals in 2008 reinforced the need for a team of specially trained responders. Specifically, Goal 16 stated, “Improve recognition and response to
changes in a patient’s condition. The organization selects a suitable method that enables health care staff members to directly request additional assistance from a specially trained individual(s) when the patient’s condition appears to be worsening."³ While these guidelines did not “require” RRTs or mandate how they should be put into clinical practice, by 2008 the majority of hospitals in the United States had established a rapid response program. This trend has continued globally, with hospitals in Canada, Australia, and the United Kingdom instituting some form of RRT, also known as a medical emergency team (MET).

Utilization of RRTs

The premise of the RRT is to assess a greater number of hospitalized patients at an earlier stage of clinical deterioration, with the aim of preventing cardiac arrest and other serious adverse events. The term, “failure to rescue” was coined in the 1990s by Jeffrey Silber, MD as a way to characterize patients who could potentially have been rescued if health care providers had responded earlier or differently. The rapid response team aims to eliminate failure-to-rescue events from taking place. The team is trained to intervene during the critical period when the patient is presenting early warning signs, such as change in vital signs, but has yet to progress to a serious adverse event.

Unpublished data from UCSD have documented that rapid response criteria are present in 80% of non-ICU in-patient arrests, with a median duration of five hours prior to loss of vital signs. Similar findings were published in the Journal of the American Medical Association (JAMA); in this study, researchers concluded that adult patients often exhibit detectible physiological changes up to eight hours before a cardiopulmonary arrest.⁴ If a health care provider notices these early warning signs and activates the RRT, the team can then appropriately assess, treat, and triage the patient prior to a code. Because of the structure and reduction in patient monitoring, the rapid response team usually responds to patients on general medical or surgical wards.

Rapid response teams may be confused with a Code Blue team; however, there is a fundamental difference between the two. Table 1 compares the differences between a code team and a rapid response team.⁵ Traditionally, the Code Blue team is called for patients that are unresponsive, lacking a pulse, and/or loss of vital signs. A rapid response team intervenes when there has been a sudden change in the patient’s condition. Most institutions have a list of criteria that indicate when a health care provider, or in some instances a family member, should activate the RRT.
The construct of an RRT is dependent on hospital protocol; however, all rapid response systems utilize the same basic principles, typically thought of as four limbs: an afferent limb, an efferent limb, a quality improvement limb, and an administrative limb. The afferent component is designed to identify clinical deterioration in patients and trigger a response. This includes assessing the patient, identifying the personnel who trigger the system activation, determining the mechanism of activation, calling the rapid response team, and collecting pertinent data. The efferent limb is the response to the activation, including both the personnel and equipment brought to the patient. The efferent limb can also be included in the patient safety and quality improvement limb. The goal is to provide specific feedback from the collecting and analyzing of rapid response and code data in order to improve response, make changes to processes, and initiate education initiatives. The final component is the team responsible for coordinating resources to facilitate improved care, overseeing responding staff, purchasing of equipment, and healthcare provider education.

**Current Challenges**

**Clinical Findings**

Early publications, such as the IHI report, analyzing the efficacy of RRTs reported significant improvement in clinical outcomes. However, subsequent reviews have not mirrored these findings. Data from the largest cluster-randomized controlled trial, Medical Early Response Intervention and Therapy (MERIT), were published in 2005. The goal of the study was to determine if a MET could reduce the incidence of cardiac arrests, unplanned admissions to the intensive care unit (ICU), and deaths during a six-month study period. Twenty three Australian hospitals participated in the study, 12 introduced a rapid response program and 11 served as the control group. The researchers concluded that while the MET system greatly increased calling of the emergency team, it did not substantially affect the incidence of cardiac arrest, unplanned ICU admissions, or unexpected death. Since the original publication of this article, a post-hoc analysis of the MERIT study showed improvement in outcomes from hospitals with a MET when the data were analyzed in an as-treated model rather than using an intention-to-treat analysis. Many researchers have weighed in on both data sets and have stated that even the post-hoc findings are hypothesis-generating at best. The failure to demonstrate benefit has been mirrored in additional systematic reviews.
A 2010 meta-analysis involving nearly 1.3 million patient admissions assessed the effect of RRTs on reducing cardiopulmonary arrest and hospital mortality rates. The authors conducted a systematic review of 18 studies published between January 1, 1950, and November 31, 2008. They found that although RRTs have a broad appeal, robust evidence to support their effectiveness in reducing hospital mortality is lacking. These results have been mirrored in smaller single-center studies throughout the United States and Australia.

This is just a small sample of studies highlighting the clinical evidence stating that rapid response programs have not been able to demonstrate the same clinical success as early studies indicated. The question then becomes why? Intuitively, if the health care provider can prevent a negative outcome from occurring, such as a Code Blue, shouldn’t patient outcomes reflect that? A 2011 *New England Journal of Medicine* review article provided a clinical perspective of the published data and controversies surrounding the use of rapid response teams. The following discussion will look more closely at some of the potential limitations and difficulties as well as how UCSD took on these challenges and can state unequivocally that rapid response teams do work . . . when implemented correctly.

**Commitment**

Studies suggest that a rapid response program is unlikely to succeed without support from hospital leaders, including senior medical and nursing personnel. In order to be successful, everyone must want the program to succeed. While this sounds intuitive, RRTs may be implemented because the Joint Commission says they should be. If this is the case, the correct processes and procedures may not be developed or enforced, data may not be reviewed thoroughly to identify areas of improvement, and the program can be seen as optional. In order to impact outcomes, the RRT has to be part of everyday practice.

**Activation Process**

The implementation of an RRT presents numerous logistical challenges, such as the development of criteria to trigger a call, the composition of the team (physicians or nurses only), the type of data collected, and the mechanism for feedback and process improvement. The concept of a rapid response program is straightforward; however, a lot of moving pieces must be in place in order to make it successful.

Staff must be properly trained to understand not only the objective of rapid response but the criteria used to initiate a call to the RRT. While every institution is different, some of the common warning signs for calling the RRT include: high or low heart rate (greater than 140/min or less than 40/min), high or low respiratory rate (greater than 28/min or less than 8/min), high or low systolic blood pressure (greater than 180 mmHg or less than 90 mmHg), oxygen saturation less than 90% despite supplementation, acute change in mental status, urine output less than 50 cc over four hours, and staff member has significant concern about the patient’s condition. Hospital administrators typically choose one of two ways to evaluate the activation criteria for a rapid response team. The first is a scoring system; the nurse uses scores of several physiologic parameters to evaluate the patient. Of the two, this mechanism is a little more complex but reduces the number of false activations. The second is a single
clinical trigger. A patient has one parameter that falls within the criteria and a team is activated. In addition, in some hospitals, family members are empowered to call a rapid response if they notice a change in their loved one’s behavior. While there are several ways to develop activation criterion, they can all be successful if the criteria are clear and staff are thoroughly trained.

Each institution formulates a trigger mechanism in addition to criteria. In some instances, there is an activation tree. The first person called could be the patient’s primary physician; depending on availability/response time, the nurse may then call the RRT. These mechanisms need to be managed and reviewed for ongoing efficacy.

Who responds when a rapid response is activated? This is also institution dependent and is greatly influenced by staff resources. There may be an overlap in staff between the rapid response and code team. In some hospitals, an ICU or ED nurse and respiratory therapist (RT) run the rapid response but have access to the on-call physician should additional resources be required. Another method is to have a physician oversee the rapid response. A pharmacist may also be involved to ensure quick access to medication. Again, there are pros and cons to each construction of the program, and they are often dependent upon the hospital resources and protocol. All can be successful if the expectations are clearly set, the team is aware of their roles and responsibilities, and effective communication is emphasized to ensure the highest level of patient care.

**Authority to Prescribe and Act**

In the situations where the nurse and RT are the primary responders to a rapid response, they may need to make immediate decisions based on the patient’s condition. In many institutions the RRT has a set of Emergency Standing Orders. This is approved by the hospital executive committee and gives authority to initiate treatment according to hospital policy by any hospital-based Rapid Response Team in response to patients who are progressively failing or exhibiting clinical instability while waiting for a physician/ordering provider to respond. There is also the issue of patient transport and end-of-life discussions. Typically, these are roles the physician will facilitate with the ICU and patient’s family. On teams where a physician may not be present, this could result in some delay until the primary care or on-call physician is available.

**Whose Patient Is This?**

Prior to implementing a rapid response program, hospital leadership should address the issue of patient management after a response team has become involved. How is the primary care physician kept apprised of patient status? What happens when the RRT transfers the patient to the ICU? How should the RRT handle communication? There is no right or wrong answer to these questions. However, the processes need to be in place in order to manage expectations and appropriately educate the staff to ensure these transitions happen smoothly and do not impact patient care.

Another important criterion for the members of the rapid response team is credibility. When the rapid response team includes members of the ICU or ED—often the most experienced nurses within the hospital—their insights and guidance can be invaluable to the staff as they evaluate their patient.
expertise can help to smooth transition amongst the nurse/physician and other staff needed to effectively treat the patient.

**Hesitation from Health Care Providers**
A large challenge that plagues institutions when implementing a rapid response team is hesitation from the nurses as well as primary care physicians. This hesitation is often a manifestation of deeper fears about patient responsibility and concern about repercussions if the team is called unnecessarily. Hospitals can overcome these fears through training and education of the hospital staff as well as working with the RRT to ensure that they are sensitive to these fears and respond with acceptance and understanding.

The nurses may hesitate to call the RRT due to a fear that the patient’s condition isn’t “that serious” and they will be criticized by the RRT and patient’s physician. The fear of false activation and the corresponding response from others may result in inaction and potentially a Code Blue or adverse event. The physician may also hesitate embracing the introduction of a rapid response due to their sense of personal responsibility if their patient’s condition changes for the worse without their knowledge. When a patient needs a rapid response team, it is because their condition has changed quickly and without warning. The physician feels a personal responsibility to ensure the patient’s safety and successful recovery. When this doesn’t happen, it can be perceived as an issue with the physician’s care. In addition, having others “take over” their patient may infringe on the physician’s sense of responsibility and can cause a conflict between the MD and the team.

**Communication**
All of these challenges and potential solutions can be summarized into one overarching goal...effective communication. This starts at the top with hospital leaders providing clear roles, responsibilities, and processes for activation. Also education and training need to be established to ensure this information is effectively communicated to the health care providers. It trickles down to the nurse having a clear understanding of when to activate a RRT and making certain that he/she is able to accurately communicate and collect the necessary patient data for the team and primary care physician. There needs to be an open line of communication for effective dialogue between the patient’s physician and the RRT. Without effective communication, there is large potential for failure due to confusion, errors, and overall ineffectiveness. The successful execution of a rapid response program requires a high level of communication. UCSD has developed unique strategies for overcoming these challenges using communication through the Advanced Resuscitation Training program.

**Advanced Resuscitation Training (ART)**
In 2007, UCSD instituted the novel resuscitation program known as ART. Not simply a replacement for traditional training courses, ART is a template for a new strategy of resuscitation oversight that can be applied in other institutions.
ART has three main goals:

- To prevent the preventable
- To resuscitate the resuscitatable
- To recognize the futile

With this in mind, the clinical leadership at UCSD, under the direction of Resuscitation Director Dan Davis, MD, has built this innovative, lifesaving program. ART has succeeded in significantly improving outcomes by increasing both survival and the rate of good neurological outcomes in the inpatient population while decreasing the overall incidence of arrests through surveillance and implementation of a rapid response team.

To Prevent the Preventable

One of the pillars of the ART program is to prevent the preventable by focusing on early detection and response to prevent a code or adverse event from ever occurring. To achieve this goal, the first step was the creation of a rapid response team. The role of the RRT is to be a second set of eyes for the hospital staff when they have identified warning signs—or have an intuition—that their patient may need more advanced medical care. In order to overcome the challenges and corresponding ineffectiveness associated with RRTs that has been identified in the literature, UCSD staff developed the following “recipe” for the ART program, which includes rapid response.

The recipe for the ART program is simple:

- Set up a system of care
- Identify the “opportunities”
- Teach, inspire, rehearse
- See if it worked
- Change the culture

The successful execution of these steps forms the foundation that has enabled UCSD to achieve the outcomes that they do today.

Rapid Response Team

Prior to ART, the majority of cardiac arrests at UCSD resulted from hypoperfusion and/or hypoxemia. Dr. Davis and the UCSD team found that most patients manifest vital sign abnormalities for several hours prior to arrest and much of the morbidity that accompanies conditions such as sepsis and acute coronary syndrome can be prevented with early intervention. In the ART matrix (figure 2), the triggers for rapid response team activation fall into five categories: circulation, ventilation, dysrhythmia, neurological, and unknown. Figure 3 outlines the activation criteria UCSD uses to trigger the rapid response team. As with many hospitals, the activation mechanism includes health care provider intuition as a reason for calling the rapid response team.
**RRT/Code Team Education**

With the ART program, the UCSD staff directly addresses the key steps in making a rapid response program work. Dr. Davis and his team believe that part of the lack of effectiveness of rapid response teams cited in the literature is related to the absence of training opportunities for nurses and physicians and the lack of an integrated model for resuscitation, from early detection all the way through cardiopulmonary arrest resuscitation. UCSD’s “front-loaded” model includes non-ICU charge nurses as members of the RRT to enhance early detection. All UCSD providers who work with patients are required to go through either ART or BART, depending on their position requirements. Ingrained in these classes are sessions on rapid response, what to look for, who to call, etc. This education effort ensures that everyone, not just the nurses, are able to recognize and activate the RRT.
The rapid response team at UCSD is comprised of Code RNs, critical care respiratory therapists, and non-ICU charge RNs. When the RRT is called, the nursing supervisor responds, and it is his/her job to oversee and facilitate the patient’s needs from a systems perspective. The supervisor supports the nurse, makes arrangements for an in-house transfer, or calls in additional resources. The RRT also has access to an on-call physician.

Members of the RRT undergo annual training to cover the clinical and operational aspects of rapid response. In addition, UCSD has a quarterly meeting for RRT and Code Blue nurses, as well as frequent emails to immediately address changes. The education staff is currently in the process of launching new training to address certain process issues. All ART, BART, RRT, and Code Blue training is provided by UCSD-trained instructors in a simulation center at the affiliated medical school, allowing the staff to do actual mock simulations with other members of the team. The type of training and education is directly correlated to the data collected on UCSD Code Blue and RRT activations and results. Data collection is an integral part of the ART program.

**Afferents**

UCSD defines afferents as the “data in.” This is all of the information that is stored in the continuous quality improvement (CQI) matrix and helps team leaders make informed decisions on whether the ART program is working as well as identifying areas of need. Collected for each RRT and code response, afferent data include patient demographics, antecedent events, intra-arrest, post-arrest, process issues, and clinical interpretation. Figure 4 describes the afferent pathway used at UCSD.

**Efferents**

Efferent data is the “data out” component of the ART program. In other words, this is how the data is viewed and analyzed for debriefing, to make process/algorithm changes, launch training activities, and identify new initiatives. All of the afferent data that lives in the CQI matrix can be analyzed and viewed to confirm that what UCSD is doing is working or if there is an area that needs more focus. These results
help ensure that ART is adapting to meet the evolving needs of the UCSD staff. Figure 5 is an example of the efferent pathways used as part of the ART program. At the center is the CQI matrix. The data output is used to make decisions within the four large categories and smaller subsets regarding individual components, such as CPR quality during a cardiac arrest.

**Figure 5-Efferent Pathways**

Addressing Challenges to Change the Culture

Changing the culture is more than just implementing processes. In order to make the program a success, the UCSD team had to directly address and manage challenges, most of which were not necessarily “tangible” or process issues. Instead, there had to be a shift in the perception of the role of an RRT and address the underlying fears and feelings the staff may have about implementing this type of system.

This is accomplished by developing a philosophy and level of enthusiasm for improving patient outcomes by implementation of the ART program. In most learning environments, training and education focus solely on behavioral psychology. Behavioral psychologists believe that all behaviors are learned and therefore can be changed through various forms of “conditioning.” By reinforcing good behaviors through education, repetition, and rewards people will become “conditioned” and when presented with the real-life situation, they will respond according to the learned principles. While this is often how we are taught, it does not necessarily hit the underlying question of why. Dr. Davis and the UCSD team teach the ART program by implementing principles of cognitive psychology.

At its core, cognitive psychology is the study of mental processes such as, attention, language use, memory, perception, problem solving, and thinking. Basically how people think, perceive, learn, and remember. The philosophy ingrained in the ART program is that if those involved in patient care understand why these programs and processes are in place and see their efficacy, they will more than just “respond accordingly”; they will embrace these concepts and continue to improve the value of the program. The model of cognitive psychology UCSD explores in the ART program addresses instructor creditability, the paradox between simplicity–complexity, hierarchical algorithms, and multi-platform
with the use of various media and venue, in order to provide a complex and adaptive approach to learning.

As anticipated, when UCSD began to roll out the ART program in 2007, there were hesitations and resistance to change from health care providers. The physicians felt they would be losing some control of their patients. In addition, there was a fear that their decisions would be overridden or they would be blamed for not catching something wrong with the patient early enough. Similarly, the nurses had concerns about when to activate the RRT and fears that if it was wrongly activated, they would get in trouble by the responders and patient’s primary physician. These are all natural concerns and thoughts that cannot be addressed just by processes. Instead, the education staff has to take the time to underscore the value of the program, the role each staff member plays, and create a team environment that removes some of the personal feelings tied to this. In summary, everyone has the same end goal of helping improve patient outcomes by preventing adverse events or codes from ever occurring, providing the highest level of care when they do occur, and reviewing data and feedback to make sure the system continues to adapt.

Role of the Primary Physician
Because UCSD is a teaching institution, there is a unique opportunity to begin training early, especially with physicians. Physicians begin the ART program when they are still interns. This affords the educators time to implement some of the principles of ART, including addressing the specific hesitations surrounding activating a rapid response team. The goal being that the more physicians understand and see the clinical benefits of preventing arrests, the more likely they will be to encourage their colleagues to activate a team when needed and eliminate some of the personal emotions or feelings of failure out of the situation. In addition to working with the interns early on in their training, the staff have also implemented other processes to increase physician acceptance. When physicians go through their annual ART course, the training they receive provides defined roles and objectives, so there is no confusion about their role in preventing arrests. The subtleties of ART and fostering a supportive environment trickle down from the top.

At UCSD, the role of the rapid response team is that of an extra set of eyes. When a rapid response team is activated, the patient’s physician is also notified. This ensures that the physician is aware of the patient’s status and outcome of the RRT intervention. Often, a patient’s deterioration has occurred relatively swiftly, and the treating physician is relieved to find that actions have already been taken by the time he or she can get to the bedside. The rapid response nurse has emergency standing orders and is able to intervene if the patient’s situation looks to be deteriorating quickly. He/she can also request back-up support from the critical care medicine resident on-call, for instance, when a patient’s change in condition takes the patient beyond the purview of the primary physician’s expertise or clinical jurisdiction. These processes are in place to ensure the primary physician is kept aware of the patient’s condition and resources are in place to help facilitate the appropriate patient care to prevent a code from occurring. The goal of these processes is to take away the “blame” and personal responsibility from the physician. These standards are implemented every time a rapid response is called. A key to this success is that the staff is one team and has the patient’s best interest in mind.
**Role of the Nurse**
The role of the patient’s nurse is critical to preventing arrests. He/she is the provider typically making the call to the RRT, guiding the code nurse’s assessment, and assisting with any interventions that are deemed necessary. The ART program provides extensive training to the nurses on what to look for and the process for activation—within a supportive environment for learning.

One of the concerns that the ART program educators work very hard to address is empowerment. Because the activation of a rapid response team often comes from the nurse, there is a concentrated effort by the ART educators to instill a sense of power and authority to these crucial staff members. Occasionally, the nurse may be forced into a situation where the primary physician does not agree with his or her assessment of the patient’s status. Nursing staff may have to use their best judgment and call the RRT even through the physician is not necessarily supportive. UCSD leadership encourages the nursing staff to call RRT and are taught that it is better to call than not and risk having a patient go into cardiac arrest. The *modus operandi* is to air on the side of caution with aggressive intervention. They have also seen firsthand that when the team responds, they will not be reprimanded or belittled if the patient is not in need of advanced care. Code and rapid response teams are taught proper protocols on how to work most effectively with the staff. A common phrase is, “I am glad you called. How can I help you?” The goal is for the staff to feel empowered to act proactively in their patient’s best interest knowing that they have the full support of the RRT and Code Blue Committee behind them.

**Code Blue Committee Meetings**
The empowerment of the staff comes from the top down. The leadership at UCSD fully supports the staff and has embraced the ART program. The enthusiasm for the processes and practices implemented through ART come from the highest levels within the institution. Each month members of the Code Blue Committee gather to review every code and rapid response. Attendees include the chair of the Code Committee from each UCSD institution, the code and rapid response teams, clinical nurse specialists from the floors, medical directors, the chief medical officer, and members of the quality improvement team, just to name a few.

The goal of these meetings is to review the afferent and efferent data surrounding every event to identify areas of progress, processes that are either working well or need to be changed, and address any areas where more education is required. The tone of these meetings is very positive. The leadership staff is able to have a bird’s eye view, and this becomes a learning environment for them to ask questions, provide feedback, and hear directly from the staff on what is and what isn’t working. The tone taken in these meetings is that of knowledge gathering. The RRTs and nurses are supported by the administration. If a mistake is made the discussion is focused on improving the process instead of judging the particular individual; the leadership encourages the nurses to call the RRT and underscores the value of patient safety and prevention. This goes a long way to empower the health care providers to use the resources at their disposal. They know that they have the support of not only the patient’s primary physician and the rapid response team, but also the highest levels of authority and leadership within the institution to do what it takes to prevent a patient from having an adverse event. That is
powerful! Applicable outcomes from these meetings trickle down from the top through the Code Blue Committee to the management teams (nursing, anesthesia, etc.) and then nurses.

**Example of a Current Challenge**

The implementation of the rapid response team as part of the ART program at UCSD has made a significant impact on patient outcomes. However, there are always areas of continued challenge and process improvements. These may come as small changes based on a particular response or changes to help improve work flow. Currently, UCSD does not have a dedicated rapid response team. The rapid response staff has responsibilities to support their unit. The rapid response/code nurse functions as a resource, assisting with high-acuity patients, helping novice nurses learn new skills, etc. While this staff is not involved directly for patient care, they do provide back-up for the nurses on the unit so that they can take a break. Often this process works; however, on shifts where the rapid response team is very active, it poses a challenge for the floor nurses to break and manage the level of activity for the RRTs. This type of challenge is one that is discussed during Code Blue meetings. The point is that there are always things to work on and processes to evaluate and update to help improve patient outcomes and overall experience, as well as the health care provider workplace. Without the feedback that comes from creating an environment where the leadership is receptive to listening to challenges and works together to find solutions, the ART program, and ultimately, patient care would not continue to improve.

**Outcomes**

**RRT Results**

You can’t improve what you can’t measure. The role data play is paramount in making the ART program a success. The afferent and efferent components of data collection help to identify areas where improvement is needed, reinforce that training initiatives have worked, and support the efficacy of the ART program to hospital leadership and the broader medical community. UCSD leadership looks at the event incidence, specifically the number of rapid response team calls per 1,000 discharges, the number of arrests per 1,000 discharges, and the RRT activations versus arrests. The reason these data are important is demonstrated in Figure 6. The Code-to-RRT ratio demonstrates that an increase in RRTs called results in a lower number of codes. UCSD had found that the earlier the patient receives preventative treatment, the greater the chance of preventing a code.
These data are further evaluated to look at the reason for calling a rapid response (figure 7). The largest numbers of RRTs are called for respiratory deterioration, followed by cardiovascular issues. This helps UCSD staff look at where additional training may be needed. This information is also viewed along with the arrest incidence in Figure 8. If there is an increase in a particular type of patient arrest, there needs to be an education initiative to look at ways to identify and prevent this type of arrest. For example, UCSD instituted a large education initiative to prevent respiratory arrests beginning in 2007 after realizing the primary reason for a Code Blue was due to respiratory distress. Now, with the largest number of rapid responses activated for respiratory issues, the incidence of respiratory arrest has decreased dramatically.

![Figure 7- Rapid Response Activation](image)

![Figure 8- Arrest Incidence by Category](image)

The data are further broken down by unit. This helps the ART program educators identify floors that may need more or advanced training. Figure 9 is an example of the code-to-RRT ratio by unit. The staff would look at these data and see that some additional training may be needed for 2E. They had a large number of codes and a relatively small number of RRT activations. Time would be spent reviewing the activation criteria and what to look for before a patient codes. Likewise, positive accolades can be given to wings where they are activating the RRTs and their code frequency has decreased. This data should be viewed over time, and in the larger context of the types of patients that are in each wing to ensure the correct training is being given; also inherently some wings will have more codes due to the patient population. These are some of the ways the afferent and efferent data collected by UCSD are used to ensure that what the health care providers and ART educators are doing is effective.
Impact on Patient Outcomes

The bar charts in Figure 10 compare the survival-to-discharge and good neurological outcomes data pre-ART training versus post-ART training. The results are clear; there has been a significant increase in survivability and good neurological outcomes since the implementation of the program. One particular point of pride for the UCSD team is the data from the non-ICU setting. The patients in the ICU are very ill, and there isn’t always a lot anyone can do to predict whether or not they are going into cardiac arrest. The non-ICU wings show the greatest opportunity for improvement through prevention and resources such as the RRT. To date more than 250 lives have been saved through the implementation of the ART program at UCSD.

When compared with the mortality rates for all of the hospitals in San Diego, UCSD has the lowest rate in the area (Figure 11). When compared with all of the teaching hospitals in California, UCSD is at the very bottom for mortality (Figure 12). These results are not going unnoticed. The ART program has been designated as a Best Practices Model by the Joint Commission and recognized as a Best Patient Safety Initiative by both the National Association of Public Hospitals and the University of California Regents. Recently, the UCSD team received a Quality Leadership Award from the University Health System Consortium based on rapid improvements in overall mortality and patient safety and a top-five ranking in overall quality of care. The greatest achievement, however, is that observed mortality at UCSD is 38%
below expected values, leading to the medical center’s recognition as one of the safest hospitals in the country.

*Figure 11- UCSD mortality rate compared to all San Diego Hospitals*

*Figure 12- UCSD mortality rate compared to all California teaching hospitals*

**The Big Picture**

Why does ART, and more specifically, the rapid response program within ART work? While there are a lot of components and processes associated with the program, the success can be summarized in empowerment and communication. Without these two fundamentals, even the best process would still fall short. The staff needs to feel that they are influential in the program success and that their voice is being heard among the highest levels of authority within the institution.

Most hospitals do not have the same level of resources or cannot devote the same level of time to a rapid response program as UCSD. That does not mean that they cannot be effective in improving patient outcomes. The key is to find a process that will work for your particular institution. The ART program has demonstrated tremendous successes in preventing and improving patient outcomes, and UCSD works with other institutions to help implement similar programs to meet their needs.

However, other hospitals and health systems have seen success from their rapid response programs by developing a system that is uniquely their own. For example, leadership at Denver Medical Center did not necessarily feel that a rapid response program would be the best fit for their institution. Instead
they developed an activation tree in which the nurse is required to call the primary physician if the patient triggers one of the clinical scenarios. If no one responds, the nurse moves up the oversight ladder to senior-level residents and attendings in 15-minute intervals. The physician who responds is required to physically examine the patient. This program began in 2006, and in 2010, Denver Health identified a statistically significant decline in non-ICU cardiopulmonary arrests.

In 2007, clinicians at Dartmouth-Hitchcock Medical Center began looking at implementing a universal surveillance system for postoperative patients to help facilitate early recognition of deterioration and cue rescue interventions. The Patient SafetyNet System (Masimo, Irvine, Calif.) was implemented in a 36-bed orthopedic unit, each patient was connected to a disposable SpO2 finger probe which is programmed to wireless alert the patient’s nurse via pager when present physiological parameter alarm settings are violated. Results published in 2010 stated that clinicians saw a 65% decrease in distress codes and rescue activations, a 45% decrease in patient transfers to the ICU during the eleven month evaluation, and when annualized 135 ICU days were saved. Similar monitoring products exist that do not require patients to be connected to any cables (Early Sense, Ramat Gan, Israel).

**Do Rapid Response Teams work?**

Yes, rapid response programs work. Hopefully, the evidence presented in this article has underscored the belief that they can be effective in reducing codes and adverse events. The key is developing a program that works for each set of challenges within a given institution. This takes teamwork and effective communication from all levels within the hospital. It won’t happen overnight, and there needs to be constant monitoring of data to ensure that what has been implemented is working, but it can work. To learn more about the UCSD ART program, please visit: http://health.ucsd.edu/medinfo/training/crs/Pages/default.aspx.

**References**