Program Evaluation Plan
For the North Carolina Rapid Response Team (RRT)
Learning Collaborative

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I. Introduction

Despite advances in other areas of medicine, in-hospital cardiac arrests remain a significant cause of morbidity and mortality in the United States and abroad. Observant investigators have found that roughly two thirds of patients demonstrated clinical deterioration within six hours of cardiac arrest \(^1\) and as many as sixty percent of patients displayed worrisome signs/symptoms within eight hours of the need for emergency transfer to an Intensive Care Unit (ICU) \(^2\). Pioneers in hospitals worldwide have developed Rapid Response Teams (RRTs) as one manner of improving the quality of hospital structure, processes, and outcomes in order to reduce morbidity and mortality from in-hospital cardiac arrests.

Since the inception of RRTs, researchers have demonstrated clear benefits for the institutions that have implemented these programs. Among the observed benefits, investigators have demonstrated a decrease in the number of non-ICU cardiac arrests \(^3\)-\(^6\) and an increase in survival to hospital discharge \(^4\), \(^6\), \(^7\) after a cardiac arrest in hospitals that have implemented RRTs. Also, the number of emergency transfers to an Intensive Care Unit (ICU) \(^7\) and the total number of hospital days required \(^7\) decrease significantly in hospitals with RRTs.

The North Carolina Rapid Response Team (RRT) Learning Collaborative represents a partnership between multiple organizations in order to take the improvements observed with Rapid Response Teams in previous studies and implement similar programs in hospitals in North Carolina. The North Carolina Rapid Response Team (RRT) Learning Collaborative plans to establish, implement, measure, evaluate, and sustain Rapid Response Teams in fifty acute care hospitals in North Carolina from August 2005 to February 2007.

In this paper, I will introduce and outline the plan for the North Carolina RRT Learning Collaborative and provide an overview of the plan for evaluating this program. The paper will
begin with a review of the literature explaining how previous quality improvement initiatives have provided the basis for this program. Next, the paper will discuss the program plan including the context, goals and objectives, program theory, logic model, and dissemination plan for the North Carolina RRT Learning Collaborative. Finally, this paper will explain the evaluation plan for this program by discussing the approach, study design and methods, logic model, dissemination plan, and evaluation planning tables for the planned evaluation of this program.

II. Literature Review

In this literature review, I will first address the problem of patient safety. Next, I will discuss hospital responses to the patient safety predicament. After discussing hospital response in general, I will then go on to discuss the 10,000 Lives Campaign, an important hospital quality improvement initiative. Next, I will begin to narrow my topic as I focus in on the problem of hospital cardiac arrests and some of the issues that surround preventing these events. Finally, I will discuss the literature on Rapid Response Teams (RRTs), an innovative organizational change designed to improve and prevent the negative outcomes from hospital cardiac arrests.

Patient Safety

In September of 1999, the Institute of Medicine (IOM) published the report entitled “To Err is Human: Building a Safer Health System,” which described startling rates of errors that endangered patient safety and posited several solutions to improve protection from such mistakes. Though this report stated that medical errors occur in various healthcare settings, it
sited between 44,000 and 98,000 preventable deaths that occur annually in hospitals in the U.S., with the most serious consequences occurring in intensive care units, emergency rooms, and operating rooms.

"To Err" defines a medical error as a “failure of a planned action to be completed as intended or the use of a wrong plan to achieve an aim.” The report goes on to categorize errors as “errors of execution,” in which “the correct action does not proceed as planned, or “errors of planning,” in which “the original intended action is not correct.” While the authors admit that not all errors result in injury to patients and not all errors may be prevented, they argue that a significant portion of the medical errors that result in harm to patients have preventable and actionable causes.

While the number of estimated deaths in the IOM report is alarming by itself, the report also names many other important costs associated with medical errors. The authors estimate that Americans spend between $17 billion and $29 billion a year as a result of preventable adverse events as a result of medical errors. Of this estimate, the authors attribute about one half of the cost to medical costs, while other costs including lost income, lost productivity, and disability costs account for the rest of costs.

Hospital Response to the Concerns about Patient Safety

Since the time the IOM report, authors have examined the mechanisms that drive Hospitals to improve patient safety. Devers’ et al conducted interviews with administrative staff from hospitals in 12 major metropolitan areas across the United States in an effort to elicit feedback about drivers for patient safety improvement projects. Through conducting interviews with executives from the 3 or 4 biggest hospitals in each of these communities, the authors
observed that Joint Commission on Accreditation of Healthcare Organizations (JHACO) requirements encouraged the majority of the patient-safety improvement initiatives observed in the study. Beyond JHACO, respondents often mentioned other important types of organizations including the Leapfrog Group, a private association including a number of large U.S. health care purchases with representatives from several U.S. government agencies, along with several professional organizations, and organizations dedicated to helping hospitals implement patient safety initiatives, such as the Institute for Healthcare Improvement (IHI).

100,000 Lives Campaign

In December of 2004, the Institute for Healthcare Improvement (IHI) announced its “100,000 Lives Campaign.” Soon after this declaration, the campaign received public endorsements from a number of organizations with important historical roles in shaping U.S. health care reform, including the American Medical Association (AMA), the American Hospital Association (AHA), the Center for Medicare and Medicaid Services (CMS), and the Joint Commission on Accreditation of Healthcare Organizations (JHACO).

Within 5 months of the announcement, IHI reported that institutions representing over 50% of the inpatient hospital beds across the country had committed to the 100,000 Lives Campaign. In committing to the campaign, institutions pledged to help prevent 100,000 deaths over an eighteen month period through implementing at least one of six programs at their hospital including the implementation of Rapid Response Teams (RRTs) to avoid cardiac arrests and resulting deaths outside of Intensive Care Units (ICUs).

In designing the programs that became part of the 100,000 Lives campaign, the IHI imposed four basic requirements. First, the IHI required that the quality improvements had
demonstrated the ability to prevent injuries and deaths in the medical literature, which for many of the projects, investigators had greater than ten years of experience. Next, the IHI required potential programs to demonstrate effectiveness in more than one setting in order to avoid unique outcomes that only isolated investigators could achieve in research settings. Finally, the IHI specified that interventions did not require significant capital investment. While IHI-directed plans may require significant reprioritization of time and money, the IHI chose not to select projects with significant expenditures required in order to implement these programs.

**Hospital Cardiac Arrests**

Among the initiatives recognized by the IHI in their 100,000 Lives Campaign,” they identify cardiac arrests that occur in hospitals as one important and actionable safety concern. Hospital cardiac arrests represent a serious and potentially avoidable cause of morbidity and mortality in the United States, although detailed information on incidence and prevalence has not been widely published.

Few studies have yielded estimates of the frequency of cardiac arrest occurs within the hospital. One study reporting outcomes from a national registry of cardiac arrests, which sampled 207 hospitals nationwide, observed an incidence rate of 54.1 +/- 41.5 arrests per year per hospital with a median hospital size of 260 beds, which translated to 0.174 +/- 0.087 events per bed per year. This study, which has limited generalizability due to over-representing certain regions of the country, especially the southeastern U.S., still provides an important national estimate of the rate of cardiac arrests that occur in hospitals in the United States.

Authors of the previously mentioned study also found that cardiac arrests occur at a disproportionately lower rate in hospitals with more than 500 adult beds per bed-year (0.17) as
compared to those with fewer than 500 adult beds (0.24) (p= 0.03). Additionally, the authors demonstrated a similar trend in hospitals with fewer than 250 beds, which had a significantly higher arrest rate than those adult hospitals with more than 250 beds (0.26 versus 0.19, p=0.01)\textsuperscript{12}.

In summary, a brief but important body of literature has documented that hospital cardiac arrests occur frequently in our nation’s hospitals\textsuperscript{12,13,15}. While both longitudinal studies at a single location and national sampling studies have examined the rates of hospital cardiac arrest, similar rates have been observed\textsuperscript{12,13}. Finally, hospital size, as measured by the number of inpatient beds, also appears to predict the rate of cardiac arrest at a given hospital\textsuperscript{12}.

\textbf{Current Prognosis for Hospital Cardiac Arrests}

A significant body of literature has documented the success rate of attempts at cardiopulmonary resuscitation (CPR) while in the hospital. In 1997, a collaborative between the American Heart Association, the European Resuscitation Council, the Heart and Stroke Foundation of Canada, the Australian Resuscitation Council, and the Resuscitation Councils of South Africa yielded the so-called “Utstein Criteria” for universal reporting for research on hospital resuscitation measures\textsuperscript{14}. With evidence-based evaluations, investigators from this collaborative proposed guidelines that studies occurring since 1997 have used as the benchmark for documenting any changes in outcomes from hospital resuscitation.

One of the more methodologically valid studies that followed in-hospital CPR attempts for over 2000 adults over a ten-year period found that the following survival rates occurred for CPR: 38.6\% (95\%CI: 36.5 \% – 40.7 \%) survival immediately following arrest, 24.7\% (95\%CI: 22.8 \% – 26.6 \%) survival at 24 hours, 15.9\% (95\%CI: 14.4 \% – 17.6 \%) survival at hospital
discharge, and 11.3% (95%CI: 10.0% – 12.7%) survival one year later. However, several factors limit the generalizability of this study including the exclusion of children, data arising from a single hospital, and a definition of a cardiac arrest that did not address “Do not resuscitate” orders or other “codes” for which the resuscitation team may not be called.

Another study that reported results from the National Registry of Cardiopulmonary Resuscitation (NRCPR), which sampled 207 hospitals nationally, a more all-inclusive registry documenting over 14,000 cardiac arrests in the U.S. over a 30 month period beginning in January of 2000, found slightly higher survival rates with CPR while in the hospital. This study reported an overall survival rate at hospital discharge of 17% over a fairly large sample of patients, although the authors provided no estimation of the precision of their results. In their discussion, the authors report that this number appears consistent with previous estimates, and the authors comment that the success rate has failed to improve significantly over the past thirty years. This study, while utilizing the accepted standard “Utstein criteria” for collecting information on hospital cardiac arrests, still suffers the limitation of only including hospitals who 1) volunteered to participate in the national registry and 2) could afford to pay the annual fee for “data support” and “report generation”. These criteria could potentially bias the results in any either direction based on how volunteer hospitals that could afford to pay to participate differ from all other hospitals.

In summary, current survival rates following cardiopulmonary resuscitation are quite poor, with fewer than one in six patients surviving to hospital discharge. While studies documenting attempts at CPR are sparse and include the limitations in the methodology used and the generalizeability of the results, the data from available studies document such low survival rates that the biases discussed could not explain the effect size of published results.
Location of Cardiac Arrests as a predictor of prognosis

In developing a means of decreasing morbidity and mortality from hospital cardiopulmonary arrest, location of arrest represents another important factor that investigators have studied. One important study tested the hypothesis that the higher level of supervision conferred in so-called “critical care areas” confers a greater chance of survival in the event of a cardiac arrest. This analysis of arrests occurring in a large district general hospital found that arrest outside of a “critical care area” was associated with 9.2 times the odds of a fatal outcome as compared to critical care areas of the hospital (OR = 9.2, 95% CI: 2.7 – 31.2). Although the estimate found in this study lacks precision due to the small number of arrests analyzed, the entirety of the range of estimates obtained represent clinically important results. Additionally, Dumot et al. documented the same trend, with Intensive Care units conferring nearly seventeen times the odds of surviving to hospital discharge as compared to the emergency room or ordinary hospital wards. While this study had many of the limitations of other studies of cardiac arrest, namely that observations occurred at only one institution and lacked generalizeability as well as statistical power, the trend in available studies points towards better survivability from cardiac arrest in more supervised areas of the hospital.

Antecedents to Arrest

Another key observation occurred in the search for a means of preventing in-hospital cardiac arrest. Several investigators have described key antecedents that often precede the occurrence of cardiac arrest in the hospital. Schein et al. performed one retrospective analysis of factors that immediately preceded cardiopulmonary arrest. In their data, these
authors found that eighty-four percent of patients showed signs of clinical deterioration or reported new symptoms within eight hours of arrest. Of the signs and symptoms observed, the investigators reported “deterioration of respiratory or mental function” in seventy percent of patients who later went on to arrest\(^1\).

Other investigators reported similar results to Schein et al. in recently in a study that examined the need for emergent transfer to the Intensive Care Unit (ICU). In the six hours preceding the need for transportation to the ICU, new signs and symptoms including hypotension, tachycardia, and tachypnea preceded need for transfer in over sixty percent of cases\(^2\). A final study of the precursors to cardiac arrest found that in ninety-nine of one hundred fifty cases, a nurse or physician documented deterioration in the patient's condition within 6 hrs of cardiac arrest\(^1\). While the retrospective nature of these studies predisposes them to a large amount of recall bias with no easily identifiable logical control group to include, they provide an important basis for further study in the prevention of in-hospital cardiopulmonary arrests.

Building on the information learned in previous studies, Franklin et al developed a set of clinical criteria that predicted arrest in roughly two thirds of cardiac arrests in a case series of consecutive patients experiencing cardiac arrests over a twenty month period. As suggested by the authors in their discussion, the criteria developed in this study (MAP <70, or >130 mmHg, heart rate <45, or >125 per minute, respiratory rate <10, or >30 per minute, chest pain, or altered mental status), which led to calling a medical doctor in less than twenty five percent of cases, provide an important basis for potential hospital interventions\(^1\). However, utilizing a case series design without an adequate control group does not allow readers to ascertain how common the “predictive” signs and symptoms occur in individuals who do not go on to experience cardiac arrest.
Rapid Response Teams (RRTs) / Medical Emergency Teams (METs)

In response to observational studies about precursors to cardiac arrest, innovative providers have developed Rapid Response Teams (RRTs) as a means of decreasing emergency transfers and mortality from in-hospital cardiac arrest. These programs attempt to identify common precursors to arrest, and utilize established protocols to intervene and if necessary transfer patients to intensive care areas of the hospital if necessary.

Observational Data

The first published example of an RRT comes from a tertiary care center in Melbourne, Australia, where a group of inventive providers created a multi-disciplinary team they termed a Medical Emergency Team (MET) that could be triggered by hospital staff members based on defined vital parameters or by staff member “worry about the patient”6. Several important clinically relevant outcomes occurred in Melbourne with the introduction of METs. Deaths attributable to cardiac arrests experienced a relative risk reduction (RRR) of fifty-six percent (p<0.005) while survivors of arrests experienced an eighty percent RRR in the number of ICU days required following arrest (p<0.001). Though this study utilized a simple before-and-after intervention analysis without an adequate control group, the authors provide important ethical and methodological justifications for this. First, in the presence of impending death, the authors did not find it ethical to randomize patients to an arm of the study with no intervention. Also, the authors demonstrated that cardiac arrests in their hospital showed no statistically significant seasonal variation that might account for the differences seen6.
Since preliminary studies of RRTs, many other authors have reported clinically important improvements in various patient populations. Another Australian cohort-based study found a 50% reduction in the number of expected cardiac arrests over a three-year study period (OR=0.50, 95%CI: 0.35 – 0.73). A large American tertiary care center that implemented METs experienced a significant reduction in the number of incident cardiopulmonary arrests (p=0.016) although they observed no change in the proportion of fatal arrests (33.3% fatality rate before and after MET intervention). One study showed that nearly four years after implementation of a Medical Emergency Team, MET calls inversely correlated with the number of cardiac arrests observed (R² = 0.84, p=0.01) with one fewer arrest per 17 MET calls. While all of these studies have identified promising outcomes for the widespread implementation of RRTs, and the majority of the observational studies demonstrate a clustering around a significant reduction in mortality, their use of cohort study design with non-contemporaneous controls allows for the possibility to introduce a measurement bias in the ascertainment of patient outcomes in each of these studies that may not occur if institutions were randomized to the intervention of implementing Rapid Response Teams.

Data from the Single Randomized Controlled Trial

To date, the only randomized trial that allocated hospitals into MET intervention versus control groups utilized a cluster-randomized design. In this study, no hospitals had METs prior to the beginning of the study, and half were offered training in MET implementation while the other half continued with their current emergency systems. Intervention hospitals were offered an educational campaign that focused on recognizes signs and symptoms that warranted calling the MET. While investigators measured an important increase in the calling of METs at the
centers randomized to the intervention group as compared to whatever form of emergency team
existed at control institutions (8.7 versus 3.1 calls per 1000 admissions, p=0.0001),
investigators failed to demonstrate significant decreases in the study’s primary outcome, which
was a composite score that included the incidence of cardiac arrest, unplanned ICU admission,
and unexpected deaths (p=0.640). Additionally, the authors failed to observe a significant
decrease in any component of their “composite outcome” when they analyzed individual
components in their secondary analyses19.

In their discussion the authors discuss several important limitations in this randomized
trial, which limit the importance of this single study. Among the limitations of this trial, a
fairly-short length of intervention time, baseline rates of calling for emergency teams was low
prior to randomization as compared to published averages, and a less comprehensive training
intervention (as compared to those in the observational studies) could all contribute to the lack
of observed effect in this trial. While none of these factors alone account for the negative
results found in this randomized trial, the trend towards significant results that authors observed
in numerous single-site before-and-after and observational trials together with the limitations in
this single trial suggest that one should be cautious in over-interpreting the importance of this
single trial19.

In the implementation of RRT/METs in various settings, unanticipated factors may have
affected the efficacy observed for the teams. For instance, a study that surveyed nurses on
inpatient hospital floors found that nurses’ attitudes affected outcomes tremendously. In
surveyed nurses, seventy-two percent reported that they would call the primary covering doctor
or resident prior to contacting the Medical Emergency Team. Furthermore, only fifty-six to
sixty-two percent of nurses reported that they would call the MET for patients with worrisome
symptoms but vital signs that fell within normal limits or for a patient with abnormal vital signs that “did not look unwell”\textsuperscript{20}. Further study of Medical Emergency Teams may reveal other important barriers to successful implementation and achievements of improved patient outcomes.

Conclusions and Limitations in the Literature

In summary, several before-and-after trials and observational studies (both at single and groups of institutions) suggest that RRTs/METs produce clinically important outcomes including a reduction in the number of cardiac arrests and an increase in survival in individuals who do experience cardiac arrests\textsuperscript{4-6}. However, the single randomized trial identified in this literature review did not ultimately demonstrate similar benefits. As discussed, limitations in the duration, and effectiveness of the intervention as well as baseline differences in study hospitals that caused them to differ from published norms could all have contributed to the negative study results in the randomized trial.

Further study with attention to the effect of time since adoption of RRT methodology and the amount of active participation involved in coaching hospitals as they learn to implement RRTs may provide more insight into the potential effectiveness of RRTs in improving patient outcomes. Initiatives like the North Carolina RRT Learning Collaborative, which plans to collect both quantitative and qualitative feedback on a collaborative program to teach RRT methodology to hospitals, will provide an important opportunity to contribute to the broader understanding of which aspects organizational strategies that lead to improved outcomes both at the patient and organizational level.
III. PROGRAM PLAN

In this program plan, I will start out by discussing the context and rationale for the NC Rapid Response Team Learning Collaborative. Next, I will introduce the goals and objectives for the program. After this, I will describe the various aspects of program theory employed by this program. Subsequently, I will introduce the logic model for this program. Finally, I will discuss the proposed implementation of this program and draw conclusions from the program plan.

A. Context and Rationale

Political Context / National Priorities: Recently, as part of the Institute for Healthcare Improvement’s “100,000 Lives Campaign,” sixty North Carolina Hospitals committed to implementing and sustaining Rapid Response Teams in their hospitals. As a means of facilitating this task, the North Carolina Hospital Association, in conjunction with several other non-profit agencies, secured a grant to develop the North Carolina RRT Learning Collaborative, a project that intends to teach and evaluate the implementation of RRTs in the hospitals have committed to implementing these teams. At this time, we do not know to what extent these hospitals continue to utilize Rapid Response Teams, nor do we know about the facilitators and barriers to success of these programs.

As discussed earlier in the literature, the hospital quality improvement movement has gained a tremendous amount of political momentum in the previous decade and especially since the publication of the Institute of Medicine’s report entitled “To Err is Human: Building a Safer Health System.” Since the time of this report, organizations with a significant amount of political and economic influence in today’s health care system, such as the Centers for
Medicare and Medicaid Services (CMS) and the Joint Commission on Accreditation of Healthcare Organizations (JHACO), have become interested in improving patient outcomes in the hospital. Through CMS’s current requirement to “Pay for Reporting,” the large payer has driven hospitals to become increasingly aware of certain national benchmarks that they term “Core Measures.” JHACO, a so-called quasi-regulatory agency that possesses the power to determine participation status in CMS, has also driven patient safety to a large extent in recent past.

State and Local Commitments: On a state and local level, commitments also exist for improving outcomes from hospital cardiac arrests. The chair of the governor’s “Task Force for Healthy Carolinians,” Jeff Spade, Vice President of the North Carolina Hospital Association, has been a proponent of the NC RRT Learning Collaborative as it helps to foster a goal from the 2010 Health Objectives to improve access to preventive services. Also, local early implementers of pediatric RRTs at the N.C. Children’s Hospital at UNC Hospitals have been given the role of “mentor hospital” by the Institute for Healthcare Improvement so that they may provide advice on successful implementation of such programs.

Acceptability: The acceptance of the NC RRT Learning Collaborative to improve and prevent adverse outcomes from hospital cardiac arrests must occur across several levels. First, the Rapid Response team members at each hospital must become stakeholders in the structure and processes set up in their individual hospitals. Second, nurses and other possible callers of the RRT, potentially including friends and family members of the patients, must establish enough comfort with the RRT to feel comfortable calling the team when appropriate. Beginning with
“Learning Session 2,” the Collaborative Learning team will better ensure acceptance of RRTs by gathering hospital teams near the end of the implementation period to share accomplishments and report preliminary results. Additionally, the RRT Learning Collaborative Directors will organize teleconference calls with RRT collaborative members on a monthly basis to discuss progress and barriers to implementation, and to ensure that the hospital team is organized and moving forward.

**Funding:** For funding, the North Carolina Hospital Association has sought grant funds from the Robert Wood Johnson Foundation totaling $100,000 to support the eighteen month project to implement RRTs at 50 hospitals across North Carolina. Accounting for “in-kind” contributions from the other partner organizations, program planners estimate that the total cost of the North Carolina RRT Learning Collaborative will approach $152,820 over eighteen months.

**Stakeholders:** Eliciting the support of nurses and other hospital staff at each of the participating hospitals represents an important component of the success of this program. Through planning and coordinating that the North Carolina Area Health Education Program (NC AHEC) will provide, representatives from each hospital will receive technical assistance, team coaching and consultation as the hospitals develop, operate and evaluate their rapid response teams.

Several other collaborating organizations represent significant stakeholders in this collaborative project. The North Carolina Hospital Association (NCHA), a professional association of more than 140 hospitals and healthcare systems in the state of North Carolina, has demonstrated a strong commitment to the success of quality improvement projects as evidenced by the establishment of its North Carolina Center for Hospital Quality and Patient
Safety, which has formed a strategic partnership with the Institute for Healthcare Improvement (IHI). The Medical Review of North Carolina (MRNC), the federally designated Quality Improvement Organization (QIO) for North Carolina that will be responsible for the measurement and data activities of the RRT Learning Collaborative, is committed to education and patient safety services as evidenced by the recent creation of their new Hospital Patient Safety Services division. Voluntary Hospitals of America Central Atlantic Region (VHA Central Atlantic), another organization involved in the RRT Learning Collaborative, has demonstrated a strong commitment to the 100,000 Lives Campaign through its involvement in previous learning collaborative projects and will be committed to the success of this collaborative project as well.

Challenges: Fundamental changes in the organization of hospital staff duties and gaining the endorsement of personnel involved in the day-to-day hospital operations represent significant challenges to the successful implementation of this program. Program implementers will face the challenging responsibility of changing the routine hospital protocol for the response of nurses, other hospital employees, or guests to concern about deteriorating health status of a patient. As previous authors have reported when they have implemented Rapid Response Teams in other locations 20, attitudes of nurses can have a tremendous effect on whether nursing staff calls RRTs for a sick patient. If the individuals charged with implementing an RRT at a new hospital do not adequately communicate the rationale and benefits to RRTs, the teams will face the challenge of resistance and absence from participation in the program. The Learning Collaborative will address these concerns by involving hospital RRT leaders in continued opportunities to collaborate with individuals from other hospitals through Learning Sessions.
and web-based internet sessions and teleconferences. Through these collaborations RRT leaders will have many opportunities to learn about experiences at other hospitals so that they may learn about and implement strategies to overcome the barriers they encounter.

Additionally, if problems with implementation of the program occur, Collaborative Directors will schedule one-on-one discussions with individual team members to provide coaching in order to overcome barriers.

B. Goals and Objectives

The goal of the North Carolina RRT Learning Collaborative is to “create, organize, and implement two collaborative learning networks to drive, achieve and sustain the training and supporting of Rapid Response Teams in fifty North Carolina hospitals”

Short-term objectives: 1-3 years

⇒ By month 3, Collaborative Learning Team and Measurement and Data Team will have lead “Pre-planning Sessions” with RRT Leadership staff, AHEC faculty/staff, and experts from collaborating organizations. The number of these sessions will be ascertained by RRT Leadership Staff.

- Proposed activities: establishing a project timeline and schedule, deciding the objectives, goals and measures of the RRT Learning Collaborative, assessing available resources, determining strategies to engage and gain the commitment of hospital leadership, developing communication strategies and organizing the hospital participants into learning collaborative networks.
⇒ By month 4, Learning Session 1 will have taught the RRT model to representatives from 20-25 hospitals.

- Planned activities: Courses on how to plan and implement the change package in each representative’s respective hospital, what implementation, measurement and evaluation tools will be used, and how to use the tools and resources.

⇒ By the end of month 6, Learning Collaborative Team will have designed and distributed “reminders” and other media to disseminate amongst participating hospitals to encourage use of the RRTs.

⇒ By month 7, enrollment of a second collaborative of an additional 20-25 hospitals will have begun.

⇒ By the end of year 1, web-based internet sessions, teleconferences, list service and “virtual discussion groups” will begin to accommodate hospitals who joined late and will cover learning gaps that have become apparent in the first year.

⇒ By the end of year 2, the importance of RRTs will have been effectively communicated to nurses and other hospital staff and attitudes towards the RRT will have improved significantly over baseline.

⇒ By the end of year 3, the RRT Learning Collaborative will have begun to design packaged teaching materials that are subspecialized to size/type of hospital (i.e. >200 beds versus less than 50 beds) and patient population (i.e. pediatric patients, post-operative surgical patients, etc.).

Long-term objectives: 4-6 years
Within 3 years, hospitals will report at least a 30% reduction in the number of in-hospital cardiac arrests.

Within 4 years, hospitals will report at least 8 RRT/MET calls per 1000 patient admissions to the hospital.

Within 5 years, hospitals will report at least a 10% improvement in survival to hospital discharge.

C. Program Theory

A number of program theories lend useful frameworks for approaching the design and tailoring of the NC RRT Learning Collaborative to meet the individual, interpersonal, and community level needs of the people and organizations involved.

On the individual level, the Stages of Change model offers an approach that can be used to assess the readiness of individual staff members at NC hospitals and then tailoring education and training based on the stage of change for each individual. The Health Belief Model provides an important approach that can be used to design effective communication methods about the importance of hospital cardiac arrest and the potential for gains with RRTs in each hospital. This approach will empower the representatives from each hospital who become trained in the implementation of RRTs to assess the perceived severity of the problem of cardiac arrests in their hospital as well as the perceptions about the potential for RRT’s to improve this problem. By using this approach to elicit information on health beliefs of individuals, program leaders can hopefully remove barriers to successful implementation and improve self-efficacy with regard to the program. Consumer Information Processing theory
also lends important concepts that can be used in the communication of program information to staff members. As the theory suggests, individuals are limited in the amount of information that they can process, and thus they often develop short-cuts based on previous experience. Media designed to remind individuals of the RRT program will be designed with this concept in mind by generating vehicles such as posters and stickers on telephones that provide short but effective messages to remind participants of the behaviors encouraged by this program.

Social Learning theory offers the explanation that people are influenced by their environments and the expectations of the results of their actions will affect future actions. This idea applies to the RRT Collaborative in several ways. First, because individuals have certain expectations for the results of their behavior in participating in RRTs that may often arise from observations of others’ behavior, modeling of the behaviors encouraged by this program through “dry runs” or “simulations” can provide helpful models. Also, as reinforcement of behavior is a large component of this model, simple rewards can be included in the program to encourage achievements such as the 100th RRT call, or the 100th patient who survived to hospital discharge after the RRT was called.

At the organizational level, the Community Organization theory will help institutions participating in the NC RRT Collaborative to develop a common goal for achieving success with RRTs in their respective hospitals. By including knowledge sharing activities and utilizing rapid cycle types of improvement techniques, program coordinators can accomplish participation and relevance, two important concepts in the Community Organization theory. Also, the concepts of critical consciousness and issue selection fit appropriately into the framework of hospital quality improvement.
Tailoring instruction techniques to individual hospitals will involve utilization of the organizational change model. Depending on the state of awareness about hospital cardiac arrests and the potential for early intervention at a hospital, the staff will exhibit different stages at different institutions. If innovative providers have already begun to initiate and implement at some institutions, RRT coordinators can utilize these individuals to help adopt the techniques learned through the Learning Collaborative to fit the needs of the institution as it relates to their readiness to change.

The existence of innovators also invokes the Diffusion of Innovations theory, which "addresses how ideas, products, and social practices that are perceived as ‘new’ spread throughout a society or from one society to another". This conceptual framework can be used both amongst the different program coordinators in order to share successes and barriers to implementation on a large scale and within hospitals to communicate the relative advantages of this program over other available alternatives. As the NC RRT Learning Collaborative is particularly well-suited for this framework, several components to this theory such as using head-to-head comparisons of the advantages of each option (i.e. RRTs versus traditional procedures) and using trials of demonstration to illustrate to participating staff members how the program will possibly perform when implemented on a larger scale. This and other organizational theories are particularly useful for the implementation of the RRT Learning Collaborative as so many of the potential facilitators and barriers occur on the organizational level.

D. Logic Model
<table>
<thead>
<tr>
<th>Resources/Inputs</th>
<th>Activities</th>
<th>Outputs</th>
<th>Short- &amp; Long-Term Outcomes</th>
<th>Impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>In order to accomplish our set of activities we will need the following:</td>
<td>In order to address our problem or asset we will do the following:</td>
<td>We expect that once completed or under way, the activities will produce the following evidence of delivery:</td>
<td>We expect that if completed or under way, these activities will lead to the following changes in the short (1-3 yrs) and long (3-5 yrs) term</td>
<td>We expect that if completed these activities will lead to the following changes in 7-10 years</td>
</tr>
<tr>
<td>-Educational materials for hospital employees regarding the reasons to implement RRTs</td>
<td>-Hospital representatives will facilitate collection of baseline data on in-hospital cardiac arrests</td>
<td>-Collaborative Learning Team and Measurement and Data Team schedule “Pre-planning Sessions.”</td>
<td>-40-50 hospitals will enroll in the NC RRT Learning Collaborative</td>
<td>-Sustained decrease in number of cardiac arrests that occur on hospital wards</td>
</tr>
<tr>
<td>-Hospital staff cooperation with RRT initiative</td>
<td>-Hospital representatives will attend learning sessions to learn about implementation of RRTs in their hospital</td>
<td>-Pre-planning Session will meet with the experts, faculty, AHEC staff and the RRT Leadership Group to plan the operation of the RRT Learning Collaborative.</td>
<td>-web-based internet sessions, teleconferences, list service and “virtual discussion groups” will be formed</td>
<td>-Sustained increase in number of calls to hospital RRT’s to identify early warning signs of impending cardiac arrest</td>
</tr>
<tr>
<td>-financial backing from Robert Wood Johnson Foundation grant</td>
<td>-Appropriate representatives will be chosen for each hospital’s RRT including: physicians, physician extendors, nurses, respiratory therapists, etc.</td>
<td>-Learning Session 1, in which the RRT model is taught to representatives from 20-25 hospitals, will occur.</td>
<td>-subspecialized teaching materials will be designed</td>
<td>-Observed improvement in survival to discharge after a hospital cardiac arrest</td>
</tr>
<tr>
<td>-relationship with NC AHEC (with clinical physicians and staff)</td>
<td>-Hospitals will identify and communicate criteria for calling RRT at their hospital</td>
<td>-Enrollment of a second collaborative of an additional 20-25 hospitals will begin.</td>
<td>Short-term</td>
<td>Long-term</td>
</tr>
<tr>
<td>-relationship with VHA Central Atlantic (with quality improvement project experience)</td>
<td>-subspecialized teaching materials will be designed</td>
<td>-hospitals will report a 30% reduction in the number of in-hospital cardiac arrests</td>
<td>-hospitals will report at least 8 RRT/MET calls per 1000 patient admissions to the hospital</td>
<td>-hospitals will report at least a 10% improvement in survival to hospital discharge</td>
</tr>
<tr>
<td>-relationship with MRNC (with measurement and data gathering skills)</td>
<td>-hospitals will identify and communicate criteria for calling RRT at their hospital</td>
<td>-second collaborative of an additional 20-25 hospitals will begin.</td>
<td>-hospitals will report at least 8 RRT/MET calls per 1000 patient admissions to the hospital</td>
<td>-hospitals will report at least a 10% improvement in survival to hospital discharge</td>
</tr>
</tbody>
</table>

**E. Implementation**

Implementation of the NC RRT Learning Collaborative will begin with the organization of the “Pre-planning Session”. Two teams will be established to direct the activities of the NC
RRT Learning Collaborative. The first team, The Collaborative Learning Team, will organize the enrolled hospitals, design and promote the Learning Sessions, develop learning collaborative content, resources and materials, and provide leadership and management for two planned learning sessions. The first learning session will enroll twenty to twenty-five hospitals and another of similar size will occur about three months later. The second team, the Measurement and Data Team, will be responsible for organizing and teaching hospital representatives in data collection and reporting.

After the Learning Collaborative establishes the above teams, hospital representatives will facilitate collection of baseline data on in-hospital cardiac arrests as described in the logic model. Then, these representatives will attend learning sessions about the implementation of RRTs in their hospital. Each hospital will choose appropriate representatives for their RRT and then establish and communicate criteria for calling the RRT at their hospital.

In the short term, the Collaborative plans to enroll 40-50 hospitals in North Carolina. The program will organize web-based internet sessions, teleconferences, list services and “virtual discussion groups.” Finally, specialized teaching materials will be designed allowing hospitals of all sizes and types to implement the organizational changes necessary to implement an RRT.

F. Conclusion

As national momentum has grown and anecdotal stories have been translated into preliminary results at many medical centers worldwide, implementation and study of Rapid Response Teams in North Carolina Hospitals represents the next logical step in the field of hospital quality improvement. The North Carolina RRT Learning Collaborative will design and
implement such teams in NC hospitals and, through a series of planned learning sessions and the collaboration of several partner organizations, will decrease the number of in-hospital cardiac arrests, increase calls to RRTs, and improve the survivability of cardiac arrest in hospitals statewide.

IV. EVALUATION PLAN

In this Evaluation Plan, I will begin by discussing a brief summary of the program plan and the overall approach to the evaluation. In the next section, I will describe the study design and study methods for the evaluation. Subsequently, I present the Program Plan Logic Model followed by the dissemination plan for the evaluation. I end the Evaluation Plan section of this paper with the evaluation planning tables, which outline the proposed manner for evaluating the study objectives.

A. Introduction and Approach to the Evaluation

Program Overview

Hospital cardiopulmonary arrests represent an important preventable cause of morbidity and mortality for hospitalized patients. As many authors have demonstrated in retrospective studies, often patients demonstrate warning signs and symptoms within the six to eight hours that preceded their cardiac arrest.[1,2] Inventive physicians across the country have implemented Rapid Response Teams (RRTs) to recognize the signs and symptoms of impending cardiac arrest and intervene on these patients.[3-5] Due to the potential for this program to save lives and prevent the lasting effects of hospital cardiac arrests in hospitals of all sizes and types, the NC RRT Learning Collaborative aims to implement RRTs in hospitals across the state of North
Carolina. The goal is to equip representatives from hospitals across North Carolina with the tools to start and sustain RRT programs to ultimately save lives and prevent the long-lasting consequences of preventable hospital cardiac arrests.

**Approach to the Evaluation**

Several factors contribute to the need for this program evaluation. The desire to provide feedback to the participating institutions for ongoing quality improvement and the wellbeing of the patients in these North Carolina hospitals represent important mitigating factors for this evaluation. Also, the desire to learn from this collaborative experience in order to provide guidance for future statewide cooperative projects motivates this evaluation. In addition, the potential for dissemination of the program to additional North Carolina Hospitals in order to achieve a wider influence of this program guides the need for a formal evaluation of the NC RRT Learning Collaborative.

**Evaluator Role**

As the North Carolina RRT Learning Collaborative involves the collaboration of several groups in order to accomplish its goals, the program evaluators must elicit feedback from a variety of sources. Evaluators must solicit responses from participants both on the leadership and implementation levels of the program including hospital RRT coordinators, hospital nurses/staff, Collaborative Learning Team members, and members of the Measurement and Data Team. Evaluators must possess background knowledge of the structure and function of hospital teams in order to solicit the appropriate information during interviews.
As the scale of this program is so large, the evaluation must consist of both external program evaluations, provided by the evaluation team, as well as internal evaluations performed by various participants in the program. These internal evaluations will allow program participants with a more intricate understanding of the day-to-day functioning of the program to solicit appropriate information that evaluators can use in the evaluation of the program. External evaluators will add objectivity and provide a forum for participants to share negative feedback to an outside source.

**Stakeholder input**

The key stakeholders affected by the evaluation of the North Carolina RRT Learning Collaborative include RRT Team leaders/implementers, hospital administrators, the Robert Wood Johnson Foundation (the primary funding agency), hospital staff, Collaborative Learning Team and Measurement and Data Team members, patients and family members effected by the program, and members of the organizations collaborating on this project. These stakeholders should be involved in the planning, implementation, and evaluation of this program.

Each stakeholder offers a unique contribution to the evaluation of the North Carolina RRT Learning Collaborative. RRT Team leaders will provide important feedback about major organizational challenges and successes encountered in implementing the program. Hospital Administrators provide the broad perspective necessary to comment on such issues as competing projects and duties of hospital staff members and may suggest ways to approach staff to elicit maximal participation in the evaluation. Finally, including hospital staff members in evaluation interviews will allow evaluators to collect information on the interest in the
program, its success on the hospital wards, the educational benefit of the educational activities, the encouragement the program should be providing, and the motivation level of the participants.

Stakeholders will be involved throughout the evaluation process. Prior to the start of the evaluation, it would be advantageous to meet with each stakeholder group individually to consider which questions should be considered in the evaluation design. Questions for consideration will vary by stakeholder group. Participating hospital staff members will be asked to provide information on comfort and awareness of the RRT at their hospital. Program staff/faculty will provide helpful feedback on teaching sessions as well as any issues with recruiting and retaining of participating institutions.

B. Evaluation Study Design and Methods

The design of the North Carolina RRT Learning Collaborative was based on a number of individual and group level program theories described above in the Program Plan. The design and methods of the program evaluation will address both individual and organizational components of the program as appropriate for each of the program’s individual components.

Evaluation Study Design

As suggested by the W. K. Kellogg Foundation, “Evaluations must be carefully designed if they are to strengthen project activities”25. By addressing the evaluation to assess to what degree the program meets its objectives, evaluators often adopt so-called
As described by Issel, one specific type of observational study, the “pre-test and post-test design,” assesses participants at least once before and after implementation of the program. In this evaluation, we will primarily use an exploratory study design to measure how well the North Carolina RRT Learning Collaborative is meeting its stated objectives.

Exploratory study designs involve collecting data from participants in the program at all levels, including the planning stages, the teaching stages, and implementation in local hospitals for the NC RRT Learning Collaborative. The goal of our program evaluation is to collect quantitative and qualitative data from participants in the Learning collaborative before and after the program is implemented and use the changes observed to suggest modifications for the purpose of quality improvement.

Utilizing ideas offered by the Social Learning Theory and Community Organization theory, this evaluation will assess to what degree the activities of the program are being effectively communicated and implemented in the participating hospitals, and how attitudes have changed as a result of this program. Based on the variety of program theories discussed in the program plan, a variety of data will be collected at the organization-level including both qualitative data, such as interview data on changes in attitudes of hospital staff, and quantitative data, such as changes in the numbers of RRT calls and deaths from hospital cardiac arrests.

This pre- and post- intervention design carries with it both strengths and weaknesses. On the positive side, comparison of organizations before and after implementation of the program will allow for qualitative and quantitative comparisons to be drawn. Also, the cost of the evaluation will be limited because no data needs to be collected for a “control-group.”
However, the pre-/post- design is subject to many types of problems including measurement bias if data collectors acquire information in different ways, the so-called “Hawthorne Effect,” in which individuals behave differently as a result of being observed, and the lack of a control, predisposing the study to problems due to changes over time not attributable to the program.

**Evaluation Methods**

The choice of research methods employed in the evaluation of this program has tremendous effects on the usefulness of the final report in accomplishing the goals of the program evaluation. As discussed previously, the primary purpose of this evaluation is to provide feedback to program planners to be used for ongoing quality improvements.

In order to accomplish this goal, this evaluation will employ both qualitative and quantitative methods as appropriate. For instance, for documenting changes in hospital staff attitudes and the effectiveness of communication, qualitative interviews represent the most appropriate methods. On the other hand, in order to document the long-term goals of improved patient mortality and increased utilization of the RRT, we will gather quantitative data through record reviews.

Based on the ideas of the Health Beliefs Model, data collected regarding hospital staff attitudes and behaviors pre- and post-intervention represent integral measures of the effectiveness of this program. This data will be collected in qualitative form, most likely utilizing individual interviews with staff members involved in the utilization of the RRTs at each hospital in order to facilitate the communication of ideas not readily amenable to quantitative data collection.
Drawing on more organizational program theories such as the Social Learning Theory and the Community Organization Theory, group level data will also be collected utilizing both qualitative and quantitative methods. Group interviews, or focus groups, conducted with representatives from participating hospitals collected in person and/or via teleconferences, will represent the primary form of qualitative data collected. Information on hospital cardiac arrests and calls to the RRT will be collected in quantitative form, via document review by the Measurement and Data Team of the Learning Collaborative.

C. Logic Model

See Program Plan Logic Model on pg. 24

D. Dissemination Plan

As this program represents a collaborative effort between several organizations, the final evaluation report must be shared with each of the major stakeholders. At the conclusion of this evaluation study, a formal written report will be assembled by the evaluating team first for presentation to the organizing group at the North Carolina Hospital Association. In addition, this report will be made available to other collaborating groups both in the form of a written report as well as a formal presentation at the conclusion of the evaluation. Quantitative data such as the tracking of calls to RRTs, location of cardiac arrests, and mortality from cardiac arrest will be presented in graphic form in both written and oral presentations. In addition, qualitative data will be coded where possible and assembled into both written summaries of recommendations as well as lists for presentation and discussion of major issues at the conclusion of the evaluation. At the conclusion the written report and presentations, program
administrators will have both qualitative and quantitative feedback on the program to use for
ongoing quality improvement in the program.

Incorporating the results of the evaluation into ongoing training of new program centers
represents another major step in the dissemination of this program evaluation. Members of the
Collaborative Learning Team will incorporate qualitative and quantitative results into teaching
materials designed to change the attitudes of staff at participating institutions. Also, teaching
faculty and staff will employ specific feedback from qualitative data to anticipate and avoid
challenges faced by previous teams. Finally, the results of this evaluation may be used to guide
further funding of this program and may be used to apply for future grants to expand RRTs
within North Carolina or to help other states implement similar programs.

As the attitudes of the involved institutions will play a tremendous role in the future
success or failure of this program, targeted media campaigns and presentations will also help to
facilitate dissemination of this program. Placing articles in the newsletters and other
publications read by administrators and decision-makers at the area hospitals will facilitate
reinforcement of the evaluation results. Also, presentation at local hospital committees, such as
the “Quality Council” at larger institutions such as the University of North Carolina and
analogous groups at smaller hospitals will also provide reinforcement for future efforts. A
directed media and communication campaign will provide the important reinforcement needed
for disseminating and maintaining this program in North Carolina hospitals.

E. Evaluation Planning Tables

**Short-term Objectives**
Short-term Objective#1: By month 3, Collaborative Learning Team and Measurement and Data Team will have lead “Pre-planning Sessions” with RRT Leadership staff, AHEC faculty/staff, and experts from collaborating organizations.

<table>
<thead>
<tr>
<th>Evaluation Question</th>
<th>Participant</th>
<th>Evaluation Method (Week 13)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Have the “pre-planning sessions” taken place? If no, why not? If so, how many sessions were necessary?</td>
<td>Collaborative Learning Team and Measurement and Data Team members</td>
<td>Open-ended interviews</td>
</tr>
<tr>
<td>Was a project timeline and schedule established? If so, how useful/accurate was it?</td>
<td>Collaborative Learning Team and Measurement and Data Team members</td>
<td>Open-ended interviews</td>
</tr>
<tr>
<td>Were available resources assessed during these sessions? Were any resources identified later that would have been helpful during program planning?</td>
<td>Collaborative Learning Team and Measurement and Data Team members</td>
<td>Open-ended interviews</td>
</tr>
<tr>
<td>What strategies were established to gain commitment from hospital leadership? What communication strategies were developed for the Learning Collaborative?</td>
<td>Collaborative Learning Team and Measurement and Data Team members</td>
<td>Open-ended interviews</td>
</tr>
</tbody>
</table>

Short-term Objective#2: By month 4, Learning Session 1 will have taught the Institute for Healthcare Improvement RRT model to representatives from 20-25 hospitals.

<table>
<thead>
<tr>
<th>Evaluation Question</th>
<th>Participant</th>
<th>Evaluation Method (Week 17)</th>
</tr>
</thead>
<tbody>
<tr>
<td>How many hospitals have committed to participation in this initiative?</td>
<td>Collaborative Learning Team and Measurement and Data Team members</td>
<td>Document review</td>
</tr>
<tr>
<td>Evaluation Question</td>
<td>Participant</td>
<td>Evaluation Method (Month 7)</td>
</tr>
<tr>
<td>---------------------------------------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------------</td>
<td>-----------------------------------------------------</td>
</tr>
<tr>
<td><strong>Short-term Objective #3</strong>: By the end of month 6, Learning Collaborative Team will have</td>
<td></td>
<td></td>
</tr>
<tr>
<td>designed and distributed “reminders” and other media to disseminate amongst participating</td>
<td></td>
<td></td>
</tr>
<tr>
<td>hospitals to encourage use of the RRTs.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>How many hospitals needed to be approached in order to secure commitments from 20-25 hospitals?</strong></td>
<td>Data Team members</td>
<td>Open-ended interviews</td>
</tr>
<tr>
<td><strong>What difficulties were encountered in recruitment?</strong></td>
<td>Collaborative Learning Team and Measurement and Data Team members</td>
<td>Open-ended interviews</td>
</tr>
<tr>
<td><strong>What reasons did hospitals give for not participating? Did hospitals that chose not to participate</strong></td>
<td>Hospital Administrators</td>
<td>Focus Groups / Open-ended interviews</td>
</tr>
<tr>
<td><strong>Did hospitals actively seek out participation without being recruited? If so, how did these hospitals</strong></td>
<td>Hospital Administrators</td>
<td>Focus Groups / Open-ended interviews</td>
</tr>
<tr>
<td><strong>How were potential hospitals approached? Were any active recruitment techniques employed? If so, were</strong></td>
<td>Collaborative Learning Team and Measurement and Data Team members</td>
<td>Open-ended interviews</td>
</tr>
<tr>
<td><strong>What measurement and data team members</strong> were involved in recruitment?**</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Did hospitals that chose not to participate share any common features?</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>How were potential hospitals approached? Were any active recruitment techniques employed? If so, were</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Did hospitals actively seek out participation without being recruited? If so, how did these hospitals</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>How were potential hospitals approached? Were any active recruitment techniques employed? If so, were</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Did hospitals actively seek out participation without being recruited? If so, how did these hospitals</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>How were potential hospitals approached? Were any active recruitment techniques employed? If so, were</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Did hospitals actively seek out participation without being recruited? If so, how did these hospitals</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
received enough information about the RRT? If not, what improvements would they suggest?

Were media and reminders visible throughout the hospital?

<table>
<thead>
<tr>
<th>Evaluation Question</th>
<th>Participant</th>
<th>Evaluation Method (Month 7)</th>
</tr>
</thead>
<tbody>
<tr>
<td>How many hospitals were enrolled? Were any new issues encountered in recruiting additional hospitals?</td>
<td>Collaborative Learning Team and Measurement and Data Team members</td>
<td>Open-ended interviews</td>
</tr>
<tr>
<td>Were any efforts made to recruit certain hospital types (i.e. rural, urban, public, private, etc.)?</td>
<td>Collaborative Learning Team and Measurement and Data Team members</td>
<td>Open-ended interviews</td>
</tr>
<tr>
<td>What led additional hospitals to join the collaborative?</td>
<td>Hospital Administrators</td>
<td>Focus Groups</td>
</tr>
</tbody>
</table>

**Short-term Objective#4**: By month 7, enrollment of a second collaborative of an additional 20-25 hospitals will have begun.

**Short-term Objective#5**: By the end of year 1, web-based internet sessions, teleconferences, list service and “virtual discussion groups” will begin to accommodate hospitals who joined late and will cover learning gaps that have become apparent in the first year.
How many teleconferences have taken place? If so, what has been successful and what has needed improvements?

Collaborative Learning Team and Measurement and Data Team members

Open-ended interviews

Have “virtual discussion groups” started? If so, what has been successful and what has needed improvements?

Collaborative Learning Team and Measurement and Data Team members

Open-ended interviews

Have list services started? If so, what has been successful and what has needed improvements?

Collaborative Learning Team and Measurement and Data Team members

Open-ended interviews

What have participants found most helpful? What has been less helpful? How could these methods be improved?

Hospital Administrators and RRT Team Members

Focus groups and Open-ended interviews

Short-term Objective #6: By the end of year 2, the importance of RRTs will have been effectively communicated to nurses and other hospital staff and attitudes towards the RRT will have improved significantly over baseline.

<table>
<thead>
<tr>
<th>Evaluation Question</th>
<th>Participant</th>
<th>Evaluation Method (Month 25)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Did the attitudes of hospital staff change significantly as a result of the program?</td>
<td>Hospital Staff</td>
<td>Before and After Focus Groups and Surveys</td>
</tr>
<tr>
<td>How do staff rate the importance of the issue of hospital cardiac arrests?</td>
<td>Hospital Staff</td>
<td>Before and After Surveys</td>
</tr>
<tr>
<td>How does staff describe their relationship with the RRT? Are there any tensions between calling the RRT and calling the</td>
<td>Hospital</td>
<td>Focus</td>
</tr>
</tbody>
</table>
Short-term Objective #7: By the end of year 3, the RRT Learning Collaborative will have begun to design packaged teaching materials that are sub-specialized to size/type of hospital (i.e. >200 beds versus less than 50 beds) and patient population (i.e. pediatric patients, post-operative surgical patients, etc.).

<table>
<thead>
<tr>
<th>Evaluation Question</th>
<th>Participant</th>
<th>Evaluation Method (Month 7)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Have teaching materials been tailored to size/type of hospital?</td>
<td>Collaborative Learning Team and Measurement and Data Team members</td>
<td>Focus Groups</td>
</tr>
<tr>
<td>Did participating hospitals find it helpful to have tailored materials?</td>
<td>Hospital Administrators and RRT Team Members</td>
<td>Focus Groups</td>
</tr>
<tr>
<td>What other modifications are needed for training materials?</td>
<td>Hospital Administrators and RRT Team Members</td>
<td>Focus Groups</td>
</tr>
</tbody>
</table>

**Long-term Objectives**

**Long-term Objective #1**: Within 3 years, hospitals will report at least a 30% reduction in the number of in-hospital cardiac arrests.

<table>
<thead>
<tr>
<th>Evaluation Question</th>
<th>Participant</th>
<th>Evaluation Method (Month 37)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Are accurate records being kept for in-hospital cardiac arrests? If not, why not?</td>
<td>Measurement and Data Team members</td>
<td>Document Review and Focus Groups</td>
</tr>
<tr>
<td>Are hospitals noting changes in the number of hospital cardiac arrests? Is the location where the majority of cardiac arrests occur different since hospitals implemented RRTs?</td>
<td>Measurement and Data Team members</td>
<td>Before and After Document Reviews</td>
</tr>
<tr>
<td>Are hospitals observing a 30% reduction in the number of in-hospital cardiac arrests?</td>
<td>Measurement and Data Team members</td>
<td>Document Review</td>
</tr>
</tbody>
</table>
Are there other issues that Measurement and Data Team, Focus Groups could explain changes in number of cardiac arrests over Team Members this time period?

Long-term Objective #2: Within 4 years, hospitals will report at least 8 RRT/MET calls per 1000 patient admissions to the hospital.

<table>
<thead>
<tr>
<th>Evaluation Question</th>
<th>Participant</th>
<th>Evaluation Method (Month 49)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Are accurate records of RRT calls being kept? If not, why not?</td>
<td>Measurement and Data Team members</td>
<td>Document Review and Focus Groups</td>
</tr>
<tr>
<td>Are hospitals reporting at least 8 RRT calls per 1000 patient admissions?</td>
<td>Measurement and Data Team members</td>
<td>Document Review</td>
</tr>
<tr>
<td>Has there been significant changes in the number of calls to RRTs over the study period?</td>
<td>Measurement and Data Team members</td>
<td>Before and After Document Review</td>
</tr>
<tr>
<td>Do hospital staff call the RRT when a patient meets the criteria? If not, what corrective action do they take and why?</td>
<td>Hospital Staff</td>
<td>Focus Groups</td>
</tr>
</tbody>
</table>

Long-term Objective #3: Within 5 years, hospitals will report at least a 10% improvement in survival to hospital discharge.

<table>
<thead>
<tr>
<th>Evaluation Question</th>
<th>Participant</th>
<th>Evaluation Method (Month 49)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Are outcomes of patients who experience cardiac arrest being followed? If not, why not?</td>
<td>Measurement and Data Team members</td>
<td>Document Review and Focus Groups</td>
</tr>
<tr>
<td>Have hospitals observed a 10% improvement in survival to hospital discharge after a cardiac arrest?</td>
<td>Measurement and Data Team members</td>
<td>Document Review</td>
</tr>
<tr>
<td>Question</td>
<td>Measurement and Data Team members</td>
<td>Before and After Document Review</td>
</tr>
<tr>
<td>-------------------------------------------------------------------------</td>
<td>-----------------------------------</td>
<td>----------------------------------</td>
</tr>
<tr>
<td>Have there been a significant change in the survival to hospital discharge since the adoption of RRTs? If not, has survival changed significantly for any specific subgroup of patients?</td>
<td>RRT Team Members</td>
<td>Focus Groups</td>
</tr>
<tr>
<td>What do RRT Team members think are the barriers that prevent RRTs from accomplishing better improvements in patient survival? Have any QI initiatives occurred?</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**F. IRB Summary**

As this project involves a program evaluation for quality improvement purposes and does not meet the criteria to constitute Human Subjects research, the Institutional Review Board (IRB) at the University of North Carolina affirmed that IRB approval was not necessary for this program evaluation project (reference IRB “Determination that Research or Research-Like Activity does not require IRB Approval” Form, UNC Study# 07-0555).

**V. Conclusion**

In this paper, I have discussed many issues as they relate to the North Carolina RRT Learning Collaborative. I have summarized literature that explains how previous quality improvement efforts have led to the current proposed program. I have described the program’s overall plan for achieving its goals and objectives within the context conceived by the various stakeholders. Finally, I have elaborated upon a proposed plan to evaluate this program based on the proposed program objectives.
The results of the evaluation will be made available to the various stakeholders as discussed in detail in the Dissemination Plan section of this paper. The possibility of future publication of the results of this evaluation for the purposes of making a significant contribution to the broader body of scientific knowledge on this topic will be explored after the evaluation is complete. Appropriate IRB and stakeholder input will be sought before we pursue any form of publication.

VI. References


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