

Change in Cardiopulmonary Arrest Response in an Anesthesiology Residency: A practice-based learning initiative

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Original Article

Abstract

Because of increases in the acuity in our patient population, increasing complexity of the care provided and the structure of our residency, we decided to systematically alter our participation in the hospital-wide cardiac arrest system. The need to provide optimum service in an increasingly complex clinical care system was the motivation for change. With substantive input from trainees and practitioners, we created a multi-tier-system of response along with pre-defined criteria for the anesthesiology response. We report the result of our practice based learning initiative.

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The Previous System

Since practice-based learning and improvement has become an important issue in anesthesiology residency training, programs have been evaluating tools to facilitate learning from feedback about clinical care. One of the clinical and education challenges of anesthesiology training programs is support of the hospital cardiac arrest system. Our hospital Cardiopulmonary Resuscitation (CPR) Committee has defined various cardiac arrest teams (adult, obstetric, pediatric, newborn) and delegated responsibility for designating and training residents to the appropriate residency programs (Internal medicine, Pediatrics, Anesthesiology). The anesthesiology role has always been airway management and the resident responsible for the Post-Anesthesia Care Unit (PACU) is the primary responder. A single response system worked well for many years until changes in clinical practice pattern in our hospital system caused us to review our resuscitation care which resulted in the realization that there were different levels urgent and emergent responses required for different clinical scenarios.

Impetus for Change

One of the issues that became an impetus for change was a structural change in the practice of Anesthesiology. In the 1990's, the traditional focus on operating room anesthesia expanded to include many kinds of care outside the operating room, including pre-anesthesia testing, critical care and pain management. Combining this clinical expansion with increasing administrative responsibilities led to the idea of the anesthesiologist as the expert in perioperative medicine (1). With the practice of Perioperative Medicine came the need to add this material to residency training (2).

We created a perioperative medicine rotation in 1997, and these residents provide daytime post-PACU coverage (7:00 AM – 7:00 PM). This had a direct impact on our resident participation in the hospital-wide cardiac arrest response system. Since this rotation occurs after six months of training, basic airway skills could be assumed. For nighttime and weekend response, we kept this role with the PACU resident, but defined that this responsibility could not be assumed by a resident until basic airway skills were verified, as defined by completion of 50 successful intubations (3). Prior to achievement of this airway skills milestone, only OR anesthesia call (not PACU coverage) assignments were made. For the previously existing anesthesia cardiac arrest response system, this evolution provided a stable pool of resident manpower. At other institutions, airway competence for cardiac arrest has been achieved through training and certification in a simulation setting (4). Although we have a full-scale human patient simulator, we considered clinical endotracheal intubation success to be a superior means of assuring airway competence.

With the publication of the RRC rules for anesthesiology residency on January 1, 2001, ACLS/BLS Certification became a requirement for CA-3 residents. This caused us to review our response team again. We decided that current certification in ACLS/BLS should be required of anesthesia responders to cardiac arrest, since initial survival from cardiac arrest improves with ACLS/BLS training (5). We created an internal program to provide AHA approved ACLS/BLS courses within our training program with equipment, books and trained staff instructors for our own courses. All residents received primary BLS/ACLS certification at entry orientation (either CBY or CA-1) and recertification within 3 months of expiration. Within 3 years we achieved

greater than 90% current BLS/ACLS certification, requiring 4-6 courses per year. As a result of this change, all cardiac arrest responders now have current BLS/ACLS certification.

Change in our Practice

With the increasing complexity of invasive cardiovascular care, we noticed more and more cases requiring urgent airway intervention not in the setting of cardiac arrest. Residents and practitioners met repeatedly to analyze patterns, interact with cardiology personnel and formulate protocols. We considered this in the context of clear evidence that time to emergency response is a primary determinant in survival from cardiac arrest (6). In the minutes before cardiovascular collapse, patients were frequently seen to be agitated or uncooperative. Some of the sickest patients in the institution essentially required elective induction of anesthesia to secure the airway. The time from recognition to control of the airway in these patients may influence the overall survival rate (7), especially since respiratory insufficiency is a known primary cause of cardiac arrest (8) and delay in securing the airway can decrease survival (9). We determined these interventions were more like induction of general anesthesia in a critically ill patient than simply securing an airway at an arrest. This higher complexity of care was deemed to require backup of the primary responder, a junior resident, with more experienced personnel. Since mastery and teaching of resuscitation is an essential element of Anesthesiology Critical Care, anesthesiology critical care fellows were asked to attend all cardiac arrest response requests using a 2nd pager during daytime hours. At night, the senior resident on-call (CA-3) assumed this backup role.

By agreement with the Department of Cardiology, we further refined our response by creating three protocol tiers of airway response – elective, urgent (within 20 minutes) and cardiac arrest (see Appendix 1). For urgent and elective protocols, we included staff over-sight during daytime hours. The rationale for the urgent tier protocol was to provide expert airway support to prevent cardiac arrest.

Measuring Change

The final element in our practice-based learning initiative was to audit performance. Because of the increasing complexity of the response, our residents requested review of performance under circumstances where the response was non-standard, or in cases where conflict arose in clinical management. We created a performance document to be completed for all arrest responses (Figure 1). Details of the response, including any non-standard occurrences are recorded. The forms are reviewed by the Administrative Chief Resident, summarized and provided to the Program Director. Any non-standard response issues are reviewed, including the chart and CPR event record and discussed with appropriate staff when necessary. This information was also given directly to the involved resident by the chief resident, as appropriate. When exceptionally good clinical care was identified, this was brought to the resident as praise by the program director. The result of our first year of data of collection is presented as Table 1.

Conclusions

Our practice-based learning initiative first determined that support of our cardiac arrest system required modification in response to increasing complexity and acuity of co-morbidity in our patients. Our single response system of the past was found to no longer be well-suited to current practice needs. With trainee and practitioner input we created a multi-tiered urgent response,

system, provided appropriate training and audited performance, all of which now better meet the needs of our practice and training program. We conclude that practice-based learning could be realized in the setting of an anesthesiology residency program and support an essential clinical care contribution, i.e. the response to rescue patients with urgent airway problems and/or cardiac arrest.

Appendix 1: Multi-tiered Protocols for Emergency Airway Response to Cardiology Units

The Division of Anesthesiology and Critical Care Medicine is a participant in the hospital Code Team, which responds to medical emergencies within the Foundation. Cardiothoracic Anesthesiology (CTA) has had a long-standing relationship with Cardiology for some airway services. The Department of General Anesthesiology (GENA) is responsible for the manpower and administrative issues involving anesthesia participation at cardiac arrest. The GENA code team role is to secure the airway, verify bilateral breath sounds, confirm end-tidal carbon dioxide and ensure that Respiratory Therapy is able to maintain controlled ventilation, sometimes until transfer to a critical care bed is possible. For the critical care units within Cardiology (Coronary Care and Heart Failure), we proposed a three level response to improve service –

1. Emergent Cardiac Arrest

2. Urgent Airway management

3. Elective Airway Management.

We also proposed a protocol for the management of each, including a fourth pathway for after hours and weekends.

1. Cardiac Arrest

The primary response to cardiac arrest events is generated through the emergency pager system. In the Coronary Intensive Care and the Heart Failure units, other requests for airway interventions occur. Imminent respiratory arrest should be handled by the cardiac arrest team and should be requested using the emergency page system. The response of the hospital code team includes internal medicine residents who usually perform ACLS code procedures. The cardiology team has the option of dismissing the internal medicine residents on arrival if the senior Cardiology team member prefers to direct ACLS, except for airway management, using only cardiology team members. A standard institutional CPR record form must be completed when this emergent cardiac arrest system is utilized.

2. Urgent Airway Management

During the 7AM-5PM period on weekdays, when anticipated response time for intubation is 20-25 minutes or less, a unique pager indicates the need for airway support for the Coronary Intensive care Unit or the Heart Failure Unit. The primary pager is carried by the anesthesiologist directing PACU. The first back up is the PACU Resident and the second back up is the intensive care fellow. If there is no response from one of these pagers within 5 minutes, the anesthesia control desk is called. Only the most senior member of the cardiology team should activate this pager, and remain at the phone to provide physician to physician information necessary to make an optimal plan for appropriate airway management. The primary responders to this pager system will be from within GENA with CTA backup. The hospital code team should not be activated for such requests because anesthesia staff must be involved for urgent intubation*, and because activating the cardiac arrest system for this purpose compromises the anesthesia response to any true cardiac arrest occurring during the time interval in question.

3. Elective Airway Management

During the 7AM-5PM interval on weekdays, elective airway issues for cardiology units is from Cardiothoracic Anesthesia. To improve the quality of the daytime response, elective and urgent

* in our institution, cardiac arrest care is managed by house staff

airway management cases are treated in the same manner as add-on surgical emergencies with a booking card. These are delivered to the Anesthesia Control Desk, where appropriate response is confirmed (GENA or CTA). The Control desk determines which CTA staff will be available, and will contact that staff to arrange the service. During those times when one anesthesiology department is responsible, if unforeseen circumstances prevent a timely response, the other department may be asked for backup.

4. After-Hours and Weekends

From 5PM to 7AM on weekdays and 24 hours on weekends, the response to these units for emergent cases is from General Anesthesia via the emergency page system. Only emergencies will be accommodated. Elective requests should come to the Anesthesia Resident on-call. For service to be provided, it should be booked via the case add-on booking system.

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Table 1. Results of Practice-Based Learning Intervention Audit

	RESULT
Audit period	5 months
Total # of hospital codes	148
# of codes audited	148
Successfully intubated by anesthesia team	121
No need for intubation	27
Reasons for “No need to Intubate”	
Stable type of cardiac arrhythmias with no need for airway protection	9
Do not intubate status	3
Pressing the code button by mistake	15

Figure 1- Report Document

**DEPARTMENT OF GENERAL ANESTHESIOLOGY
CARDIAC ARREST RESPONSE**

Date:	Time:	Bedspace:
Patient Name:		
Clinic Number:		
Junior Resident:		
Senior Supervisor:		

Intubated	Yes	No		Expired verified	CO₂	Yes	No
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Details (brief):

Irregularities (be specific):