

Keeping Cardiac Arrest Documentation Alive in the Electronic Medical Record

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Cardiac arrests are among the most critical events that occur in the hospital. Although the Utstein-style guidelines for documentation of in-hospital cardiac arrest (IHCA) were updated in 2019, hospitals with electronic medical records (EMRs) that do not include built-in cardiac arrest note templates may not be following these standards (1, 2).

As a result of the rapid fluctuations that health care underwent during the coronavirus disease (COVID-19) pandemic, intensive care unit providers noted the documentation of IHCA sustained at University Hospitals Cleveland Medical Center (UHCMC), a tertiary care teaching hospital. Without adequate documentation, providers receiving postarrest patients reported gaps in crucial arrest information, prohibiting the delivery of timely patient care. This

issue originated from various factors, including providers volunteering to help with patients out of their field, the shift in medical units to COVID-19 units, and the abundance of patients requiring attention, all causing documentation to be a lower priority. A quality improvement initiative was developed to improve the documentation of cardiac arrests throughout the UHCMC system.

METHODS

The initial process for arrest notes was an unstructured free text box to be completed by the code leader in the EMR. A root cause analysis revealed that the two main contributors to the poor quality of notes were that providers forgot an essential component of the arrest or lacked the knowledge of what to include in notes. Then, standards of

(Received in original form February 24, 2023; accepted in final form May 31, 2023)

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ATS Scholar Vol 4, Iss 4, pp 464–468, 2023
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DOI: 10.34197/ats-scholar.2023-0031BR

Table 1. Utstein in-hospital cardiac arrest domains

A. SUMMARY OF UTSTEIN IN-HOSPITAL CARDIAC ARREST DOMAINS			
CATEGORIES OF DOCUMENTATION	MINIMUM RECOMMENDED VARIABLES	SUGGESTED SUPPLEMENTAL VARIABLES	
	Patient	<ul style="list-style-type: none"> Age Sex 	<ul style="list-style-type: none"> Race Out of hospital arrest leading to admission Pre-existing conditions
	Pre-arrest	<ul style="list-style-type: none"> Inpatient vs. Outpatient Service patient is admitted under (medical, surgical, etc) 	<ul style="list-style-type: none"> Date of hospital admission Vital signs prior to arrest Interventions already in place (mechanical ventilation, inotropes, vasopressors, etc.)
	Arrest	<ul style="list-style-type: none"> Time and date of arrest Location of arrest Witnessed or not witnessed Resuscitation team activated Chest compressions performed Initial rhythm identified AED or manual defibrillator used Shocks delivered when appropriate ECPR during cardiac arrest 	<ul style="list-style-type: none"> Initial condition of patient Number of shocks delivered total Epinephrine and other drugs given Airway interventions performed Confirmation of tracheal tube placement CPR quality
	Post-arrest	<ul style="list-style-type: none"> TTM Avoiding pyrexia Coronary angiography and reperfusion attempted if indicated 	<ul style="list-style-type: none"> Patient transfer information (other hospital, ICU, other unit, etc) Time TTM initiated and what temperature targeted Post-cardiac arrest pyrexia (>38C) Cardiac devices used? (IABP, LVAD) Findings on post-ROSC EKG Target BP range Vasopressor/inotrope infusion after ROSC Prognostication tests if comatose
	Follow up	<ul style="list-style-type: none"> Date, time, and reason CPR was stopped Whether ROSC was obtained Survival to discharge or 30 days Neurological outcome Date and time of death Organ donation 	<ul style="list-style-type: none"> 12-month survival status Cause of death Quality of life measures at 1 year
B. UHCMC CARDIAC ARREST BENCHMARKS		UHCMC POST-ROSC CARE BENCHMARKS	
Patient Identifiers		EKG	
Initial Rhythm		CXR	
Length of Code		Bloodwork	
Airway Management		Targeted Temperature Management (TTM)	
Special Interventions Outside of ACLS (e.g. tPA, bicarbonate, glucose)		Exclusion of TTM if GCS > 8, SpO ₂ < 88% despite FiO ₂ 100% for > 30 minutes, MAP < 70 despite maximal vasopressor support, major operative procedure within 72 hours, uncontrolled bleeding, pregnant, < 18 years old, poor prognosis (elected comfort care, etc)	
Family Notification			
ROSC or Time of Death			
Unit Transferred to (if ROSC)			

Definition of abbreviations: ACLS = advanced cardiac life support; AED = automated external defibrillator, BP = blood pressure, CPR = cardiopulmonary resuscitation, CXR = chest x-ray, ECPR = extracorporeal cardiopulmonary resuscitation, EKG = electrocardiogram, FiO₂ = fraction of inspired oxygen, GCS = Glasgow Coma Scale, IABP = intra-aortic balloon pump, IHCA = in-hospital cardiac arrest, LVAD = left ventricular assist device, MAP = mean arterial pressure, ROSC = return of spontaneous circulation, SpO₂ = peripheral oxygen saturation, SaO₂ = peripheral saturation of oxygen, TTM = targeted temperature management, tPA = tissue plasminogen activator, UHCMC = University hospitals Cleveland Medical Center.

The top of the table (A) depicts a summary of the 2019 Utstein-style guidelines for documentation of in-hospital cardiac arrest, adapted from the original article by Nolan et al. (2) The Utstein consensus group identified 6 main categories of documentation with separate core and supplemental variables in each domain. (2) Each of these domains include core variables that should be included in documentation as a minimum recommended standard to maintain quality of documentation, and supplemental variables that may be beneficial to include but are not essential. (2) The aim of Utstein guidelines was to encourage hospital systems to incorporate these agreed-upon core variables during IHCA documentation to improve the quality of documentation and patient care. In the bottom of the table (B), the UHCMC benchmarks for both cardiac arrest documentation and post-ROSC care are listed, as implemented from core Utstein guidelines and local UHCMC Resuscitation Committee discussion.

documentation were developed per Utstein-style guidelines as benchmarks for the documentation of IHCA and post-return of spontaneous circulation (post-ROSC) care, described and listed in Table 1 (1, 2).

After an institutional review board approval of this quality improvement project, documentation of IHCA was reviewed from September 1, 2020, to November 30, 2020, before intervention. Inclusion criteria were all inpatient cardiac arrests. Cases were excluded if the patient never lost a pulse, had a do not resuscitate order, and had an outpatient or intensive care unit arrest.

A cardiac arrest note template was then developed using a bullet-point format so that providers could quickly complete the document while meeting all Utstein-style benchmarks. An education period took place to ensure that all providers and departments were aware of the new note template in the EMR. Because UHCMC code leaders are mostly internal medicine residents, education was delivered by creating a simple one-slide PowerPoint presentation introducing the new code blue

note, followed by a live demonstration of its use in the EMR. In the live demonstration, residents would interact with the note to understand its branching logic apparatus. These sessions took place every 2 weeks from June to August 2021. For other departments, a PowerPoint was sent out via e-mail every month for these 3 months, including similar introductory material and screenshots of the question format included in the note.

Postintervention documentation was then reviewed from September 1, 2021, to December 30, 2021. In the absence of a validated tool to assess satisfaction with this type of note, provider interviews were conducted to assess experience with the note after its implementation.

For the sample size calculation, the estimated percentage of compliance in the preintervention group was 40% and that in the postintervention group was 80%. With an estimated 80% power and α -value of 5%, we calculated the need for 22 charts in both pre- and postintervention groups. A chi-square test was used to compare the percentage of compliant notes between the two groups. The aim

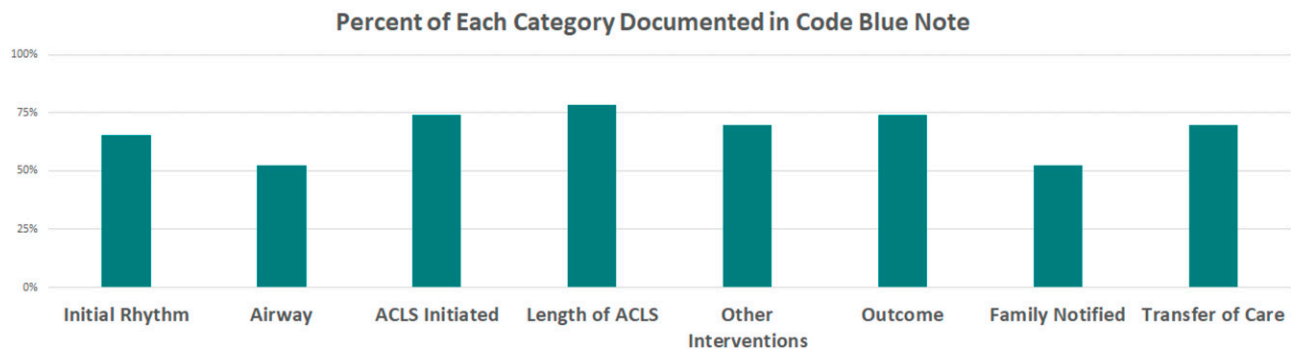


Figure 1. The percentage of cardiac arrest notes that included the University Hospitals Cleveland Medical Center benchmarks before the code blue note intervention. In the preintervention group, the total number of in-hospital cardiac arrests from September 1, 2020, to November 30, 2020, totaled 28. Of these 28 arrests, 5 were excluded because the patients never lost a pulse. Of the remaining 23 arrests, only 8 met all the University Hospitals Cleveland Medical Center benchmarks of cardiac arrest documentation (35%). Of the 11 patients who underwent return of spontaneous circulation, only four notes commented on post-return of spontaneous circulation benchmarks (36%). Two of these arrests had no provider documentation at all, and one had arrest documentation written more than 20 days after the actual arrest. Only 50% of documents in the previous process mentioned airway management or family notification. Twenty-five percent or more of the notes did not mention initial rhythm, whether advanced cardiac life support (ACLS) was initiated, outcome, or length of ACLS. None of the categories had been addressed in 100% of the notes before intervention.

was to improve the quality of IHCA documentation and post-ROSC care by 30% from baseline at UHCMC.

RESULTS

In the preintervention group, 23 IHCA met the criteria. As detailed in Figure 1, only 35% of these arrests met all the UHCMC benchmarks of cardiac arrest documentation, and only 36% of patients who underwent ROSC had notes commenting on post-ROSC benchmarks.

In the postintervention group, 25 arrests met inclusion criteria. Twenty of them used the new code blue note template, indicating that 20 (80%) of the 25 arrests met all quality benchmarks for arrest documentation. Furthermore, because post-ROSC benchmarks were also included in this template, 80% of providers met these quality benchmarks as well.

A chi-square test of independence was performed to examine the relationship between the intervention and the number of notes meeting all quality benchmarks. The relationship between these variables was significant: $\chi^2(1, N=53) = 14.02$; $P < 0.001$. Postintervention notes were more likely to meet quality benchmarks.

In the postintervention group, the five arrests that did not use the code blue note included physicians who were not typically placed in the code leader role. The 20 arrests that included the note for documentation were written by internal medicine residents.

DISCUSSION

Because UHCMC does not have an EMR with a built-in template for arrest documentation, the development of the code blue note aimed to standardize cardiac arrest documentation while increasing the ease of documentation for providers. With

repeated education of the intervention at UHCMC, there was a 45% improvement in cardiac arrest documentation and a 43% improvement in the documentation of post-ROSC care. This improvement is a result of the template including accepted Utstein-style criteria for documentation in bullet-point question format, allowing more rapid completion of a note shortly after the event. As a result of this initiative, the code leaders at UHCMC were more compliant with documentation. Postimplementation interviews with providers revealed the common themes of improved transitions of care and knowledge of arrest events.

To implement an ideal note template that is time sensitive yet includes crucial information for patient care, the core variables under the Utstein domains of the cardiac arrest process, postresuscitation process, and outcome should be included at a minimum (Table 1). The education on this type of intervention should include multiple focused sessions to the target audience with real-time demonstration of the new note, along with supplemental material sent via e-mail with step-by-step instructions.

Whether incorporating post-ROSC care in arrest documentation causes more timely patient care is an area of future exploration. Other future endeavors are aimed at developing an education process for all departments through recorded Zoom lectures because this note will be introduced to all branch campuses of the University Hospitals Health System.

Acknowledgment

The authors thank the UHCMC Resuscitation Committee for supporting this quality improvement initiative from its initial development phase all the way to the end. The authors also thank the information technology department at

UHCMC for working diligently to prioritize our code blue note and implement it in the EMR within 6 months. Finally, thank you to the quality improvement and faculty mentors in the internal medicine residency program at

UHCMC for pushing all residents to create a quality improvement project and guiding them through the process.

Author disclosures are available with the text of this article at www.atsjournals.org.

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