WHEN MINUTES COUNT
YOU CAN’T IMPROVE WHAT YOU CAN’T MEASURE
Learning Objectives:

*After completing this course, the learner should be able to:*

- List and discuss the three “Gold Standards”;
- List three factors related to the variable resuscitation documentation processes; and
- Describe how improved documentation and timekeeping enhance quality improvement

Introduction

Over the past 10 years, treatment improvements have progressively improved the potential for patients to survive an out-of-hospital cardiac arrest. Hospitals also have sought to improve outcomes for patients who experience an in-hospital cardiac arrest, but have not had the same success. One reason may be because of issues with inadequate data tracking. Evaluating the appropriateness of resuscitation practice requires accurate and complete data collection. Healthcare technology capabilities have greatly improved for general computerized charting for patients but have not translated as easily to data collection and documentation during resuscitation events. While there is emphasis on improving medical and nursing documentation to validate patient care and management, the one area that can have fatal implications is still completed manually: code event documentation with pen and paper. Many, if not the majority, of hospitals continue to use non-computerized methods for event recording, which makes areas of improvement difficult to analyze.

Through accurate and complete documentation of a resuscitation event, including the “gold standard” process-of-care time intervals, facilities can develop strategies to accurately evaluate and analyze resuscitation practice and develop appropriate improvement processes to increase survival to discharge outcomes.

Very few clinicians can tell you what the survival to discharge rates are at their hospitals or where the code documentation is located, which is concerning. Data from the 2002 Resuscitation Databank, which is based on thousands of cases that are reviewed from the NRC, indicates survival to discharge is 17%. However, the survivability and discharge at the Seattle VA is currently 38%. Why the difference? It is because the Seattle VA changed their processes.

In reviewing the Chain of Survival from the American Heart Association (AHA), it is critical to understand how important it is to activate early access, early CPR and particularly compressions, early defibrillation (within 2 minutes to improve outcomes) and early advanced care such as hypothermia to optimize neurological function post arrest (Figure 1).
But yet today, outcomes average 19% – up only 2% from 2002, despite these improvements. What needs to be understood is how data is collected, accurately assessed, and compiled so that it will provide the most accurate information to recognize exemplary practices as well as make practice improvements.

During the 1990s, research demonstrated that inconsistent definitions were preventing meaningful comparisons throughout healthcare systems, prohibiting explorations regarding the most effective interventions and limited quality improvement. Investigators sought to enhance communication within the field of CPR research by having the AHA along with representatives of the International Committee on Resuscitation (ILCOR) evaluate arrest outcomes.
“Utstein Style” was the terminology coined to measures of quality developed during a meeting held at the Utstein Abbey in Norway in 1990. It was used to assist clinical investigators in reporting results of resuscitation studies in humans in a consistent way to prevent miscommunication. It was created because of the lack of standardization and the use of non-uniform terminology in reports of studies of cardiac arrest in humans. From this meeting, the “Gold Standards” were developed to assist medical and nursing professionals with universal terminology regarding cardiac arrest outcomes. Without consistent variables, it is difficult to have comparable data to determine areas of improvement.

**The Gold Standards include:**

- **Early CPR:** Initiate CPR within 1 minute of cardiac arrest recognition.
- **Fraction of Chest Compressions:** Limit the percentage of time not in active chest compressions during the resuscitation event.
- **Time to First Shock:** Deliver the first defibrillation shock within 3 minutes when ventricular fibrillation or pulseless ventricular tachycardia is the presenting rhythm.

### Early CPR

Early CPR initiation is critical for improving coronary perfusion pressure and myocardial blood flow. Early chest compressions improve the potential for a successful arrhythmia conversion and are analogous to priming a pump. Unfortunately, it is difficult to assess when the patient first experiences an arrhythmia; this large variable is difficult to control.

### CPR Fraction

The proportion of time in which chest compressions are performed (known as fraction of compression time) in each minute of cardiopulmonary resuscitation is an important modifiable aspect of quality cardiopulmonary resuscitation. Minimizing pauses during chest compressions is crucial, even during intubation. Wik et al reported during an out-of-hospital study that chest compressions were performed 38% of the time – only 24 seconds in every minute. Clearly, the amount of pauses is too long to effectively convert an arrhythmia to a normal sinus rhythm. Abella et al also reported that in-hospital chest compressions rates were below resuscitation standards. The article reported that good-quality CPR is essential and recommended measurement, monitoring, and implementation of a feedback system to improve the quality of CPR.
CPR fraction is an independent predictor of survival during a resuscitation event. Pausing during chest compressions adversely affects the cerebral and coronary blood flow; an increase in pauses correlates to a decrease in survival rates. Of the three Gold Standards, there is a large room for improvement by decreasing the pause time.

**Defibrillate within 3 Minutes**

The third Gold Standard for hospitals is defibrillation within 3 minutes of arrest. Chan et al published in the New England Journal of Medicine that defibrillation needs to be initiated within 1 minute of cardiac arrest. However, more than 30% of the reported cases are more than 2 minutes. Having the code cart nearby and electrode pads preconnected to the defibrillator are essential to defibrillating in the 1-minute time frame.

The graph in Figure 2 shows data collected by Chan et al and illustrates how important seconds are to survivability. If a patient was defibrillated in more than 2 minutes from onset of cardiac arrest, the changes of survival to discharge are only 22%. However, if the patient was defibrillated in less than 2 minutes of onset, their chances of survival to discharge increase to 39%. But if an institution cannot measure its data and understand how long it typically takes for the first shock to be delivered, it is difficult to put forth the improvements needed to reduce the time to first shock.

*Figure 2*

Survival Outcomes Related to Time to Defibrillation

![Graph showing survival outcomes related to time to defibrillation](image-url)
The same is true for neurological outcomes (Figure 3). Clinicians can save patients, but if they are not functional – if they cannot walk and talk and enjoy their family – what have we, as clinicians, done? We can extend the quantity of survival, but the patient needs quality of survival too.

The longer it takes to deliver the first shock, the less likely the patient will survive (Figure 4). Defibrillation after more than 6 minutes reduces the survivability to a mere 13% survival to discharge.

When minutes count, you want to be there. Institutions need to review the code data to identify areas of improvement. Once these areas of improvement have been identified, the implementation of these improvements can positively affect outcomes. Improvements in mock codes based upon the analysis will also improve the process.
Methods to Improve

How do we improve patient outcomes? What are the areas of focus? The most important step is to determine what to measure. Without knowing what to measure and without a mechanism for data capture and analysis, it is difficult to implement changes for improvement.

There are many contributing factors that can cause inaccuracies when collecting data manually via paper and pencil. One factor is the stress of the code. Another is lack of experience or if the documenter is not ACLS trained. Inaccuracies arise from misspelled words; unfamiliarity of what occurs during a code; and lack of consistent times on watches, the defibrillator, and the wall clock. The code documenter traditionally has been the unsung hero; this role should be elevated in importance and should be a seasoned staff member, familiar with codes, CPR, and the medications typically administered. In addition to the documenter, there should be a designated code team leader. A study by Hayes et al reported that 50% of Canadian residents felt that their training in ACLS provided insufficient training for them to be an effective leader during a code. Creating a team between the experienced code documenter and the code leader (oftentimes, a resident) will ensure that there is ample back-up support.

A study conducted by Wong et al involved 67 nurses and physicians being asked when they believed 5 minutes elapsed during treatment of a patient. The ranges in this study were from 1 minute and 18 seconds to 8 minutes and 37 seconds, demonstrating that clinicians lose track of time during a crisis situation or when they are focused on the patient. The important finding from this study is that without standardized timekeeping, data involving time is not captured appropriately. Therefore it is difficult for Gold Standard intervals to be calculated. Best guesses for data collection involving time are simply not accurate.
There is a need to move resuscitation into the evidence-based realm. Many clinicians do not know their resuscitation trends at their institutions or their survival to discharge rates, or if they have changed. Even more important, these survival to discharge rates, if even known, may not even be shared with key players. You cannot improve what you cannot (or did not) measure.

Don Quixote said that “It is foolish to see the world as it is, instead of how it can be.” By implementing a mechanism of accurate data measurement, an institution can begin to trend the data and measure critical points such as survival to discharge. By measuring these points, new processes can be implemented to improve the survivability.

**Electronic Code Documentation**

By utilizing an electronic code documentation system using a PDA, such as ZOLL CodeNet® used by the VA in Seattle, data accuracy can be improved. Code data collected from the defibrillator can be merged and time-synced with the code data captured with the PDA into one code record on a computer (Figure 5).

**Figure 5**

Code Data from Defibrillator and CodeNet Writer to Computer
Clinicians can review a code, including the ECG transmission to assess the arrhythmia (Figure 6 & 7) and if the appropriate therapy was applied. If there was an incident during the code, by reviewing the code record with everyone involved, the issue can be indentified and corrected moving forward.

**Figure 6**
Details of Defibrillation in Code Record

**Figure 7**
Example ECG from Code Record
CodeNet can capture crucial data points such as when compressions were initiated, how long compressions were in progress, and when compressions were stopped. More importantly, the pauses during CPR are captured (Figure 8).

The combined defibrillator and code log (Figure 9) can yield powerful information and can be scanned directly into a patient’s electronic record. These complete and accurate records are ideal for Risk Management and are available during Joint Commission audits.

The ability to create aggregate reports allows trending of the code data over a period of time.

**Crucial data points include:**
- CPR quality
- Frequency of an event by department
- Time to first compression
- Time to first shock
- Time to first administration of epinephrine
- Survival statistics for both event and discharge
- Survival by event type.

These data points can also be compared department to department.
In early 2010, on a Friday afternoon, the VA in Seattle had a patient who coded in a procedure area in a chair. The code was called, and within seconds, the code team responded. The amount of time pausing during compressions was minimal at 10 seconds or less. The patient was defibrillated 6 times. On the sixth defibrillation, his rhythm returned to normal sinus rhythm. The length of the entire code was 35 minutes. The patient was admitted. On Monday, the patient was in the Critical Care Unit. I walked in his room. He sat up and greeted me, unsure who I was. I informed him that I had helped run his code and that he had an excellent team working on him that saved his life. The patient got out of bed, gave me a hug and said, “Thank you for saving my life.”

Documentation is critical to all aspects of critical care. It allows clinicians to analyze and assess the code data, and allows changes to be implemented. But, most important, it can improve patient outcomes and allow them to return to a healthy and normal life.
REFERENCES


