

# ELIMINATING MISINFORMATION ABOUT DYSRHYTHMIA

Case Study in eLearning

*RN Basics, RN Advanced, Technicians*

**amplifire**  
When Learning Matters



## EXECUTIVE SUMMARY

### PROBLEM

Electrocardiography is the most commonly used diagnostic test in cardiology, yet research shows that nurses do not remember their training in important aspects of dysrhythmia.

### GOALS

1,318 nurses and 180 technicians received an Amplifire course teaching the subject of heart dysrhythmia and EKG readouts. The goals were to standardize training across many hospitals, reduce costs, remove regional variations in practice and procedure, and eliminate confidently held misinformation (CHM).

### TIME SPENT LEARNING

Depending on the region, time spent learning was reduced by 75% to 94%.

### RISK REVEALED AND REMEDIATED

Knowledge variation was high with some nurses showing nearly 40% confidently held misinformation and others with 0% and perfect proficiency.

84,900 data points were generated: 10,801 instances of confidently held misinformation and 10,945 instances of uncertainty were found and corrected.

### PROOF OF LEARNING

Refreshers given about four months after initial learning showed retention of the newly learned material. Nurses were 62% closer to perfect mastery and techs were 88% closer.

## BACKGROUND

Dysrhythmia impacts millions of people in the US. Atrial fibrillation affects about 2% to 3% of the population. AFib and atrial flutter resulted in 112,000 deaths in 2013, up from 29,000 in 1990. The CDC estimates that 12.1 million people in the United States will have AFib in 2030.<sup>1</sup>

Electrocardiogram (abbreviated as EKG or ECG) graphically represents the electrical activity of the heart. Invented by Willem Einthoven in 1902, an EKG is a vital part of the evaluation of any patient suspected of having dysrhythmia.

EKG monitoring is one of the most common technologies used in acute care. Nurses, in particular, bear significant responsibility for the care of patients receiving monitoring.

Nurses and technicians always receive training in the interpretation of an EKG and the actions that should follow, but research at the Cleveland Clinic shows that knowledge vital to patient well-being is forgotten over time.<sup>2</sup>



Dysrhythmias are often categorized into four groups: extra beats, supraventricular tachycardias, ventricular arrhythmias and bradyarrhythmias. A number of tests can help with diagnosis, especially an electrocardiogram (EKG). In certain cases, the EKG can indicate a Code Blue event that calls for immediate attention and treatment.

1. [What is atrial fibrillation?](#)

2. [Research Delves into Nurses' Retention of ECG Interpretation Knowledge](#)

# AMPLIFIRE

## How It Works

Amplifire first classifies a clinician's knowledge in three categories:

**Confidently Held Misinformation:** When a learner is sure they are right, but they are actually wrong.

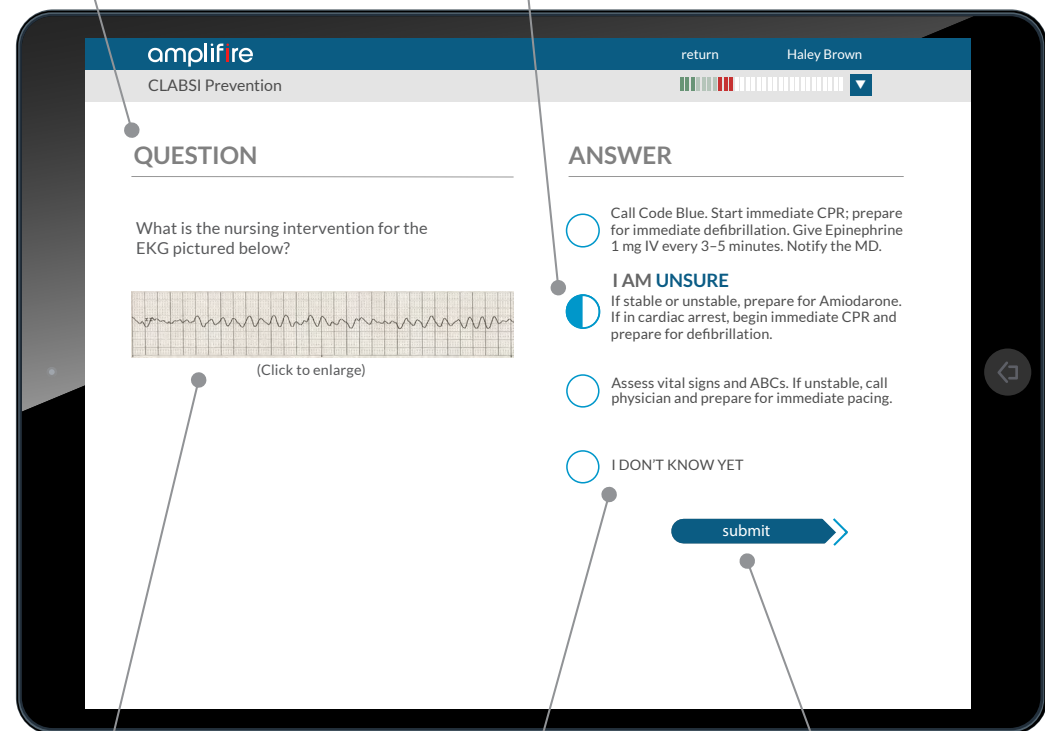
**Uncertainty:** When a learner is unsure.

**Proficiency:** When a learner is both confident and correct.

Once knowledge is categorized this way, the platform uses triggers from cognitive science that activate learning. It automatically customizes the course in real time for each learner, leading them to rapid proficiency across the topic.

Asking questions is a trigger that causes *retrieval, curiosity, and attention*—all drivers of lasting memory.

Asking about confidence in one's knowledge causes *metacognition* (thinking about one's thinking), which drives long-term memory.



Images and interactives *simulate* real-life. Here, the learner can explore an EKG that suggests a critically dangerous moment.

Learners can be honest about their knowledge, helping create the emotional state of *alert*, which is optimal for learning.

Feedback will be delayed by a few minutes. This *spacing* boosts the durability of the learning.

## INSTRUCTIONAL DESIGN

### 1,318 nurses at UCHealth

1,318 nurses and an additional 180 technicians received an Amplifire course covering the topic of heart dysrhythmia and EKG readouts.

The course was first created in Amplifire by experts at Texas Health Resources. It has been used extensively there for onboarding nurses before being made available to Amplifire customers.

In *Module 1: EKG Measurements*, nurses were instructed that by the end of the module that first, they would have more confident knowledge of the waves, segments, and intervals of the cardiac cycle captured on EKG rhythm strips. Second, that their knowledge would be enhanced on rate calculation, heart anatomy, and the purpose of the cardiac conduction system. Lastly, that they would understand the various EKG waveform components, including:

- QRS complex
- ST segment
- P wave
- PR Interval
- T wave
- QT interval

*Module two: Rhythm Identification* was designed to give nurses confident knowledge in identifying various EKG rhythms, including:

- Sinus rhythms
- Atrial fibrillation
- Ventricular rhythms
- Junctional rhythms
- Tachycardias/bradycardias
- AV blocks
- Ventricular fibrillation

*Module three: Nursing Interventions* gave nurses more ability to determine appropriate basic life support interventions based on EKG rhythm strip identification. Nurses were shown a strip, and asked to choose which action was most appropriate.

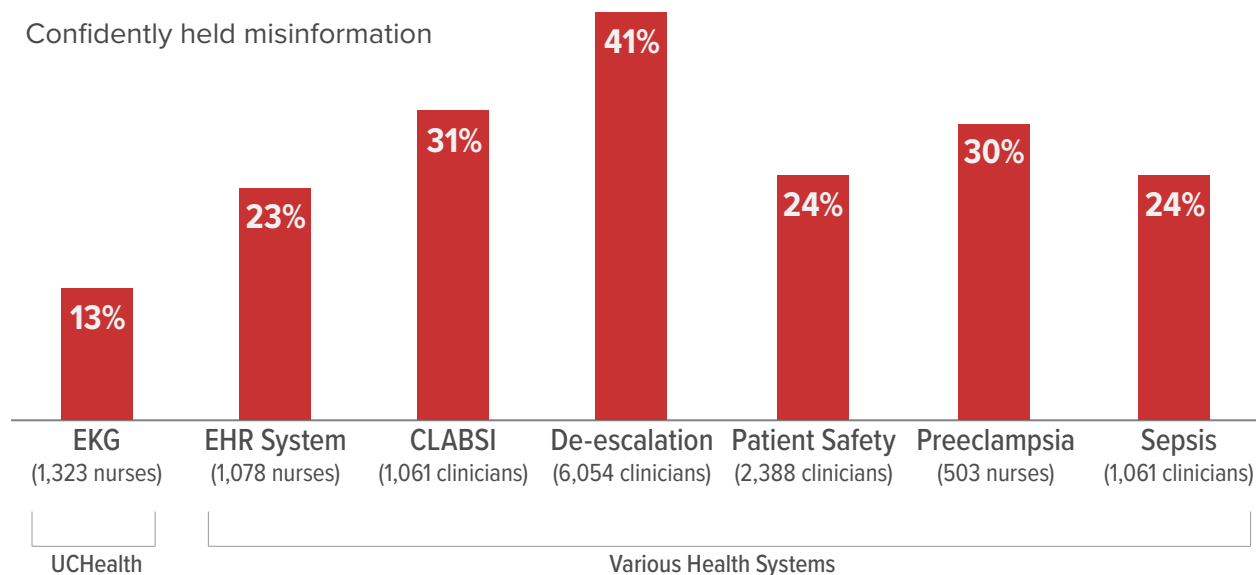
## MISINFORMATION COMPARED TO OTHER HOSPITALS

UCHealth's nurses were generally knowledgeable. They demonstrated that only 13% of their knowledge was confidently held misinformation (CHM).

Below is a graph showing the average amount of CHM at various healthcare systems in six other knowledge areas: electronic health records, CLABSI, de-escalation techniques, patient safety, preeclampsia, and sepsis.

UCHealth's 13% misinformation is uncommonly low and means that the great majority of nurses were proficient, even before Amplifire.

The following page, however, shows that variation *among* nurses was high. This is typical as there are always clinicians who display far more expertise in their craft than others.



## KNOWLEDGE VARIATION

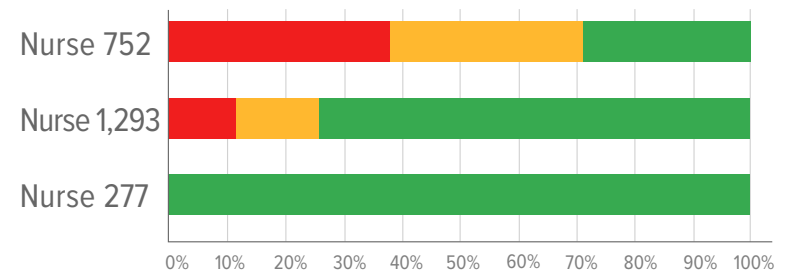
(prior to learning)

Amplifire's reporting dashboard shows the baseline knowledge of each nurse and technician as they begin Amplifire. Knowledge can be sorted by confidently held misinformation, uncertainty, and proficiency.

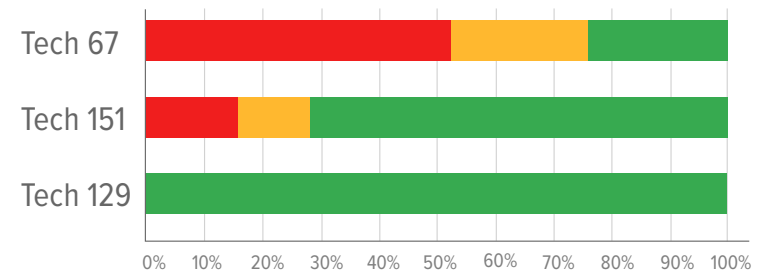
While average knowledge for nurses was solid (previous page), knowledge variation among nurses was high as seen by comparing three nurses and three techs in these graphs at right.

By the end of the initial Amplifire training, variation was eliminated and all nurses and techs were proficient (both confident and correct) on all the material.

RN Nurse: Basic Dysrhythmia



Tech: Dysrhythmia



■ Confidently Held Misinformation
 ■ Uncertainty
 ■ Proficiency

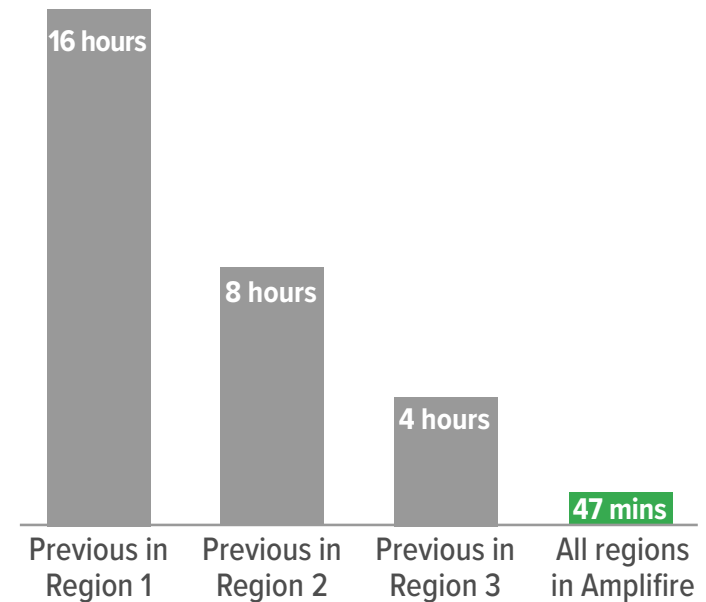
## TIME IN TRAINING AND RETURN ON INVESTMENT

Nurses invariably come to training with a wide range of experience. Amplifire detects and adapts to each individual's existing knowledge. This prevents inexperienced learners from slowing down more proficient nurses resulting in faster training yet better learning and memory formation.

Before Amplifire, as seen to the right, training time for nurses varied by region from 16 to 4 hours. With Amplifire, that fell to an average of 35 minutes. Four months later, refreshers added another 12 minutes.

For each nurse, Amplifire was combined with a 2-hour virtual training in Teams adding up to a total training time of 2 hours and 47 minutes.

- Savings after cost of training: \$363,000
- Return on investment: 4181%





## STRUGGLE

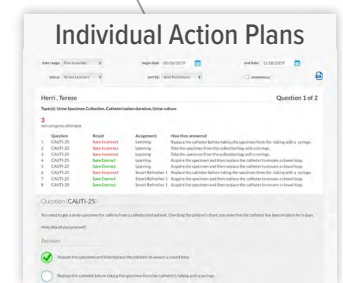
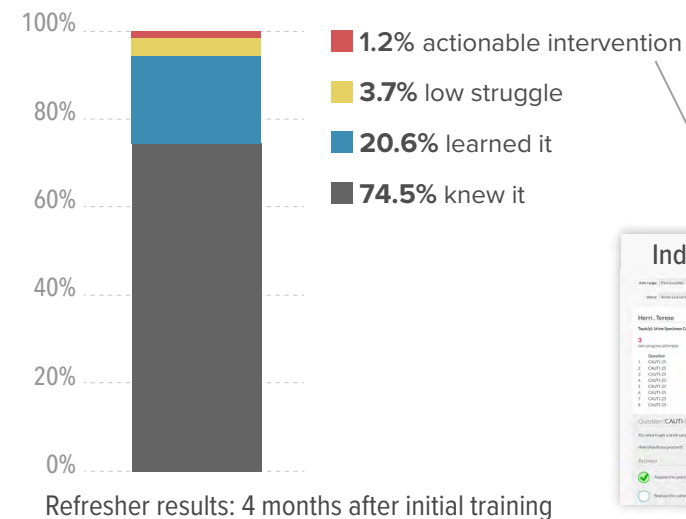
■ **Struggle:** On 1.2% of the material clinicians struggled to master a topic on the refresher. Despite being presented with the needed information, proficiency failed to emerge. While many human traits like height or weight follow a normal distribution curve, some phenomenon follow a Pareto distribution in which a small percentage of people account for a disproportionate share of error.

**Individual Action Plans:** Amplifire's reporting dashboard generated individual action plans for nurses with high struggle. Administrators and educators can use these plans for individual at-the-elbow consultations or group webinars that focus on common misconceptions.

■ **Low struggle:** Nurses exhibited low struggle initially but then quickly remembered the concepts on 3.7% of the material.

■ **Learned it:** Learning was rapid on 20.6% of the material

■ **Knew it:** 74.5% of the material was already known from prior training, on-the-job experience, or initial learning in Amplifire.



## RISK BY TOPIC

To help make specific risks visible across an organization, the Amplifire dashboard can rank topics by confidently held misinformation. CHM is a sign of imminent error because confidence is the precursor to behavior. When someone is confident, they act.

Clinical behavior that results in a near miss can be thought of as a *lagging indicator of risk* as the mistake has already occurred. On the other hand, confidently held misinformation can be thought of as a *leading indicator of risk* because the mistake can be seen coming, but is yet to occur.

Notice in this course that some topics like cardiac function and ST segment hold substantial misinformation risk while others like heart rate pattern and sinus rhythm display none.

■ Confidently Held Misinformation
 ■ Uncertainty
 ■ Proficiency

### Topics

Name	Average Knowledge
Cardiac Function	
QRS Duration	
100% AV Paced	
ST segment	
Conduction System	
Junctional Rhythm	
Sinus Tachycardia	
Rhythm Identification	
EKG Boxes	
Sinus Tachycardia	
Interpreting EKG	
2nd Degree AVB Type I	
Atrial Flutter	
Ventricular Fibrillation	
Pattern Labeling	
Asystole	
Heart rate pattern	
Sinus Rhythm	

## TRAINING RESULT

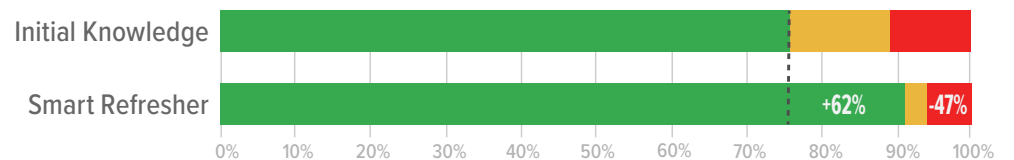
### Increases in consistent knowledge across the healthcare system

Nurses took a refresher two months after their initial training in Amplifire. Refreshers represent an opportunity to measure how well the material was remembered. Did the new learning stick?

The refresher data showed strong evidence that learning had occurred and was remembered across the entire organization with both nurses and technicians. Knowledge gaps, misinformation, and uncertainty had been greatly reduced. In all cases, people were more than 50% closer to perfect mastery on the topic of dysrhythmia.

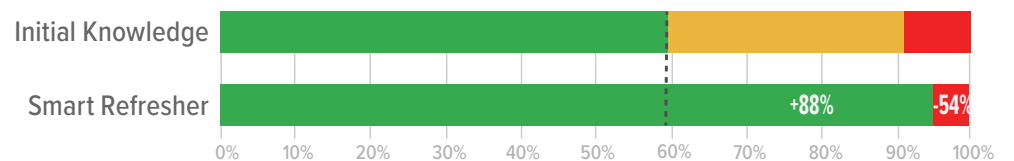
#### RN Basic Dysrhythmia:

62% closer to perfect mastery | 47% less misinformation



#### Tech Dysrhythmia:

88% closer to perfect mastery | 54% less misinformation



## ABOUT AMPLIFIRE

Empirical data shows that caregivers in every healthcare organization possess knowledge gaps, doubts, and medical misconceptions. The Amplifire learning platform tackles these issues using discoveries from cognitive science and algorithms that adapt evidence-based content to the needs of each individual caregiver.

Healthcare organizations embrace Amplifire as a change management tool that transforms training from a rote activity, where administrators can only hope for results, into a strategic activity that delivers measurably better outcomes. Popular course libraries include:

- Clinical Safety and Quality
- Compliance
- EHR
- Obstetrics
- Opioids
- Pediatrics
- Revenue Cycle Management
- Safe Surgery

With more than three billion learner interactions, Amplifire continues to harness scientific research, advanced analytic techniques, and artificial intelligence. Learners experience a faster, more engaging path to proficiency so they can attain their highest potential.



*“ Amplifire is a tool that more accurately, completely, and rapidly loads complex clinical knowledge into expert minds. It gives us not only the ability to transmit knowledge, but the ability to measure how well we transmitted it and how well it stuck. ”*

— Brent James, MD

Clinical Professor at the Clinical Excellence Research Center at Stanford University

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## Comments from Executives (need new)

“ This is a great way to reinforce learning. For learners who struggle with a topic, Amplifire automatically makes the learner study that topic.  
– Senior Director, Learning Operations

I appreciate the platform’s use and adherence to evidence-based principles grounded in learning science. There are few techniques better at supporting the development of declarative knowledge than test-based learning and spaced retrieval.

– Senior Director

When a learner struggles with a topic, this product, Amplifire, makes them learn it. ”

– Medical Director