

A person is shown from the chest up, wearing a dark grey t-shirt. They are holding their left hand over their right chest area. A bright red, glowing light emanates from the chest, suggesting pain or a medical condition. The background is dark and out of focus.

AORTIC DISSECTION

A Can't Miss Diagnosis

Case Study in learning: 452 physicians

amplifire
When Learning Matters

EXECUTIVE SUMMARY

PROBLEM

Aortic dissection is survivable, but it requires rapid expert diagnosis and treatment. A timely, accurate diagnosis of aortic dissection can be the difference between life and death, but it is commonly missed.

THE GOAL

452 physicians completed an “Aortic Dissection” course from Amplifire’s *Can’t Miss Diagnosis* series. This course examines risk factors for aortic dissection and encourages physicians to remain diligent when diagnosing patients to ensure that cases are quickly recognized and treated, improving patient outcomes.

TIME SPENT LEARNING

On average, physicians achieved mastery in only 11 minutes.

RISK REVEALED AND REMEDIATED

Amplifire’s platform revealed that nearly 50% of physicians were either confidently misinformed or uncertain about the critical difference between medical and surgical aortic dissections. Overall, 1,241 instances of confidently held misinformation and 3,035 instances of uncertainty were found and corrected.

LEARNING

Learning is only complete when learners demonstrate 100% mastery. Of the 452 physicians, they confidently knew about 55% of the material. They mastered 37% of the material they needed to learn with ease. And they struggled to learn on 8% of the material.

BACKGROUND

Affecting about 10 in 100,000 Americans, acute aortic dissection is the most common aortic catastrophe.¹ The condition is lethal if not quickly and aggressively treated. Sadly, as aortic dissection is still relatively uncommon in the scheme of cardiovascular emergencies, it often goes undiagnosed. In fact, physicians only correctly suspect the condition 15% to 43% of the time and the misdiagnosis rate holds steady at 35%.²

Aortic dissection is survivable, but it requires rapid expert diagnosis. In the case of aortic dissection, mortality rates drastically increase the longer this condition remains untreated, from 40% on presentation, plus 1–2% per hour.³ Moreover, different treatment and management plans are required for both Type A and Type B aortic dissections. Awareness, time and accuracy are of the essence.

The in-hospital mortality rate from aortic dissection hasn't declined in decades.⁴ There is room to improve patient outcomes. In the critical decision-making moments, emphasized training in aortic dissection awareness and diagnostic practices could be the difference between life and death.

[1\) Aortic Dissection and Aortic Aneurysm Surgery](#)

[2\) Why the Delay? Identification of Factors Which Delay Diagnosis of Acute Aortic Dissection](#)

[3\) Insights From the International Registry of Acute Aortic Dissection](#)

[4\) Medical Ignorance Contributes to Toll From Aortic Illness](#)



Life-or-Death Diagnosis

In a 27-year study of a population of 106,500, 84 patients were diagnosed with aortic dissection — 21% of patients died before hospital admission, 22.7% within 6 hours if left untreated, 50% within 24 hours, and a total of 68% within the first week.⁵ Aortic dissection was the initial clinical impression in only 13 of the 84 patients (15%). But, when it is caught and treated, the survival rate can be as high as 88% after three years.⁶

[5\) Epidemiology and Clinicopathology of Aortic Dissection](#)

[6\) In-hospital Mortality and Three-year Survival After Repaired Acute Type A Aortic Dissection](#)

INSTRUCTIONAL DESIGN

452 physicians at a large east coast system

452 physicians received an Amplifire course covering the topic of aortic dissection, including awareness, risk factors, diagnosis, and treatment.

The course was developed by Dr. Per Danielsson at Swedish Medical center in Seattle, WA. It is part of the *Can't Miss Diagnosis* series, which focuses on diseases that are relatively rare, difficult to diagnose, and catastrophic when diagnosis and treatment are delayed. The key to good outcomes for these diseases is to be prepared in advance to recognize and treat them, and to address individual cases with a high index of suspicion for disorders that are infrequently seen.

The “Aortic Dissection” course is comprised of 15 questions that when mastered, equip physicians with increased awareness for the condition, as well as expert knowledge of diagnostic practices and treatment plans. Upon completion of the course, learners are able to summarize risk factors for aortic dissection, classify the different types of aortic dissection and their respective treatments, explain the physiology, and order appropriate imaging tests.

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.

The screenshot shows the Amplifire app interface on a tablet. At the top, the 'amplifire' logo is on the left, and 'return' and 'Haley Brown' are on the right. Below the header, the title 'Aortic Dissection: A Can't Miss Diagnosis' is displayed. The main content is divided into two columns: 'QUESTION' on the left and 'ANSWER' on the right. The question text reads: 'Your patient presents with nonsevere pain in his chest. He has a family history of aortic dissection (father), which is enough to give you a high index of suspicion for AD in your patient. What should you order next?'. Below the text is an image of a doctor examining a patient's chest with a stethoscope. The answer column contains four radio button options: 'EKG to exclude ST-elevation myocardial infarction (STEMI)', 'I AM UNSURE' (which is selected), 'Aortic imaging (CT angiography or transesophageal echo) and surgical consult', 'Tests to pinpoint or eliminate other potential diagnoses', and 'I DON'T KNOW YET'. At the bottom right of the answer column is a blue 'submit' button with a right-pointing arrow. A back arrow is visible on the far right edge of the screen.

Images and interactives *simulate* real-life. Here, the learner can imagine that they are with the patient as described.

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.

MISINFORMATION COMPARED TO OTHER HOSPITALS

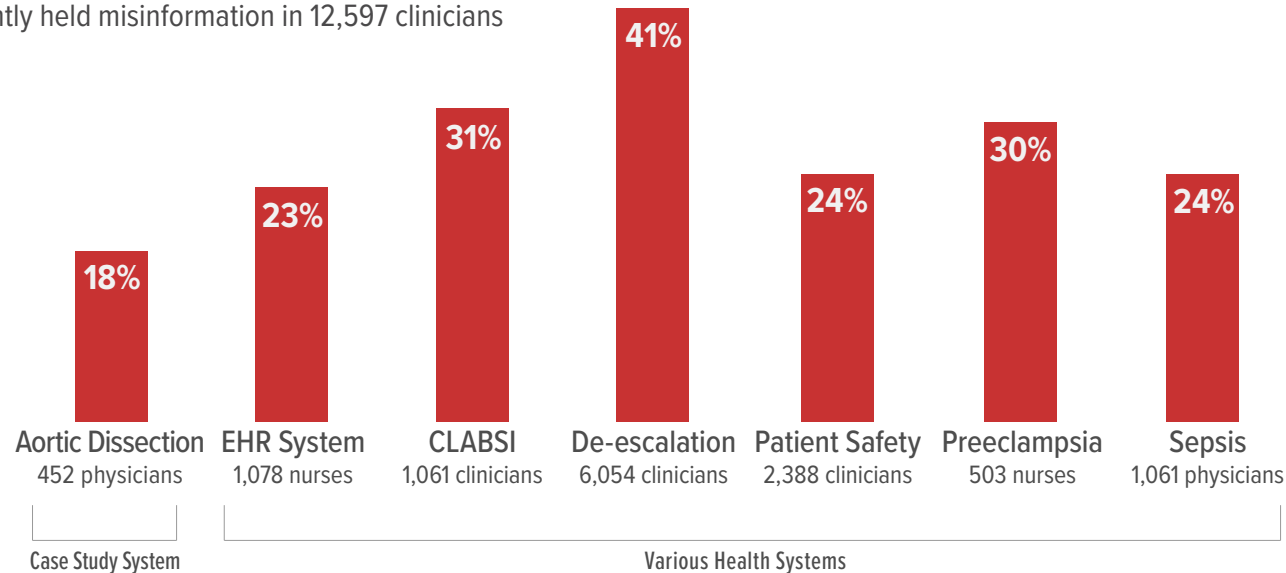
This healthcare system's physicians were generally knowledgeable. They demonstrated that 18% of their knowledge was confidently held misinformation (CHM).

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.

Historically, 18% misinformation is uncommonly low and means that the great majority of physicians were proficient, even before Amplifire.

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

Confidently held misinformation in 12,597 clinicians



KNOWLEDGE VARIATION

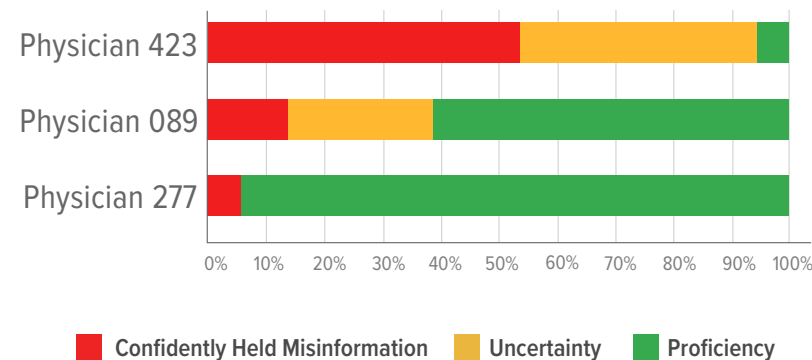
(prior to learning)

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

While average knowledge for physicians was solid (previous page), knowledge variation among them was high as seen by comparing three physicians in the graphs at right.

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

Aortic Dissection



STRUGGLE

(during learning)

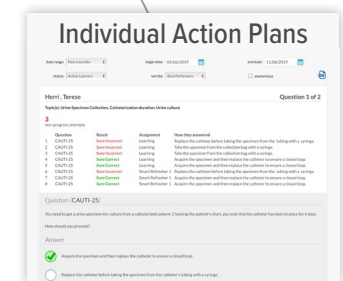
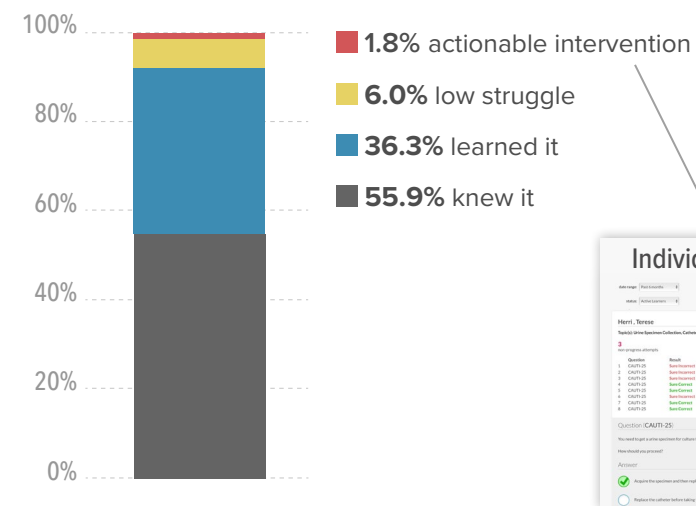
■ **Struggle:** Clinicians struggled to master a topic on 1.8% of the material and, despite being presented with the needed information, proficiency failed to emerge. That's a small percentage, but while many human traits like height or weight follow a normal distribution curve, some phenomenon follow 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 physicians 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:** Physicians exhibited low struggle initially but then quickly remembered the concepts on 6.0% of the material.

■ **Learned it:** Learning was rapid on 36.3% of the material.

■ **Knew it:** 55.9% of the material was already known from prior training and on-the-job experience.



RISK COMPARISON 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.

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.

One finding that stood out for this healthcare system was that almost fifty percent of the clinicians had CHM or uncertainty about the difference between a medical or surgical aortic dissection.

Topics

Name	# of Learners	Average Knowledge
Risk factors	452	
Screening	452	
Incidence-Relevance	452	

Confidently Held Misinformation Uncertainty Proficiency

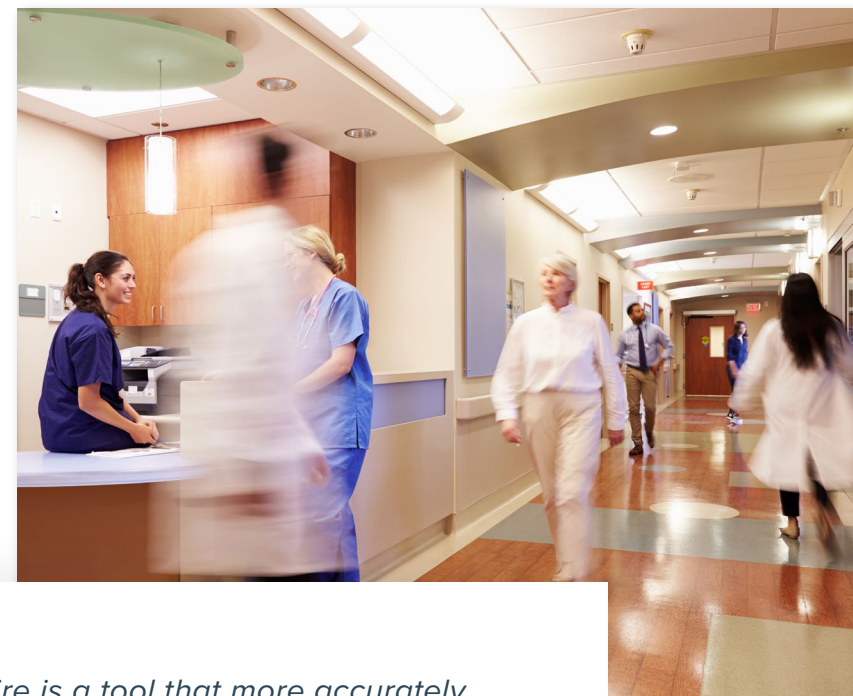
ABOUT AMPLIFIRE

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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