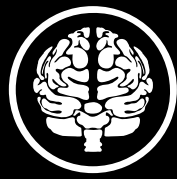


area9
LYCEUM



Advancing Value- Based Health Care In a Pandemic

Rapid Response Training Critical for
Improving Care and Safety

- ADAPTIVE LEARNING IN FOUR DIMENSIONS



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Area9 Mission in Health Care:

“TO HELP DELIVER THE WORLD’S BEST EDUCATIONAL OUTCOMES FOR HEALTH CARE PROFESSIONALS IN SUPPORT OF ACHIEVING BETTER HEALTH CARE OUTCOMES, VALIDATED BY A LONG-TERM, SCIENTIFIC APPROACH.”

Introduction

Global health care has been in a period of transformation, with an increased focus on an outcomes-based approach that measures the value of health care delivered. While the goals of value-based health care (VBHC) remain paramount, other priorities have emerged amid a pandemic: the need for rapid-response training for physicians, nurses, and other clinicians who are the first responders in a global health crisis.

Preparation and continuing education for clinicians is part of an ongoing evolution in health care in pursuit of quality, efficiency, and effectiveness. The Triple Aim seeks to elevate the experience of care, improve population health, and reduce the per capita cost of care (Berwick, Nolan & Whittington, 2008); the Quadruple Aim takes the Triple Aim a step further by reducing burnout and improving satisfaction among caregivers (Bodenheimer and Sinsky, 2014). In support of these aims, there is high demand for efficient and effective training for doctors, nurses, and other clinicians to help ensure they know how best to contribute directly to improved patient outcomes and reduced health care costs—even in the face of unprecedented health care challenges such as COVID-19.



“WHILE THE IMPORTANCE OF QUALITY MEDICAL EDUCATION HAS ALWAYS BEEN RECOGNIZED, THE CONTENT OF THAT EDUCATION AND THE NEED TO KEEP IT FRESH AND RELEVANT HAVE NOT BEEN SUFFICIENTLY ADDRESSED.”

At Area9, we are dedicated to the mission of delivering advanced adaptive learning, from medical school training to continuing education for practicing physicians, nurses, and other clinicians. Over the past two decades, we have developed and refined computer-based adaptive learning models, using a biological approach that combines the latest in brain science with cutting-edge computer technology. Instead of assuming or predicting where learners will struggle or where they will need reinforcement, which is the approach of the more traditional “inference models,” biological platforms mirror how learning actually occurs. The biological approach has proven to be highly effective in training health care students and in preparing them for board certification (Healy et al, 2018), as well as in delivering meaningful continuing education and maintenance of certification (MOC) education for practicing physicians, nurses, and other clinicians.

In this paper, we will discuss the importance of continuing education to equip medical professionals with knowledge and skills to improve patient health across the breadth of populations and a spectrum of diseases (Stevenson & Moore, 2018). The rapid emergence of COVID-19 as a pandemic, affecting millions around the globe, further highlights this need.

We believe the objectives of continuing education and MOC are best pursued with the personalized approach of adaptive learning, particularly to identify and close knowledge gaps that are common among even well-trained practicing physicians and other clinicians. In addition, as will be further discussed, adaptive learning can help address nursing shortages and the need to improve nurse training. This is a global problem, particularly in the United States where there is a projected shortfall of nurses to meet the rising demand for these professionals. With its greater emphasis on learning outcomes and data collection, rather than merely documenting attendance of a course or training (Moore, Green & Gallis, 2009), adaptive learning improves preparation and supports lifelong learning across the medical community.



As the medical community seeks to improve the preparation, training, and maintenance of medical professionals (AMA, 2017), Area9 remains committed to creating content and advanced adaptive learning platforms, while also becoming a leading voice in furthering discussions about VBHC, as well as the need for rapid-response training for urgent health care issues.

Training in a Time of COVID-19

The outbreak of the coronavirus that causes COVID-19 has sent shockwaves around the globe in terms of how people live, work, travel, and learn. Amid such disruption, there is a great need to learn about this disease in order to care for patients and protect the safety of frontline care providers.

In early 2020, as the novel coronavirus spread quickly in Italy, overwhelming hospitals and increasing the death rate among the largely older Italian population, Dr. Giuseppe Lippi, Clinical Professor of Biochemistry at the University of Verona, was in quarantine. As he observed what was happening in hospitals around him, Lippi was struck by the need to educate medical professionals. “Our knowledge at the time of emergence of this pathology was zero. COVID-19 was something we had never seen—or, more appropriately, that we had largely underestimated,” stated Lippi, who is also secretary of the European Federation of Clinical Chemistry and Laboratory Medicine.

Propelled into action to provide expert information about COVID-19, Lippi approached Area9 to help launch a free online training module. The course was completed in only 72 hours. Within days, the [COVID-19 learning module](#) was approved to be released using the AACC Learning Lab on the NEJM Knowledge+ platform. The module addresses how COVID-19 is transmitted, symptoms and differences in severity, complications, diagnosis, and prevention. As of June 2020, about 80,000 clinicians have been certified; in addition, more than 10,000 non-clinical professionals also completed the training. Two-thirds of the participants are from India, the Philippines, and elsewhere in Southeast Asia, which demonstrates the global appetite for such information. “The medical community in general and lab medicine professionals in particular are desperate for guidance,” said Nader Rifai, Ph.D., Professor of Pathology at Harvard Medical School and Director of Clinical Chemistry at Boston Children’s Hospital.



Similarly, the ongoing need for rapid response training led the American Heart Association to quickly create and launch an online course in cardiac care for COVID-19 patients. It was a six-day process for development and four days for regulatory approval. Such training is essential, given the impact of COVID-19 on people with heart disease and stroke patients, as well as the cardiac issues that can arise among those who contract the virus.

“THE MEDICAL COMMUNITY IN GENERAL AND LAB MEDICINE PROFESSIONALS IN PARTICULAR ARE DESPERATE FOR GUIDANCE.”

Overall, COVID-19 education and training point to the need for highly curated information from the foremost experts to improve patient outcomes and promote the safety of care providers. These are critical outcomes amid a pandemic that has repeatedly threatened not only public health but also the ability of health systems to care for waves of severely ill patients.

Value-Based Health Care: Pursuing Superior Outcomes

Even a pandemic, and the urgency of devoting often-scarce resources to combat it, cannot derail the longer term, overarching goals of VBHC. For years, stakeholders across the medical industry have come together to support and expand VBHC. Several leading voices have emerged, urging the establishment of metrics to capture the patient health outcomes achieved per dollars spent; among them are Professor Michael Porter of Harvard Business School and Donald Berwick, MD, President Emeritus and Senior Fellow of the Institute for Healthcare Improvement. Their research has contributed to a VBHC delivery framework to restructure health care systems worldwide (Berwick & Nolan, 2008; Institute for Strategy & Competitiveness, 2018; Porter & Teisberg, 2006). In addition, the International Consortium for Health Outcomes Measurement (ICHOM) advocates restructuring care delivery around outcomes. To promote superior outcomes, ICHOM supports the use of health outcomes data to improve competition and results achieved, while addressing quality and inefficiencies (Porter & Teisberg, 2006).



Now, the next step in implementing and executing a VBHC approach is to improve the education of policymakers, managers, medical professionals, and patients. A vital component, as stated earlier, is improving the training and education of physicians, nurses, and other health care professionals (Maurer & Ryan, 2016; Moriates et al, 2014; Johansson et al, 2016). However, the nature of the health care environment poses a challenge. Rapid advances in biomedical science have not only significantly expanded the medical profession's understanding of health and disease and the development of new tools, but have also resulted in specialization, fragmentation, and complexity. While integrated care is viewed as an important strategy for reforming health systems, the complexity and multiple unknowns within health care can undermine successful application and evaluation of integrated care (Kodner, 2009; Valentijn et al, 2013).

As the VBHC concept is adopted, more models and solutions are emerging. Medtronic, the world's largest medical device manufacturer, for example, has devised what it calls risk-sharing models in which the company and its customers are accountable for system costs and patient outcomes. Medtronic is increasingly entering into supply agreements with customers with pricing adjusted based on how well its products work in patients, rather than affixing a per-unit cost regardless of the device's performance in individual patients (Loftus, 2018). Similarly, Novartis CEO Vasant Narasimhan has called for development of drugs that are targeted to patients who stand to realize optimal benefits, which could improve public health outcomes and potentially reduce overall costs of care (Narasimhan, 2018). As these examples show, VBHC is so important, it has become an integral part of health care delivery business models.

Education as a Pillar in Building Better Outcomes Models

Medical education is an important pillar in building better outcomes models to create and capture more value in the health care system. While the importance of quality medical education has always been recognized, the content of that education and the need to keep it fresh and relevant have not been sufficiently addressed.



An example of expanding health care education and skill development is the American Medical Association's (AMA) "Accelerating Change in Medical Education" program launched in 2013 with grants made to 11 medical schools across the U.S. and a consortium to facilitate sharing and dissemination of new and impactful ideas and projects. Now the AMA consortium is expanding to include graduate and continuing medical education programs to promote lifelong physician learning, with discussions involving a variety of high-profile national stakeholders in medical education (AMA, 2017).

Another major initiative to support medical education began in February 2013, when NEJM Group (a division of The Massachusetts Medical Society, publisher of the New England Journal of Medicine) and Area9 partnered to launch NEJM Knowledge+, which has been recognized as a highly efficient, effective way for clinicians to prepare for board exams, earn CME and MOC, and engage in lifelong learning. NEJM Knowledge+ is a first-of-its-kind platform with the most extensive smart technology that adapts to clinicians' learning goals, pace of learning, and knowledge gaps to deliver the information they need to know. In a recent survey study by Healy et al (2018), the majority of respondents rated this adaptive learning platform as helpful and the content as good for exam preparation and relevant to their learning needs. The study also found that, among NEJM Knowledge+ users in the 2014-2016 time period, a significantly higher proportion reported passing the American Board of Internal Medicine Certifying Examination (ABIM-CE) on their first attempt, compared to the national average (95% versus 89%, $z=2.6397$, $p=0.0083$) (Healy et al, 2018).

Another aspect of the ongoing transformation in health care, and the need for education to support it, involves an array of new competencies being demanded, including business acumen, data analytics skills, and broader interpersonal relationship skills such as better communication and leadership capabilities (Greenspun et al, 2016). In addition, multiple chronic conditions and other comorbidities, as well as behavioral health issues such as depression, demand a broader skill set (Plogh, 2013). Physicians must be equipped with the appropriate skills and knowledge to diagnose and treat multiple conditions; this speaks not only to being better trained, but also to continuously upgrading their knowledge and skills through lifelong learning.



There are four factors that undermine the ability of hospitals, health systems, and individual practitioners to take a value-based approach:

- Discrepancies between medical specialists and the needs of the health care field: More specialists are needed in areas of greatest demand (Plochg, 2013; Plochgh, Klazinga & Starfield, 2009); examples include the lack of renal health care and cardiology professionals (Kaduszkiewicz, 2018).
- Quality problems in health care delivery: The need to improve quality in health care delivery has been a focus for more than a decade (Berwick & Hackbarth, 2012), with some headway, but challenges remain.
- Need for greater teamwork and cooperation among doctors, nurses, and other health care providers: Health care delivery is vastly improved through teamwork and cooperation among all medical staff to address existing comorbidities and the complexity of specialized care. Delivering quality patient care requires parallel health care professional development and a greater ability to address patients' need by assembling a team of health care professionals (Valentijn et al, 2013; Baker et al, 2007; and Barach P, Cossman, 2017).
- A shortage of doctors and nurses: A need for more doctors and nurses in the United States is a continuing trend that poses a real risk to patient care in the future. An estimated shortage of between 40,800 and 104,900 doctors is projected by 2030 (AAMC, 2017) and around one million nursing positions will need to be filled by 2024, highlighting the need for more personnel (Mincer, October 2017). Similarly, Germany is facing a shortage of doctors, which has led hospitals to recruit more physicians from abroad. This calls for more support within the German health care system to ensure quality of care, physician wellbeing, and retention of health care personnel (Klingler and Marckmann, 2016; Berger, 2018; Jacobs et al, 2018).

To help address the nursing shortage in Denmark—with implications elsewhere in the world—Area9 and its partner, Thieme Medical Publishers, a global supplier of high-quality content and information for medical professionals, are helping to launch NURSEED. This four-year program, started in March 2020, is implementing 21st century nursing education with the goal of improving skills and knowledge retention.



It is being funded by a €2 million grant from the Danish Innovation Fund. In addition to Area9 and the Thieme partnership, other NURSEED partners include Absalon University College, Danish Technical University, and several Danish municipalities. By tailoring instruction and content delivery to each student's needs, NURSEED's goal is to improve overall competency among nursing graduates entering the field. In particular, more support can be offered to low-performing students to build their skills and reduce drop-out rates. The first major objective will be to integrate the Area9 Rhapsode™ adaptive learning platform into the UCA nursing education, using Thieme content for core science subjects. In the next phase, nursing curriculum will be revamped with a blended learning approach: combining personalized computer-based adaptive learning to improve each student's knowledge and skills, followed by in-classroom teaching and skills workshops.

Addressing each of these factors makes it more important than ever to bring efficiency and efficacy to the lifelong learning journey of physicians as medical students, residents, and specialists.

Medical Errors: Learning Gaps a Culprit

Another major concern within the medical community is medical errors. In the U.S., medical errors are the third-leading cause of death (Makary et al, 2016). In an open letter to the Centers for Disease Control, Makary et al define the causes of death due to medical error as: errors in judgment, skills, or coordination of care; diagnostic errors; system defects resulting in death or failure to rescue the patient; and preventable adverse events (May 2016).

In November 1999, "To Err Is Human," the groundbreaking report on medical errors, was released with a shocking admission: "Health care in the United States is not as safe as it should be—and can be. At least 44,000 people, and perhaps as many as 98,000 people, die in hospitals each year as a result of medical errors that could have been prevented, according to estimates from two major studies. Even using the lower estimate, preventable medical errors in hospitals exceed attributable deaths to such feared threats as motor-vehicle wrecks, breast cancer, and AIDS" (Institute of Medicine, 1999, p.1). Medical errors result in costs (including additional care necessitated by the errors) that have been estimated at between \$17 billion and \$29 billion per year.



At the time “To Err Is Human” was released, the founders behind Area9 were in the early stages of what has become two decades of work in adaptive learning. As we launched into our medical education work, this report demonstrated to us the importance of using medical simulators for training doctors to improve patient safety. (At the time, there were about 100 simulation centers; today, there are tens of thousands.) The American Academy of Medical Colleges (AAMC) has called the use of simulators—which replicate health issues and patient experience using lifelike mannequins, physical models, standardized patients, or computers—“the most prominent innovation in medication education” in recent years (2011, p. 4). As we have seen, simulators, combined with other medical education models, can be used to identify and address knowledge and practice gaps that can exist even among skilled physicians. For example, when medical situations were recreated using simulators, doctors were shocked to discover that, when under pressure in critical situations, they often lacked the knowledge of what to do. These findings are not meant to criticize clinicians who had practiced competently for years; rather, the results shed light on how most medical education occurs. It starts with the time-starved medical student who is forced to cram for exams and, as a consequence, does not retain knowledge that’s infrequently used.

Moreover, as the AMA observed in its 2017 report, “Creating a Community of Innovation,” the prior focus of medical education has been to “create fully loaded, pluripotent, naïve physicians”; now, the focus is on “creating physicians who are self-directed, critically thinking, expert workplace learners...[who] learn how to know what they don’t know and appropriately use just-in-time knowledge resources and decision support systems to address identified gaps” (AMA, 2017, p. 20). This shift can be accomplished through best practices in adaptive learning to deliver CME and MOC, by identifying learning gaps and making learners more aware of what they don’t know and/or are less sure of. One way this is accomplished is by asking learners to self-assess how sure they are of an answer, which continually develops self-assessment skills. To improve attitudes toward medical errors and adverse events, research also supports the need for implementing a patient safety curriculum that promotes learning regarding adverse events (Vohra et al, 2007).



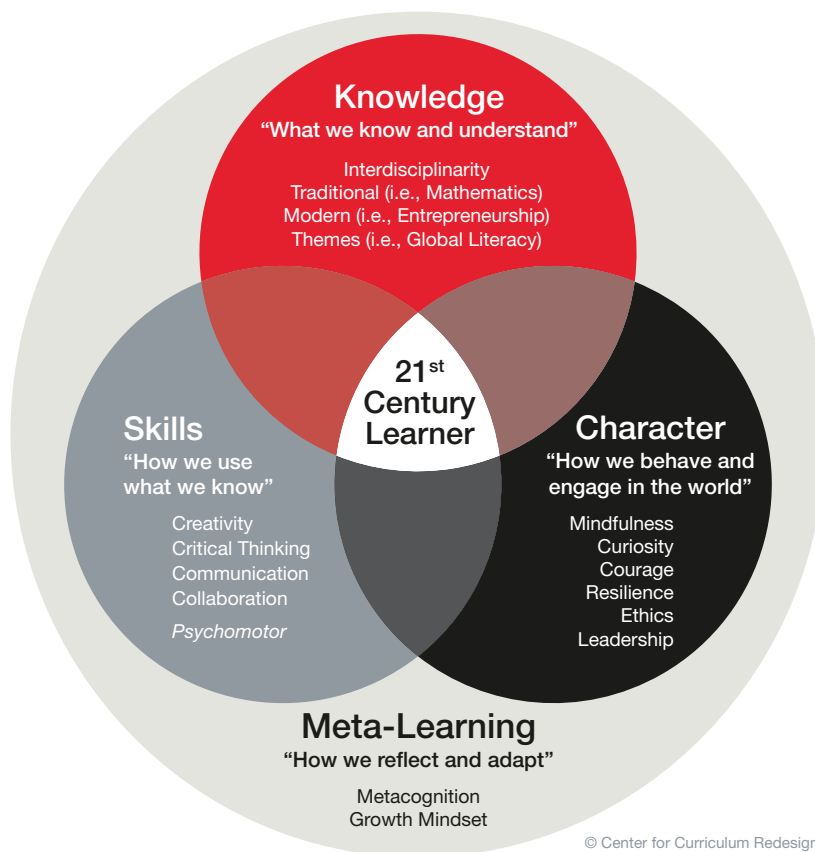
At Area9, we see there is both great opportunity and a strong imperative to intervene in the medical community’s life cycle of learning to promote more value in the system by furthering knowledge, encouraging greater collaboration among professionals, and improving interaction between physicians and patients. By addressing knowledge gaps, our hope is that the incidence of medical errors can be reduced significantly.

Four-Dimensional Learning in Health Care

While knowledge is a major component of learning, it is not the only aspect. Charles Fadel, founder of the Center for Curriculum Redesign, has described education and learning in terms of four dimensions: knowledge, skills, character, and meta-learning (i.e., learning how to learn) (CCR, 2018). The challenge of traditional education is how to impart baseline knowledge to students so they can keep learning and apply new knowledge as they interact with others. Corporate learning and development professionals face the same dilemma of how best to educate workers in specific areas. The elusive goal has been establishing a streamlined process for learning in order to achieve automaticity—that is, acquisition of knowledge and skills to the point they become “second nature.” In promoting VBHC and improved patient outcomes, a certain degree of automaticity must be achieved among physicians, nurses, and other clinicians, including to know instinctively how to intervene when patients are in crisis or medical trauma.



“PROMOTING VBHC AND IMPROVED PATIENT OUTCOMES REQUIRES A CERTAIN DEGREE OF AUTOMATICITY—THAT IS, ACQUISITION OF KNOWLEDGE AND SKILLS TO THE POINT THEY BECOME SECOND NATURE.”





Conclusion: In Pursuit of Lifelong Learning

It's not a simple undertaking to educate and train health care providers who deliver reliable patient safety and quality outcomes. But the goals are clear, as stated in Batalden-Davidoff's definition of quality improvement in health care: patient outcomes, system performance, and professional development (Batalden, 2007). With these goals in mind, the role of lifelong learning is clear. No matter how well-trained or experienced they are, physicians and other health care professionals must upgrade their knowledge and skill set continuously to remain relevant and competent to address the complexities of modern health care.



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ABOUT AREA9 LYCEUM

Area9 Lyceum builds 21st century skills and competencies through the world's first four-dimensional learning platform, Area9 Rhapsode™. Based on more than 20 years of research into human factors and cognition, Area9 Lyceum's AI-based platform delivers truly personalized learning at scale - cutting training time in half, guaranteeing proficiency, and making lasting impacts on careers and business outcomes.



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