AMA Research Challenge Winners

Top-voted five participants from the AMA Research Symposium poster competition presented their research to a panel of judges at the first ever AMA Research Challenge.

AMA Research Challenge co-winners

Victoria Danan and Shamsh Shaikh were announced the night of Jan. 13 as co-winners of the first AMA Research Challenge!

Finalists & research topics

Victoria Danan (co-winner)

- **Poster:** Winning the Ventilator Lottery: A comparison of five scarce resource allocation protocols in the midst of the COVID-19 pandemic (PDF)
- **School:** Charles E. Schmidt COM at Florida Atlantic University

Read more about this finalist>>

Eli Levitt

- **Poster:** High Emotional Intelligence is Associated with Lower Medical Student Burnout in the Clinical Year (PDF)
- **School:** FIU Herbert Wertheim COM

Read more about this finalist >>

Heerod Malekghassemi

- **Poster:** Should Healthcare Workers Treat COVID-19 Patients Despite the Inadequate Personal Protective Equipment? (PDF)
- **School:** Touro University Nevada Coll of Osteo Med

URL: https://www.ama-assn.org/about/research/ama-research-challenge-winners
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Read more about this finalist >>

**Shamsh Shaikh (co-winner)**

**Poster:** The Effect of Pod-based Electronic Cigarettes (“JUUL”) on Endothelial Phenotype: Preliminary Results (PDF)

**School:** Boston University SOM

Read more about this finalist >>

**Aimen Vanood**

**Poster:** Neurological Manifestations of COVID-19 in 1156 Hospitalized Patients in Michigan, United States (PDF)

**School:** Oakland University William Beaumont SOM

Read more about this finalist >>

**Panel of judges**

- **Howard Bauchner, MD**: Editor-in-chief, JAMA and the JAMA Network™
- **Mira Irons, MD**: AMA chief health and science officer
- **Clyde Yancy, MD, MSc, MACC, FAHA, MACP, FHFSA**: Vice dean of diversity and inclusion, professor of medicine and medical social sciences, and chief of the Division of Cardiology at Northwestern University’s Feinberg School of Medicine
- **Vineet Arora, MD, MAPP**: Assistant dean for scholarship and discovery, Herbert T. Abelson professor of medicine at the University of Chicago’s Pritzker School of Medicine, University of Chicago Medicine

**Host**

- **Todd Unger**: AMA chief experience officer

**Transcript**

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Unger: On behalf of the American Medical Association, welcome to our first ever AMA Research Challenge. I'm Todd Unger, the AMA's chief experience officer. I'm excited to host today's event where we will showcase and judge the best of the best in research from medical students, residents and fellows, and the international medical graduate communities. Today's research challenge is the culmination of our recent AMA Research Symposium, an annual event that is the largest of its kind and typically draws hundreds of entries. Despite a pandemic, this year was no exception. People really stepped up and rocked it. In fact, this year we received 60% more entries than ever before. Truly remarkable. A great event attracting great minds and great interest from across the country. So a big thank you to everyone for your interest and participation in research, the bedrock of medicine, science and improved patient care. Here are the numbers.

We had nearly a thousand submissions, approximately 500 of which were selected for presentation in our virtual research symposium poster gallery. Of those, the top scored posters were featured in our poster competition and voted on by participants, which brings us to today and our five finalists, a group whose work represents the innovative thinking needed to move medicine forward. For today's research challenge, where the number one idea will get selected, each finalist will have five minutes to present their idea. And for the final judging format, we've taken things to the next level. We've lined up a dynamic blue ribbon panel of experts to make the final call.

Please welcome our judges. Dr. Howard Bauchner, editor-in-chief of JAMA and the JAMA Network. Dr. Mira Irons, the AMA's chief health and science officer. Dr. Clyde Yancy, vice dean of diversity and inclusion, professor of medicine and medical, social sciences, and the chief of the Division of Cardiology at Northwestern University's Feinberg School of Medicine. And Dr. Vineet Arora, the assistant dean for scholarship and discovery and a Herbert T. Abelson professor of medicine at the University of Chicago's Pritzker School of Medicine. Thank you judges for being here today.

Now it's time to meet our incredible finalists, the five top vote-getters from the AMA Research Symposium, who all just happen to be medical students. First up we have Aimen Vanood from Tempe, Arizona. Aimen, what inspired you to get involved in research?

Vanood: Yeah, that's a great question. So I've been interested in research since I was in college. I studied biomedical engineering, and you'd always hear people say this word, research, but I didn't really know what that meant. So my sophomore year of college, I got involved in a monkey lab actually, and it was a really cool experience, but it showed me that I really enjoyed research. I stuck with that through college. Fast forwarding to medical school, I've been able to see clinical research and I think that's very powerful. Seeing patients every day is a real good motivator to get involved in clinical research. So I'd say currently the thing that motivates me the most is my patients and giving them a better life.

Unger: Well, thanks so much, Aimen. Now let's welcome Heerod Malekghassemi from Henderson,
Nevada. Heerod, why did you decide to go to medical school?

Malekghassemi: Like many people, I had certain tragedies in my life that I was unable to answer with the tools that I had at the time, and I found myself looking for answers that led me towards science. I found myself looking towards medical school in that sense to help make sense of things that I didn't quite understand and inspired me to look toward the future to try to spread that same knowledge to other people who are having a hard time understanding certain scientific things that are going on in their lives.

Unger: Well, thanks for being with us, Heerod. Next, Victoria Danan from New York City. Victoria, what keeps you motivated?

Danan: This year has definitely been very hard. What's kept me motivated is just reminding myself how far I've come and how much more I want to go. It's being surrounded by my support system because you can't lie, we're not always motivated and sometimes you feel like this year has been awful and this is it. But if you have your family there to support you and remind you what you're in there for, it's been very valuable to me. Those are big influences, and seeing the health care staff and health care heroes this year, put their life on the line, practice throughout this pandemic, practice when you knew it was dangerous and give their all to help others. It's really reminded me while I spent this year studying for my STEP exam, and I spent a year just sitting there in my books, why I'm studying and why I'm working and what my end goal is. And it's to be able to emulate what I've seen from the health care heroes this year.

Unger: It's great to have you here, Victoria. Now let's welcome Eli Levitt from Coral Gables, Florida. Eli, what inspired you to go to medical school or want to be a doctor?

Levitt: As far back as I can remember, I've always been interested in helping other people. And as an athlete, who was often on the field with other players, whenever someone went down, I noticed that I found myself drawn to them while others would maybe run away. I would be the first one to offer them a helping hand, whether that was to get up if they were okay, or to make sure that we were getting the appropriate attention from a trainer, or a doctor, or whoever was around. And as I went on through my education, I became more and more sure that a career in medicine would allow me to continue to offer a helping hand to anyone in need.

Unger: Thank you, Eli. And finally, Shamsh Shaikh from Burlington, Massachusetts. Shamsh, who has influenced you the most?

Shaikh: I would have to say my biggest role models are my parents. My mother and my father, having come from India at a very young age and sort of having to craft out their entire lives in a different country, having learned just a little bit of a language at first and really setting the stage for me and my younger brother to excel. I've seen time and time again how hard they work for us and I'd love
to be able to repay them in the future.

**Unger:** Great. Thanks, Shamsh. Thank you again to all our finalists for being here today. And with that, let the research challenge begin. First to present, Aimen Vanood.

**Vanood:** Hi, my name is Aimen Vanood. I'm a current fourth year medical student at Oakland University William Beaumont School of Medicine. I'm excited to present this project titled Neurological Manifestations of COVID-19 in 1,156 Hospitalized Patients in Michigan, United States.

As we know, COVID-19 was declared a global pandemic by the World Health Organization in March of 2020. Michigan was an early epicenter of disease and Beaumont Health system is the largest health care system in South Eastern, Michigan serving over one third of the Metro Detroit area during the pandemic. A report from Wuhan China that I initially found as a pre-print in March, but has since been published in *JAMA*, described 214 patients with COVID-19. Of these, 78% experienced neurological symptoms, including headache, altered mental status and stroke.

The purpose of our project was to quantify neurological symptoms seen in COVID-19 patients within the United States and see how these are related to inpatient mortality. We did this by conducting a retrospective chart review of 1,156 hospitalized patients with COVID-19 in Beaumont Health system. We reviewed each patient’s ED encounter, history of present illness and discharge summary. For patients who had consults for neurology, neurosurgery, psychiatry. Or PM&R, we reviewed those notes as well, as well as the initial ICU evaluation notes for patients who were admitted to the ICU. All patients were admitted on or before April 1, 2020, representing the initial cases of COVID-19 in Michigan. We then divided our patients into three groups, group one were those who presented with neurological symptoms. Group two were those who developed neurological symptoms during admission. And group three were those that did not experience any neurological symptoms during their entire disease course.

Our results showed that there was no significant difference in the distribution of age, sex or race between the three groups. There was also no difference in past medical history, including hypertension, coronary artery disease, obesity, chronic lung disease, chronic renal disease, past history of cancer or dementia. Overall, 733 patients presented with neurological symptoms.
While weakness and myalgia were the most common symptoms, other symptoms that were seen included 18% of patients presenting with altered mental status, 16% with headache, and 8% with syncope. A total of 131 patients developed neurological symptoms during admission; 90 of these also presented with neurological symptoms. The most common inpatient neurological symptoms were altered, mental status, agitation and weakness, which are not uncommonly seen in patients with prolonged hospitalization. We also had nine patients who developed a stroke and one patient who developed acute disseminated encephalomyelitis, or ADEM. We also had one pediatric patient who developed meningitis, ultimately resulting in mortality.

Altered mental status and stroke were the most common predictors of mortality in our cohort. Because we had a larger percentage of patients with altered mental status, we wanted to take a closer look at these findings, so we created a classification tree to see how combinations of symptoms related to mortality. We found that patients with altered mental status, who did not have myalgia, had 50% greater chance of mortality during admission. Conversely, 29% of patients who had both altered mental status and myalgia experience mortality.

Overall, our results show that neurological symptoms are not uncommon in COVID-19 patients. Additionally, altered mental status was the strongest predictor of mortality in our cohort. However, whether altered mental status at presentation confers the same risk of mortality as altered mental status during admission remains yet to be elucidated. Our future goals for this project is publishing our data along with short-term metrics, such as length of hospital stay and ICU admission, and longer term metrics, such as repeat admission and stroke after initial discharge.

Before I finish, I wanted to thank my six medical student colleagues and friends for helping me with data collection, as well as our P.I., Dr. Kojan, for his guidance, knowledge, and just for believing in me when I came to him with this project idea. I also wanted to thank our statistician, Patrick Karabon, for his tremendous help with analysis. Thank you so much and have a great rest of your day.

**Unger:** Well, thank you, Aimen. Great job. Now it's time for our judges. Dr. Bauchner, why don't you kick it off?

**Dr. Bauchner:** Thanks, Todd. Well, Aimen, first, congratulations to you and your coauthors on the presentation. It was crystal clear, so I really appreciate that.

Obviously, the link between neurological symptoms and mortality are not surprising in virtually every medical condition, additional neurologic signs and symptoms will carry a worse prognosis. I think you did an excellent job in trying to distinguish between those who present with neurological symptoms versus those who develop it. Obviously one of the concerns is that this is based upon chart review, and so you're always dependent upon what information makes it into the chart. And then the other issue, that at least in this presentation wasn't captured, was a link that individuals had symptoms for
and whether or not that necessarily would have been captured in the medical record. But overall, an excellent exploration of the relationship between COVID-19 neurologic symptoms and mortality.

**Unger:** Judges, any other thoughts?

**Dr. Irons:** So I'll actually jump in now. I'd like to applaud you also because you asked a question, you made an observation, asked a question. I really liked the fact that you asked for help because faculty members and our colleagues are always there to help us. And I know that you were reading the literature that got you interested in this. I do agree with Dr. Bauchner and his suggestions. The one thing I always think about is, where does this take us next? So I would hope that you'd also be thinking about asking questions about causality and looking at subgroup analysis to see how this can help us care for patients and tell us more about this virus that is really unlike any other virus that we have ever come into contact with.

**Unger:** Dr. Yancy, Dr. Arora, any thoughts from you before we close?

**Dr. Yancy:** Yeah, just very quickly. Can we just celebrate the fact that medical students put this idea together? I mean, at a time when people are worrying about passing tests and being on rotations to be intellectually creative like this is important.

So I think about this as a scientist, two questions come to mind. First, is this a marker of the totality of the COVID-19 burden or is it a really separate phenomenon that is unique to vulnerability within the central nervous system? An excellent question to pursue going forward.

We've heard quite a bit about the COVID-19 fog, and these data acquaint us with the penetration of neurologic, if you will, complications in the setting of COVID-19. It's not trivial. It really looks like, by my eye, about one out of every five people might in fact have some sort of COVID-19 complication with the illness. The last thing I will squeeze in, just because of my unique lens. It's important to continue to articulate that once the infection has been established, the course is the same, regardless of race. In fact, the risk that race represents is the necessity for hospitalization and the presentation circumstances. And as we refine those observations, it will really help us understand how best to approach this condition. But my congratulations to the co-op, it's just a terrific job.

**Unger:** Dr. Arora, just any quick thoughts before we have to head on onto the next one?

**Dr. Arora:** Just as a practicing hospitalist, I will say this is really useful to let all of our colleagues and our trainees know that be on the lookout for neurological symptoms and take them seriously.

**Unger:** Great advice. Thank you so much. And again, great job, Aimen. Now for our next finalist, Heerod Malekghassemi.
**Malekghassemi:** Hello, my name is Heerod Malekghassemi, and I'm a second-year medical student at Touro University in Nevada. This summer, the events of the COVID-19 pandemic and massive personal protective equipment shortages across the nation and so I have my research partner and I, Jose Parra, delve further into the issue of administering care under such circumstances. The novel coronavirus, SARS-CoV-2 has affected billions of people around the world by spreading while in close contact, primarily through respiratory droplets. Under normal circumstances, health care professionals are given personal protective equipment, which I will now refer to as PPE, in order to protect themselves while caring for patients. Due to the massive spread of SARS-CoV-2, many physicians across the United States were subjected to practice without proper PPE. In one case in Southern California, health care workers did not show up for work at a nursing home for two consecutive days. Six residents had died of coronavirus and another three dozen were infected.

Similar occurrences have been reported throughout the country. And in some cases, health care workers were even terminated for speaking about the lack of PPE at their place of work. Upon receiving this information, Jose and I looked into the legal and ethical literature and found a gray area in the AMA Code of Ethics and Nevada State legislation for a physician should proceed with care when subjected to these unsafe conditions. The AMA code of ethics, through its April 2020 provisions states that the ability of a physician to ethically decline to provide care if PPE is not available depends on several considerations, particularly with the anticipated risk to the provider, but it does not explicitly outline what constitutes that risk. To better understand this, we conducted research on those directly involved by creating an online survey that was provided to over 150 MDs, DOs, NPs, and PAs. The survey was conducted through a software called Qualtrics that insured participant anonymity while maintaining response accuracy. Our blind survey addressed two key components.

Question one, do you feel it as justified to refuse to see COVID-19 patients without adequate personal protective equipment as a health care provider? To which the providers we surveyed overwhelmingly responded, yes. And question two, should a health care provider be held liable for abandoning a COVID-19 patient because of inadequate PPE? To which the providers we surveyed overwhelmingly responded, no. As previously stated, safety to providers afforded by the AMA Code of Ethics, states that they are permitted to refuse care if they pose a direct threat to their safety.

This research raises the issue that how laws and ethics constitute a direct threat are up for interpretation and create a sense of ambiguity. It is ultimately this work’s goal to initiate conversations on the legal and ethical constructs that currently exist in guiding health care providers during a pandemic when PPE is lacking. Potential legislation could be proposed to mandate and refine the requirement of workplace administrations to provide the necessary PPE during a pandemic, as well as implementing anti-retaliation policies to further protect health care providers in voicing their concerns. The content of this research proved prevalent in southern Nevada. Further research must be conducted to expand its work in order to receive a more compound result from across the nation.
Thank you for your time.

**Unger:** Great work, Heerod. Dr. Irons, why don't you kick off the judges discussion?

**Dr. Irons:** Oh, sure. Well, Heerod, congratulations. I'd like to really congratulate you on some fine work and for asking a really important question. And I think the sad part is that this is a question I think that none of us ever thought we would have to ask. But what the pandemic has shown, amongst all of the other things, is that we can never guarantee appropriate resources and that we really have to put our efforts into making sure that what happened and what we're seeing with PPE during the pandemic doesn't happen in the future. It's interesting, and I think it's important that you reference the Code of Medical Ethics because this is an area where there is tension. And it derives from the fact that medicine is fundamentally a moral activity and that physicians have a duty to provide care during a public health emergency.

But our health care systems also have a duty to provide the necessary protection and resources and supplies that physicians need to use to care for patients. Physicians are generally the people that show up and are always there regardless of what happens, but the tensions that your research has shown us are really important for us to know and think about in the future.

**Unger:** Let's hear it from our other judges.

**Dr. Arora:** I can jump in. I want to applaud this research Heerod because I think that it is really an important step forward to understand what our health care physicians, nurses and other staff are thinking, given the lack of PPE and safety protections. I think that all of us go into the field because of a calling and the need to serve our patients. But at the same time, we can't forget how important it is to take care of ourselves and for the health care system to help us take care of ourselves.

And I just think that it's so important, particularly given the issues around whistle blowing and the fact that health care staff, health care workers are a scarce resource. We see that during surges. And so we can't have people running into the burning building that are not equipped with the right equipment. They're not going to be there to save lives for the next week. And so, we've seen that in the pandemic. And so I think this is incredibly important work. One thing is to definitely get it outside of Nevada and understand during the phases of the pandemic, as PPE has gotten better, what can we do? Quick thoughts from Dr. Yancy or Dr. Buckner?

**Dr. Yancy:** Couple of things. I really applaud Heerod for doing this for different reasons. As a second year medical student, to become keenly aware of the importance of the ethical considerations of what it is we do will only equip him in his co-investigators for the rest of their careers in the most ideal way. Some of the most difficult things that I've faced as a practitioner, I'm still actively practicing, not just medicine, but critical care medicine is in fact, this intersection of medical decision-making and ethics.
And COVID-19 has brought that to the level of the practitioner as well. We might as well become facile with these conversations, and the sooner, the better. We have to understand things like what's the prevailing community standard? Does the hospital have an entity that oversees ethics? Are there legal statutes, preferably that protect, but some that expose vulnerabilities and make someone at risk for certain liabilities? This is a space that we don't spend a lot of time discussing, exploring, and certainly not studying. And the fact that they've studied this space and are becoming more aware of this important dimension of what it is we do at the edges of medicine where we're running in towards risk, but we have to protect ourselves. And we have to also understand the circumstances, the patient's space. Really great to be thinking about ethics this early in their career.

**Unger:** Dr. Bauchner, any very quick thoughts?

**Dr. Bauchner:** I was surprised by the results, actually. I think we need to really understand why. What's the environment, the painful environment, where health care providers, physicians, nurses feel like they can't give care? As I said, I found the results surprising. It’s captured in part by the image that's on the top of the slide that I saw, which says we need PPE. And so I would like to know more about the clinicians who answered the survey and why they gave these responses.

**Unger:** Really interesting discussion, judges. Thank you Heerod for that research. Now up next is Victoria Danan.

**Danan:** Hello. My name is Victoria Danan. I'm a second year medical student at Charles E. Schmidt College of Medicine at Florida Atlantic University, and I'm presenting today Winning the Ventilator Lottery: A Comparison of Five Scarce Resource Allocation Protocols in the Midst of the COVID-19 Pandemic. This project was developed in preparation for the worst case scenario during a COVID-19 pandemic. Because the hospital systems were concerned about the limitation and restrictions of life-saving resources, such as ventilators. In effort to prevent this issue, we reviewed multiple scarce resource allocation protocols from several societies and states. We quickly realized that there are no goal center protocols available to help clinicians make this tough decision. It is inherently against the physicians moral call to determine which patients will not receive life-saving treatment. However, during these critical times, we're faced with this possibility. The goal of the scarce resource allocation protocol was to help identify which patient will benefit most when faced with limited life-saving resources.

We used 15 mock COVID-19 patients, which were evaluated according to the five published protocols. One from the University of Pittsburgh, one from Maryland CHEST, one from our home Baptist protocol and protocols from the state of New York and Utah. these were chosen in order to span different geographic areas, different years of publication, and to not limit our scope to academic centers versus state protocols.
Our patient profiles was based on our early experience that reflected a similar patient population sitting in our hospitals in the early days of the pandemic. Some basic information from their profile is highlighted in table one, including age, sex and co-morbidities. Other data including mock labs and vital signs were used in order to calculate an initial sequential organ failure assessment or SOFA score for each patient. SOFA scores, which are widely used as a standard for mortality prediction, take into account degree of dysfunction of six organ system. In other words, the higher the SOFA score, the worse the patient's predicted outcome. As you can see in people two, these patients were ranked based off the SOFA score from lowest to highest risk of mortality. On the right, we assigned a color to each patient indicating which patient would receive the scarce resource. Patient in green had first priority for the scarce resource allocation. Patient in orange would fall into a randomized lottery system and patient in red would have the scarce resource reallocated away from them.

It was clear that these three protocols, the Baptist, New York and the Utah protocols are very similar in how they prioritized scarce resources. Our results showed that these protocols would put half the patients into the scarce resource group based on their SOFA score and exclusion criteria and place the other half into a randomized lottery system which would randomly pick who gets to remaining ventilators. In contrast, the other two protocols, the CHEST in Maryland implemented first the strategies and tiebreakers to triage patients and relied less on the SOFA score. To many, the approach of a randomized lottery system seems the fairest because it assigns ventilators solely by chance, without regard to additional factors such as race, ethnicity, sexual orientation or socioeconomic status. It eliminates the potential for discrimination. Randomization's strengths however, is also its weakness because blind allocation will not likely result in effective resource stewardship or support the goal of saving the greatest number of lives.

Unfortunately, some patients were too sick to benefit from ventilator therapy will take that away from patients who are less ill and who benefit more from having the ventilator reallocated to them. In addition, randomization could also engender distrust in the allocation system because there's a lack of public disclosure on how the random processes is carried out. While the method of a randomized lottery system may have worked as a response to the H1N1 pandemic, we now know that COVID-19 is different in many ways and that clinical judgment is critical in executing these SRA protocols and saving the greatest number of lives. These SRA protocols are essential in times of emergency, and they should be adaptable to many scenarios in different disease. In summary, our simulation exposed the need to revisit and revise protocols that are currently in place that will ethically address pandemic scenario, such as COVID-19. Highlighted here is our concern of over-reliance on exclusion criteria and the SOFA score resulting in the use of a lottery system without enough clinical assessment to stratify patients before putting them into a lottery system. Thank you.

Unger: Great work, Victoria. Dr. Yancy, why don’t you lead off the discussion of the judges?

Dr. Yancy: I want to applaud Victoria, but I also want to be candid with my peer judges. This is hard
because this really is the intersection between using an imperfect point scoring system for good reason, to really allocate precious resources versus a random system, one that allows, hopefully, protection from biases. But what's really the right thing? I guess what makes this hard is that as a field, we don't know what the standard is. And so to think that we are empirically adopting one versus the other, that gives me some pause. So this kind of research is very necessary, but it's very hard to do. And thinking about going forward, particularly if someone has to operationalize this in a major way, how will you execute the decisions and how will you transparently communicate the way in which these decisions were made, particularly when it is the withdrawal or the redirect of resources from one to another? That makes it hard. I think it's necessary work, but it makes it hard. I'm really curious to know what my peer judges think.

Unger: Who's up next?

Dr. Arora: I can jump in and just say that I want to commend Victoria on a presentation of a very difficult and disturbing topic that gets at the core of clinicians, and also patients, because I think you've done an excellent job at showing us that where you live and the protocol that's being used where you live would yield different results. And so when we think about equity, does the protocol echo equity, but do we have equity across the region? And so I think that's an interesting implication, perhaps we should be standardizing these protocols. So I commend you for bringing that forward and pushing us to think as a group, as a nation, what we should be doing.

Dr. Yancy: But that's the tension, isn't it? It's a protocol, not science. And so it is an empiric plan that is incredibly imperfect but yet very important consequences emanate. I'm sorry that I preempted others, but it just fascinates me with what we should do.

Dr. Irons: Okay. Well, I'll jump in. You're right, it's a protocol, it's not science. But this is hard. And it's hard because we don't talk about this. We don't talk about end of life care as much as we should. And we certainly have not talked about crisis standards of care and lotteries and prioritizing therapies. But I really want to also applaud Victoria because she, what she thought about was, how do you take all these frameworks and recommendations and actually understand how they play out in real life?

It was clear that how you implement a lot of the discussions and the recommendations that we do in medicine is not known until you put it out in the field. And the plan that she used to answer this question I think is really helpful.

Unger: Dr. Bauchner, any final thoughts?

Dr. Bauchner: *JAMA* has published quite a few pieces in this area. I think it's emerged as one of the great ethical dilemmas of the COVID-19 pandemic. Something that I don't think many of us thought we would really face often, if at all, in the United States. And I think this research report, although utilizing case studies that weren't real, really highlights the combustion between ethics and critically
important clinical decisions, who will get a ventilator?

As I said, I don't think many of us thought we would see this in our lifetime, to the extent that it may have occurred. And apparently is occurring in Los Angeles as we speak. So I thought this was a remarkably powerful piece in articulating the tremendous variation in who would get a ventilator depending upon which protocol you used.

**Unger:** Well, thank you so much. What a great discussion. Again, nice work, Victoria. Let’s introduce our next finalist. Eli Levitt.

**Levitt:** Hello. My name is Eli Levitt, and I'm a fourth-year medical student at the Florida International University, Herbert Wertheim College of Medicine. And I'm doing a dedicated research year at the University of Alabama at Birmingham.

Today, I'm very excited to share the results of my study on emotional intelligence and burnout in medical students in the United States. I worked together with a number of medical students, faculty, and biostatisticians on this project. This project first started in April of 2018 after a brief lecture by a couple of the faculty on how burnout can be very common in medical education. This was concerning to me and I asked them if there were any opportunities to be involved in their research.

Although they were wrapping up that current project at the time and would soon publish their findings on empathy and burnout, they were happy to set up a couple of meetings where we would discuss starting this new study. We found that there was another professor who had information collected on emotional intelligence that had not been analyzed yet. He came up with a research question to combine this data and ask, "Is there an association between emotional intelligence and burnout in medical students in the United States?"

We did a secondary data analysis on these two studies which had data collected between 2014 and 2017. All the studies described were approved by the IRB. We included a total of 260 medical students in our analysis. About 60% of them were males. The average emotional intelligence of the entire group was 111, which is higher than the national average of 100. We also found that about 48% of the students reported signs consistent with high emotional exhaustion during their third year of medical school. About 25% of the group reported signs consistent with low emotional exhaustion.

When we compare these emotional intelligence scores, you found that the group with low emotional exhaustion had higher average emotional intelligence than the group with high emotional exhaustion. We also looked at personal accomplishment. In this group, we found that the students with high personal accomplishment had high emotional intelligence on average.

There's more details about other findings in our study on the poster, but I wanted to focus on these two findings today. We think that these findings are very interesting in the context of literature.
Because knowing how emotional intelligence relates to burnout can help guide further medical education, research, and curriculum development.

We're very excited to share these findings with the medical education community and hope that it will influence leaders around the country and at our institution to promote improving emotional intelligence and lowering burnout. We are very excited to look at these results and share them. And we hope that you are able to provide feedback. And we are very interested in any potential future collaborations. Thank you so much for your time today and for listening and for learning about my project. And I really appreciate the opportunity to present.

**Unger:** Well, thank you so much, Eli. Fantastic work. All right. Judges, Dr. Arora, you're up first.

**Dr. Arora:** Thank you, Eli, for this wonderful presentation. And also I do want to commend you and any students out there who are doing research pre-pandemic. Sometimes you can think, oh no, COVID hit, and it's not related, but kudos to you for persevering and bringing an important topic forward. I do also want to say as somebody who works in a medical school, advising students, the question always comes up, which is, how do you select for students that will have high emotional intelligence? And can you teach high emotional intelligence?

And then also related to your work, which is fascinating on so many levels, generates a lot of questions, is whether or not there could be this cycle of burnout and emotional intelligence. When you are burned out, you can have depersonalization, as I know your poster talked about, and how does that relate to the emotional intelligence. But overall, I think fascinating findings that really require further research to understand what to do next.

**Unger:** Judges, any other thoughts?

**Dr. Bauchner:** The report made me think about people who I thought had high emotional intelligence and whether or not they really struggled in their career. So there was kind of a self-reflection when I read it. Also, I was hoping that there was a place I could go shop for emotional intelligence so I could take an extra shot or two.

So I really liked it. I thought it was just really appealing. And just to reflect on your comment, when we talk about holistic evaluation of medical students or residents, I think their emotional well-being becomes really important in trying to sort out whether you think they'd be an appropriate candidate for your institution or your residency program. So there was a lot of psychological and emotional appeal of this project.

**Unger:** Dr. Irons?

**Dr. Irons:** I'll jump in really quickly to congratulate you. I have to say that I won't repeat what's been
said before, but I agree with all of it. When I listen presentations and read abstracts, one of the things that goes through my mind is, do I want to know more? And I really wanted to know more. You raised a lot of questions in my mind, you provided an actionable path for their future, and you communicated it really well. So kudos to you. Congratulations.

Unger: Dr. Yancy, any final thoughts?

Dr. Yancy: Yeah. I'd like to sit down with Eli and a big pot of coffee. Because on the one hand, the data are almost too good to believe. Here you have a very high threshold emotional intelligence, and you're protected from burnout, a lower score in burnout is likely. If that is true, then we really need to work on ways we can cultivate more emotional intelligence. Or we need to understand what tool is used, how is it constructed?

But I think this is what I love about science. When you do good work, it yields a series of successive questions that need to be explored. It's not a completed sentence in and of itself. But yeah, Eli and I need to sit down, roll our sleeves up, and think about what are we learning from this and how confident are we that we've really discovered something that is incredibly important, that's worth pursuing. But I'm fascinated with this, just I want to do more.

Unger: Well, thanks Dr. Yancy. I'll join you for that coffee because I'm very interested too. And thanks, Eli. And now for our final presenter, Shamsh Shaikh.

Shaikh: Hi, everyone. My name is Shamsh Shaikh. I'm a third-year medical student at Boston University School of Medicine. Thank you to the AMA for this opportunity to present my research. Today's topic I'll be discussing is my project, the effect of pod-based e-cigarettes on endothelial cell phenotype. And these are sort of our preliminary results that we as a lab came up with.

So just a brief introduction and an insight into the problem as to why we initiated this research project. What we saw is that, back in 2017, a new product called Juul took over the e-cigarette market. And it did so in a manner that in almost under a year, it took over 70% of the market size for e-cigarettes. And a recent paper by our collaborators revealed that 25% of high school students and even 7 to 8% of middle school students report having used Juul in the past month at the time of publication.

So we analyzed, and we looked into why these devices are so popular among youth populations. And we saw that there were three reasons. One was that these devices are pod-based. So instead of going to a store and having to buy a large quantities of e-liquid, they actually come in little miniature pods that are easily accessible, easily implanted into the device and taken out. But we also saw that these were very discrete devices. So the amount of vapor and smoke produced was extremely minimal compared to other competitor devices.

And lastly, we saw that they were very accessible. So Juul was sold at pretty much every location that...
a person can think of. And what we saw is that a recent study, again in one of our collaborators, revealed that Juul actually induced endothelial dysfunction. These are the cells that line our blood vessels. And they underwent damage after having been exposed to Juul in rat animal models.

So we wanted to investigate these effects in human models and to see whether or not this device was actually be safe as marketed by the company. So the objective that we aim to investigate was, we wanted to invest just to get the effects of Juul e-liquid components. So the different components that make up each e-liquid pod on human aortic endothelial cells. These are commercially available endothelial cells that we grew up via cell culture.

What we did is we explore the endothelial cells to various compounds from the Juul e-liquid in serial dilutions. And what that means is we went from a low concentration of 0.00001%, so significantly low, all the way up to a dilution concentration of 10%. And this was looking at a 90-minute exposure. And then we analyze the results on these endothelial cells via a TUNEL assay. This assay measure cell viability, and we reported the data, as you can see in that large colorful figure, as a percent apoptosis value. Apoptosis, again, is cell death.

And what we saw is very interesting actually. We saw that the higher dilution of the Juul, e-liquids, but also the higher dilutions of just the nicotine salt alone, as well as the PG/VG vehicle, which is a propylene glycol and vegetable glycerol vehicle solution that serves as a base of these pods or e-liquid compounds, all three of those individual components actually induced significance cell death.

What we also saw is that concentrations less than 1% resulted in increased cellular toxicity. However, there were no overt differences in the two flavors that we studied, which were Virginia tobacco and menthol. Which are the two most popular flavors at the time of this research study. We also saw that the toxicity induced by nicotine salt alone, and by PG/VG vehicle alone, was similar to that of the entire Juul liquid as an aggregate compound.

In the middle of the poster, you can see different figures from a microscopy imaging. We stained nuclei using a TO-PRO-3 dye, and then we looked for percent apoptosis via the TUNEL assay as mentioned, which analyzes DNA fragmentation and DNA damage. At the bottom, you can see our results for nicotine salt, the vehicle alone, as well as the two individual Juul flavors that we use. And then finally, just to wrap up and summarize our findings, we saw that Juul e-liquid components, individually and together as an aggregate liquid solution, demonstrated acute endothelial cell toxicity.

In future studies, we'd like to expose these endothelial cells to Juul aerosols, so the actual smoke or vapor that arises after combusting or lighting up or taking puff of the Juul device. And we'd like to evaluate for transcriptomics, as well as analyze oxidative stress in endothelial cells. And what we've designed is, or what we're aiming to design soon, is a sort of cell exposure chamber, as you can see.

And I sort of initiated that design as you can see here. There's also a valve that connects to a
smoking robot that'd be like to analyze. And that is also pictured below. I'd like to thank the National Heart, Lung, and Blood Association, as well as my lab and Dr. Hamburg, my PI. Thank you very much.

Unger: Excellent work, Shamsh. Dr. Bauchner, will you lead off the discussion?

Dr. Bauchner: Well, this one was obviously different than the other four. This is a translational lab-based research project. So I was particularly fascinated from that perspective. The study itself left me with many more questions. But e-cigarettes have emerged, and there's a substantial debate about them. One, do people who, early in life, begin to use e-cigarettes convert to traditional cigarette smokers? First. And then the second great debate is whether or not does the use of e-cigarettes and people who are smoking traditional cigarettes, does it help them quit? In this case though, the investigators backed up and tried to sort out whether or not there appears to be any physiologic abnormalities associated with the use of e-cigarettes. So, I really commend the investigators for going back to the lab to try to understand it.

One of the questions I had is I don't know how sensitive this type of cell death is to any product, so as they go forward, I would ask them to add other controls. For example, would just using oxygen as a control create cell death? But they've laid out a remarkable series of future investigations and I really applaud them looking at the components of e-cigarettes and the potential harm that the product could do.

Unger: Dr. Arora.

Dr. Arora: I want to commend this translational work as well. I loved the importance of it from a policy angle, a public health angle, as well as incorporating those basic and translational pieces into it. I found it, I do want to pick up on the idea of a control because I did find it fascinating that the Juul components reminded me of when we think about side effects and drug components, there's the active ingredients and the inactive ingredients. What we found here is that which part of it is really contributing to cell death, it sounds like all of it. That's important to think about for the device and that might be important to think about for future usages of these types of components and the device in the future.

Unger: Dr. Irons.

Dr. Irons: Now, huge congratulations for a variety of reasons. The first is that it reminds us that there are other significant public health issues that we really have to deal with. When I think of the time that we were focusing on this problem prior to the pandemic, it's important to resurface that. It also tells us about the importance of basic science in answering a lot of the why questions because you have to understand the why before you can get to the how in terms of how to treat it. I'd also really like to congratulate you on how you described your research, how you communicated it. It was very clear. It was, even the PG/VG vehicle explanation, I thought was really helpful. I really appreciated knowing
what you're going to do in the future and that you're thinking about this in the long run and not just as a single experiment. Congratulations.

**Unger:** Dr. Yancy, your final quick thoughts.

**Dr. Yancy:** I really want to applaud the investigators here. Why do you do this kind of work? You do this to inform public policy and rather than just make a draconian dramatic statement, "We don't like this. We don't want to do this," let it be driven by science. The TUNEL analysis is so important because it really demonstrates a biologically plausible mechanism by which the ingredients within Juul are in fact, toxic, not just harmful, toxic. It's reminiscent of what we had to do to declare that secondhand smoke was so injurious by looking at the exhaled and the burnt carbon fragments that came across, the nitrates, the hydrocarbons, and demonstrating ex-vivo how toxic those were, which helped us drive public health policies that reduce the exposure to secondhand smoke.

I think we have to be strident. I mean, I'm a cardiologist, and I understand the burden of cardiovascular disease attributable to smoking and it's not just because it's a lit cigarette, it's using tobacco in any iteration. The fact that these investigators step forward to demonstrate yet another biologically plausible pathway that we need to understand is commendable.

**Unger:** Thank you so much judges and thanks, Shamsh, for your excellent work. Let me just say these have been five terrific and insightful presentations. The judges certainly have their work cut out for them. It's going to be a tough decision here to pick a winner. Let's check back in with our panel and get their final thoughts in who they're going to crown as the winner of the AMA Research Challenge. Judges?

**Dr. Bauchner:** So firstly, I want to congratulate all five of the investigators, as well as their research teams. Singling out individuals at the end is always somewhat painful and difficult, but I did have two that I particularly were taken by. Shamsh Shaikh, the e-pod and e-cigarettes, I found to be a fascinating beginning of what I could imagine to be a group of investigations and also takes what is a huge public health issue back to the lab to find real data and evidence that would support public health policy.

I thought Victoria's protocol to laying out what has become what I thought I would almost never see in the United States, which was rationing at a large scale of resources, ventilators, and now what may happen in Los Angeles, oxygen and other decisions and how using different protocols, you get different answers. So, I felt that that highlighted some of the profound ethical dilemmas that have emerged with this pandemic.

**Unger:** Dr. Irons.

**Dr. Irons:** I want to congratulate everybody and would love to say that we'd love to have five winners.
here because I think you've all done amazing work, but I'm going to end up with the same two that Howard ended up with. Really impressive work on the endothelial cell, the basic research that was done with e-cigarettes and endothelial cell damage, and really important to inform for policy decisions moving forward. Victoria's work, the work that Victoria did while you think about it, is so simple in some ways, but really underscores the fact that we have to think about what our outcomes are and have to understand how our actions and our recommendations will actually play out because this is what's important. It's important to patients. It's important to families and it can actually help inform what we're seeing in the health care environment right now. So, I would end up really singling out these two.

**Unger:** Thank you. Dr. Yancy.

**Dr. Yancy:** What a pleasure to be involved in vetting all of this work. To recognize the number of young investigators that are beginning to think critically about medicine. We've heard this phenomenon recently about the Fauci effect and that there is an uptick in people interested in medicine and hopefully that means there's an uptick in people interested in science and we've seen just a sample of that today.

I am going to mix up my choices compared to my wonderful peers, because I want to pick the two that I think are most actionable, meaning that there are reasonable next steps. I concur that the study of the Juul tobacco exposure phenomenon is incredibly important for its public health implications, and I won't dwell further than that, but I also tipped my hand during our conversations. I really want to encourage Eli and his peers to explore with much more intentionality, what is the definition of this whole phenomenon of emotional intelligence? Is it modifiable? Is it that important in preventing burnout, that things we learned from the further study of emotional intelligence can help not just medical students, but can help senior physicians, nurses, other health care providers? I think that's a very actionable item. It's worthy of additional pursuit, so those are my two choices.

**Unger:** Thanks Dr. Yancy. Dr. Arora.

**Dr. Arora:** This is a definitely a tough one, and I always say to my own students who I judge every year at the end of our summer research forum. I say something like, "You're all winners in my book," and so you are all winners in my book. We do have to separate out what might be the most substantive work, and I was going to his side a little bit with Dr. Yancy in what could actually impact policy.
So, I was really taken with Victoria's work. It was eye-opening, it was really something that was, like struck to the core of somebody as a clinician, as a patient. We need to do more to understand how to actually help people develop protocols and standardize them. And, how do we agree on them so that when a patient comes into a hospital that we know that they'll get the same level of care wherever they are, depending on those resources. So, that was definitely my one.

My second was also Eli's because I think the issues of burnout are so huge, not just in medical students, but in our entire health care workforce right now. So my question would be, should we be doing work looking at emotional intelligence in health care workers and how to boost emotional intelligence right now, especially given that the epidemic levels of burnout that were happening actually before the pandemic. So, we still have that as a problem to face.

Unger: Judges, do we have a decision? Okay, judges.

Dr. Arora: Well, I have been appointed the person who will deliver this decision, and I do want to thank my co-judges, and we survived. It was hairy at times, but we pulled through and we couldn't agree, so we decided that in the spirit of collaborative research, that there's two types of research that actually are important to acknowledge. The winners, I think all of our finalists reflect the really wide scope of research that we see. With that, we have a one winner that's more on the basic translational side and one that's more on the social science and ethics side.

Our first winner is Shamsh Shaikh for the effect of the pod-based electronic cigarettes or Juul on the endothelial phenotype preliminary results. We were very impressed with your work, so congratulations. Then our second winner who was definitely gave us so much to think about, so many questions that need further answers and really, really inspired us to think about how do we really do better for our patients right now during the pandemic, especially during these scary times, is Victoria Danan, Winning the Ventilator Lottery: A Comparison of Five Scarce Resource Allocation Protocols in the Midst of the COVID-19 Pandemic.

So on behalf of the judges and the AMA, I would like to congratulate both of you and join me in a round of applause. Thank you.

Unger: That's excellent and congratulations to our winners. We'll have a chance to talk to them more after this. But first, I want to thank our judges, Dr. Bauchner, Dr. Irons, Dr. Yancey and Dr. Arora, we really appreciate your thoughts, your insights, perspective, and the mentoring that you do for all our researchers out there. Thank you so much.

Dr. Bauchner: Bye, Todd.
Dr. Yancy: Thank you.

Dr. Arora: Thank you.

Dr. Irons: Thank you. Bye, Todd.

Dr. Arora: Thank you.

Unger: Now for the moment we've all been waiting for, it's time to bring in our winners. Hi, Shamsh. Hi, Victoria.

Shaikh: Hi.

Unger: Our judges have deliberated, and we have one final question for both of you. How does it feel to be the co-winners of this year's AMA Research Challenge?

Shaikh: Oh, wow.

Danan: Wow.

Shaikh: Thank you very much. That's awesome news.

Danan: Thank you so much.

Unger: Congratulations—

Danan: That's great. Wow.

Unger: to the two of you. Victoria, do you want to say something?

Danan: Thank you. Thank you so much and congratulations. Thank you so much and congratulations, Shamsh. It's an honor to be a co-winner. Wow. Thank you.

Shaikh: Thank you, Victoria, as well. That's really awesome news. Thank you, Todd.

Unger: It's a pleasure and an honor to have both of you. Thank you so much again, winners, for being with us and for all the work you did, we're proud of you and we look forward to more research from both of you in the future.

Wow. Congratulations to all our finalists and to our AMA Research Challenge winners, Victoria Danan and Shamsh Shaikh. Impressive work all the way around. On behalf of the AMA, thank you to all of the participants, their research partners and mentors who worked in the background to guide their ideas. Research is what propels medicine and science forward, and judging from the enthusiasm and
quality of the work that we're seeing, we're in good hands. Thank you. Be safe and keep the research and big ideas flowing.