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Moderators: Christopher Farnsworth and Zhen Zhao, Experts: Fred Apple, Paul Collinson, Mari L DeMarco, Ann Gronowski, David B. Sacks, and Yusheng Zhu. *Critical Roles of Clinical Laboratorians in Translational Research and Applied Sciences—Experts’ Insights and Experiences*. Clin Chem 2022; 68: 877–83. <https://doi.org/10.1093/clinchem/hvaa195>

Guests: Dr. Christopher Farnsworth, from Barnes Jewish Hospital in St. Louis, MO and Dr. Zhen Zhao, from Weill Cornell Medicine and New York Presbyterian/Weill Cornell Medical College.

Bob Barrett:

This is a podcast from *Clinical Chemistry*, sponsored by the Department of Laboratory Medicine at Boston Children’s Hospital. I’m Bob Barrett.

Clinical laboratorians have been at the forefront of translating science into clinical practice, playing crucial roles in the development of techniques, instrumentation, and technologies that aid in patient care. They have been essential for the advancement of medicine and for providing timely, accurate diagnosis of medical conditions. Today’s laboratory structure has also necessitated a change in how laboratory directors are now trained, requiring a greater emphasis on regulation and management, rather than research and method development.

A Q&A feature appearing in the July 2022 issue of *Clinical Chemistry* examined the critical roles of clinical laboratorians in translational research and applied sciences to help address that very issue. In this Q&A, six experts shared their experiences building translational research programs and establishing leadership in scientific subspecialties with the goal of determining the future role of the clinical laboratorian in translational research.

We are pleased to have the two moderators of that Q&A feature in this podcast. Dr. Christopher Farnsworth is an Assistant Professor of Pathology and Immunology and serves as the Medical Director of Clinical Chemistry at Barnes-Jewish Hospital in St. Louis, Missouri. He is joined by Dr. Zhen Zhao, Assistant Professor of Clinical Pathology and Laboratory Medicine at Weill Cornell Medicine and Director of the Central Laboratory at New York Presbyterian/Weill Cornell Medical College in New York City.

Dr. Farnsworth, let’s start with you. This article stresses that laboratorians have a rich history of translating science into clinical practice. Can you elaborate on this role? Perhaps with some milestones over the years.

Christopher
Farnsworth:

Yes, this is a great question. My father is a history teacher so I’m really a big fan of all things history. And if you look historically, their profession, especially in its early days, the lab director was often times an established scientist before actually becoming a hospital clinical lab director. Further, they had so much less available to them with regards to methods, particularly those that are packaged up, like the kits, as we think of them today. So, as a result, many of the great discoveries in our field and previous generations of laboratorians were often made by the laboratorians themselves.

So, one example that we used in the Q&A is actually Donald Van Slyke, who was a PhD-trained chemist who actually went on to become the Chief Chemist of the Rockefeller Institute Hospital. Dr. Van Slyke was really one of the forefathers in our field. He’s actually most well-known for creating an apparatus to measure blood gases in patients, a technique that was not previously available.

Today, we order our electrolyte cartridges and our blood gas instruments and it’s really easy for us to do, and they didn’t have the technique, so he created one.

Another great example is Jack Ladenson, who actually created the first antibody pairs to CK-MB and troponin, which are both assays that are now used pretty ubiquitously in our hospitals for diagnosing patients with myocardial infarction, and these are really just two examples of chemists and inventors that recognized analytical needs in their clinical lab and then created a solution in their research laboratories that almost immediately translated back into patient care. So just something that we’ve seen a lot of historically in terms of our field and have really driven our profession forward.

Bob Barrett:

Okay. So, Dr. Zhao, what has changed for the practicing clinical laboratorian that’s potentially impacted their role in participating in research? And again, give our listeners some perspective on key milestones over the years.

Zhen Zhao:

So, as is described by Dr. Farnsworth, clinical laboratorians have played an important role in several areas. However, the modern day clinical laboratory looks dramatically different. Automated instruments and regulatory cleared assays have replaced the vast majority of laboratory developed tests and then removed the assay development from the hands of the laboratory.

The new laboratory structure also puts a greater emphasis on regulation and management, leading to increasing the clinical and managerial responsibilities held by the laboratorians.

Even in academic institutions, clinical laboratorians have limited resources and protected time for research and method development.

Nevertheless, laboratory directors remain in a distinct position to impact patient care and to bridge the gap between research and clinical application, due to their unique understanding of unmet clinical needs and technical expertise in laboratory testing.

Bob Barrett: Six experts with diverse research backgrounds were interviewed in this Q&A feature. So, what were the important takeaways for making time for research and balancing all of the demands for the modern day laboratorian, Dr. Farnsworth?

Christopher Farnsworth: Yeah. So, the experts that we interviewed all had very well-established research programs and they included Ann Gronowski, Fred Apple, Mari DeMarco, Yusheng Zhu, Paul Collinson, and David Sacks. These are all laboratory directors across both the U.S. and Canada and the U.K. that have varying research laboratories. And what was interesting about their perspective is despite geography and really their focuses being very different, was just how homogenous this answer really was for them. They’re all very similar and they all really had overlap with at least one other expert.

And I think you can kind of distill it down to three major points that they made by this group. I think the first one that several made was to really negotiate as much protected time as possible, early on when you first start a position, and make it abundantly clear to your immediate supervisor what your goals and endeavors are for research. And I think the rub for many new trainees coming out of clinical fellowships is that they don’t have sufficient funding from governmental grants at that point to really negotiate much protected time and startup funding for research, which is fair.

But I think that the response really given by this group is just make it very clear up front that I want to move towards doing more research, more translational research, more clinical research, and to just build your program slowly. Maybe you don’t start out with 50% protected time. Maybe it’s 10% or 20% or zero but in those cases, find some internal funding, build collaborations across your university, then start to seek some extramural funding as you start to gain more traction and start to get more notoriety, both in your institution and perhaps nationally. And then use that to kind of leverage for more protected time as you go. Dr. Collinson and Dr. Apple are actually very clear in these early stages. For them, it required sacrificing personal time to build their research programs but they were able to get their program to a point

where they were able to start to do more research in things that they really wanted to do.

The second major recommendation that these experts made was to really focus on building your team around you and there are various ways that they recommended that you do this.

The first was that you can engage trainees and be ready with projects when they come to you. The clinical residents, PhD students, whomever you have at your disposal, to have some ideas and things kind of percolating, and really engage them. That’s a great way to get projects off the ground but also have people help with data analysis and help with writing. Dr. Zhu actually strongly recommended that we also kind of leverage the clinical teams around us to know more about the problems. And it’s really tempting as laboratorians to sit in our labs and make sure things are running correctly, but he made really clear that he is out communicating with providers. He’s on the floor talking to people and as a result, he was able to generate interesting research questions and I think this is all part of our team and then you get to engage those people in doing research studies with you, various providers at your institution.

Some of the other recommendations that were made was that as you do start to build some sufficient funding, to build a team around you, a research team that can really help you multitask, such as a lab manager that can help optimize time and some of your academic pursuits.

Those were kind of the ways that they recommended that you engage people around you. And then really the final thing that we can distill down I think from the Q&A from these experts was that for them patient care always came first, regardless of how interesting a particular research question was, that was always the number one thing that they always came back to. Sometimes that patient care feeds into improving some of the research but ultimately, making sure that their clinical responsibilities were covered was the most important thing for really all the experts, I think.

Bob Barrett: Another interesting theme was their diverse pathways to research success of these experts, including areas and diversity of research focus. Dr. Zhao, do you believe that it’s important for laboratory medicine researchers to specialize within a focused area?

Zhen Zhao: So, we actually asked our experts a question: do you think that laboratorians should specialize within a focused area of research or be more diverse in their research efforts? So, interestingly, there is no consensus on this topic.

For example, Dr. Zhu advocated for diverse research as his research areas are very broad and evolved based on the clinical needs and research environment, but they are always under the realm of laboratory medicine. In contrast, Dr. Apple, Dr. Sacks, and Dr. Collinson strongly suggested to specialize.

Dr. Sacks said it is important to gain knowledge and establish a reputation as an expert in a focused area of research for a successful research career.

Dr. Apple recommended to become an expert on every facet of a specialized analyte. However, Dr. Apple added that this does not mean you cannot be a diverse research scientist. To echo that point, Dr. Collinson suggested that within the specialization, there are always opportunities for diversity, especially if there is the opportunity to use tests in a different way.

Dr. Gronowski and Dr. Demarco see merit to both approaches and suggest that laboratorians should do a bit of both. Dr. Gronowski recognized that laboratorians often accumulate a diverse spectrum of research topics and investigation of which can lead to discoveries that should be shared by publication. She thinks that it is also good for laboratorians to have one or two areas of research on specific topics so that they can form and test the hypothesis and really advance particular area of science.

Dr. Demarco believes there are advantages to build an externally funded research program specializing on specific area. However, it does not mean that you are forever stuck doing a narrow line of research.

For example, her research focused on protein biomarkers with an emphasize on clinical mass spectrometry. She rarely turns down an interesting clinical research challenge if this concerns on the protein biomarker and can potentially be solved with mass spectrometry.

So, as Dr. Apple mentioned, at the end of the day, either direction can work as long as your final product is quality and worthy of peer reviewed publication.

Bob Barrett:

Well, finally, Dr. Farnsworth, can you add your perspective regarding specialization in an area? And also, what do you forecast for the future of academic research of clinical laboratorians in the next 10 to 20 years?

Christopher
Farnsworth:

Yeah. I think Dr. Zhao’s kind of summarization of what our expert said, it was really a good one. I think the only think that I would add, I would hardly claim to be an expert myself

in the area of translating research in our field but I've really liked the route of trying to incorporate both, where you're really doing a focused area of research but also expanding out into other interesting problems as they come.

I feel like that's really great that you can kind of be known for a specific area but at the same time, really grow your brand in other areas. From a marketing perspective, thinking what do we want our brand to be? I think all of it is really laboratory medicine, right? But I think if we have that one specific thing that helps put us on the map as we expand into other areas, it's really beneficial.

And I think to discuss more as to what's the future of research and laboratory medicine, obviously predicting the future is impossible. But our experts did have some really great potential ideas for those. Particularly those involved with and centering their careers around some high impact projects, I think that was mentioned by several was really informatics and computation biology.

We've seen these even among our trainees at my institution. It seems like almost all of them have computation and coding skills which is a little nerve racking as – but the good thing is that we can lean on them to use those skills but there's just so much data that we generate at the laboratory that can be used for things like potential diagnostic tools like earlier section of sepsis, or even something as simple as detecting like instrument errors in real time. I think there's a really practical utility there that we can use some of our skills for and we'll see more of that in the future.

I think another area that I feel where experts really thought we continue to grow is detection of infectious diseases, particularly emerging diseases, the COVID-19 pandemic obviously showcased laboratorians' capabilities to develop and rapidly implement assays for newly diagnosing disease. I think we're starting to see a repeat of that now, right? With some of the monkey pox emergence in the U.S. and laboratories are already rapidly developing new assays for diagnosis.

One of the experts actually said that COVID-19 is likely not going to be the last pandemic during our career so being prepared for and really learning lessons from this one is probably going to be helpful.

And then finally, our panel of experts also noted a dramatic increase over the past 10 to 20 years in the role of, and interest really, in novel biomarkers for disease diagnosis and then monitoring even more so in recent years, and the trend that they would project all increase in the coming years.

So, we’ve seen continued development of novel biomarkers such as those emerging for traumatic brain injury, Alzheimer’s disease. I feel like there’s this holy grail searching for a biomarker for acute kidney injury, so I think those fields will continue to just explode and we’re also witnessing this repurposing of currently available biomarkers. I think that as laboratorians we’re really well-suited to help translate a lot of these research studies into routine clinical work.

So, I think kind of putting ourselves at the center of that and really being the ones that drive those forward, it’s just a really great space for us to consider working in, as laboratorians in our research setting, and especially because we bring that clinical expertise. But also we have – a lot of us have the scientific background to help bolster it. I think it’s going to be crucial for us, as a field, as we continue to kind of figure out what is the evolving role of the laboratorian in research.

Bob Barrett:

That was Dr. Christopher Farnsworth from the Department of Pathology and Immunology at Barnes-Jewish Hospital in St. Louis, Missouri. He was joined by Dr. Zhen Zhao from the Central Laboratory of New York Presbyterian Weill Cornell Medical College in New York City in this podcast on Critical Roles of Clinical Laboratorians in Translational Research and Applied Sciences.

A Q&A feature on that topic appears in the July 2022 issue of *Clinical Chemistry*. I’m Bob Barrett. Thanks for listening.