HEALTH INFORMATION TECHNOLOGY ADVISORY COMMITTEE (HITAC) INTEROPERABILITY STANDARDS PRIORITIES TASK FORCE MEETING

April 16, 2021, 2:00 p.m. – 3:30 p.m. ET

VIRTUAL

Speakers

Name	Organization	Role
Arien Malec	**Change Healthcare**	**Co-Chair**
David McCallie	**Individual**	**Co-Chair**
Ricky Bloomfield	Apple	Member
Cynthia Fisher	PatientRightsAdvocate.org	Member
Valerie Grey	New York eHealth Collaborative	Member
Jim Jirjis	HCA Healthcare	Member
Edward Juhn	Blue Shield of California	Member
Ken Kawamoto	University of Utah Health	Member
Victor Lee	Clinical Architecture	Member
Leslie Lenert	Medical University of South Carolina	Member
Clement McDonald	National Library of Medicine	Member
Ming Jack Po	Ansible Health	Member
Raj Ratwani	MedStar Health	Member
Ram Sriram	National Institute of Standards and Technology	Member
Sasha TerMaat	Epic	Member
Andrew Truscott	Accenture	Member
Michael Berry	Office of the National Coordinator for Health Information Technology	Designated Federal Officer
Wanda Govan-Jenkins	Office of the National Coordinator for Health Information Technology	Staff Lead
Denise Joseph	Office of the National Coordinator for Health Information Technology	Staff Lead
George Hripcsak	Columbia University	Presenter
Russ Waitman	University of Missouri	Presenter
Chris Chute	Johns Hopkins School of Public Health	Presenter
Melissa Haendel	University of Colorado	Presenter

Call to Order/Roll Call (00:00:00)

Operator
Thank you. All lines are now bridged.

Michael Berry
Thank you very much. And welcome, everybody. Thank you for joining the Interoperability Standards Priorities Task Force. I'm Mike Berry. I'm with ONC and we really appreciate your participation and input today. We have a packed agenda, as you've probably seen, with multiple guest speakers. We welcome them as well. We'll get started with our meeting with calling rollcall. So, when I call your name, please indicate that you are here. And I will start with our co-chairs. Arien Malec

Arien Malec
Howdy.

Michael Berry
David McCallie.

David McCallie
Good afternoon.

Michael Berry
Ricky Bloomfield

Ricky Bloomfield
Good afternoon.

Michael Berry
Cynthia Fisher

Cynthia Fisher
Hello, present.

Michael Berry
Valerie Grey. Jim Jirjis. Edward Juhn.

Edward Juhn
Here.

Michael Berry
Ken Kawamoto. Victor Lee. Les Lenert. Clem McDonald. Jack Po.

Ming Jack Po
Here. I'm here.

Michael Berry
Thank you. Raj Ratwani. Ram Sriram.

Ram Sriram
Present.

Michael Berry
Sasha TerMaat.

Sasha TerMaat
Hello

Michael Berry
And Any Truscott. Okay. If I missed your name, you're still dialing in, I will take note as I watch you dial in. So, thank you everybody, and I'd like to turn the meeting over to Arien and David for their opening remarks.

Introductions (00:01:44)

Arien Malec
Good morning, afternoon. David has done most of the work here. This is an exciting line up. Really lining up to discuss the use of EHRs for what we used to call, and I guess we do still call the learning system. I think our experience over the last year has shown that even though we have a very large penetration of EHRs and EHR source clinical data, it was the UK that did the lion's share of adaptive real-world clinical trials, studying the effectiveness of things like convalescent serum or possible antiviral agents. The U.S., comparatively, I think, did a fantastic job of sponsored clinical trials, but that kind of real-world learning from on the ground experience, real-world evidence, and clinical trials in the comparative effectiveness or utility of particular agents at that level of time and that level of time scale and that level of adaptability, we haven't had the capabilities for. We have a great panel today that has done a lot of the lion's share. I'm going to turn it over to David, who's done much of the work here, to line up the questions that we want to frame up for these panelists to think about. How do we take the work they've done and potentially expand it broader nationwide.

Improving the use of EHR Data and Staging Questions (00:03:28)

David McCallie
Thanks, Arien. The agenda for the meeting is roughly the three presentations. We'll hear from George Hripcsak about OHDSI and the work they're doing with mapping between OMOP and FHIR. We'll hear from Russ Waitman about the PCORNET. And we'll hear from Chris Chute and Melissa Haendel about the N3C project. We've asked each presenter, each of the three groups to try to limit their time to 15 minutes so that we can have plenty of time for discussion. I think probably the best approach would be to get all the presentations, and then have the discussion rather than to intermix the discussions. But if you have just an absolutely burning clarification, raise your hand, and we'll make a decision on whether to acknowledge you.

Next slide. A couple of boiler plate slides that we'll go through. These are the participants in the task force. Next slide. For our guests, we did a prioritization of potential areas for standard priority, and our top vote getter was health equity standards, which we've been working on. The second top voter getter was real world evidence comparative effectiveness, EHR dating use, the learning health system that Arien just described. So you guys are currently in second place, but if you really dazzle us with your presentations, maybe you can move up to first place.

Next slide. I think I have introduced our guest by name. Here's their title, as least as best I could determine from the web. This is an august group. I can't wait to hear what they are doing and what they have to say.

I've spent much of my career looking up to all, except Melissa. Melissa is new to me. Chris, Russ, and George, I have looked up to you and your work in the academic community leading in health and thematics.

Next slide. As Arien mentioned, to try to get everybody on the same page, we sent an e-mail to our guests setting the context for what the standard priority group does, which is to, as it sounds, prioritize standards development work. And so, the questions that we sort of suggested they think about answering are related to how standards could improve the ability to do this learning health system real-time or near real-time and aggregation of clinical data.

So based on what worked well, tell us about that. What would improve your ability to aggregate EHR data for research? How could the process be made faster, so those times we have a crisis on our hands such as during COVID, we can get knowledge turned around faster. We would be interested in how you think this could be scaled up and scaled out. In particular scaled out to smaller sites, ambulatory, LT Pack, etc. We had a suggestion from one of the task force members that the topic of quality and reliability of the data might be of interest. And then, since we are advising the regulatory functions of ONC, what role, if any, do you see for the bulk FHIR certification requirement that goes online for the vendors in January of `23. I think that's correct. And what role for the full unstructured EHR data dump, or nonstandard EHR data dump that would go online in 2024, if you have thoughts about that. Feel free to talk about whatever you want. You're here to tell us what we should hear. Those are some of the things that are on our mind. Next slide. George, it's your show for 15 minutes.

Arien Malec
And I'll be time cop since David is emcee. So, be warned.

Presentation on OHDSI and OMOP/FHIR (00:07:38)

George Hripcsak
Thank you, David, and thank you for the opportunity. I'm George Hripcsak from Columbia University and New York Presbyterian. I'm going to be talking about OHDSI. Next slide. The mission of OHDSI, Observational Health Data Sciences and Informatics, is to improve health by empowering a community to collectively generate evidence. And Columbia happens to be the coordinating center. Next slide. This is the OHDSI network, 300 collaborators from 30 countries, and health records on 600 million unique patients, which is nearing about 10% of the world population. Next slide. We generate evidence. I'm going to keep coming back to this theme. We characterize things, we test hypotheses, and we do precision medicine that is predicting patient-level medical conditions. We're an open science effort, which is not just open source, but everything we do is open. Everything immediately goes to the internet. When we generate evidence, the internet sees it before we do.

Next slide. How do you get health records on 10% of the world population? You don't. You leave it where it is. It is a distributed data base. You convert your data to a common data model, most of the theme of this talk. You distribute a query around the world. You collect the answers, and you collaboratively interpret it and publish it. Next slide. I don't want to preach to this choir, so I'll just say the data comes in in all form, both within the nation and around the world. Next slide. And we need the common data model to bring that together. And I'll go into more detail. Let's go to the next slide. OMOP Cumulative Model, Observational Medical Outcomes Partnership is our former name. But we decided not to make the mistake take that Microsoft made, and we left our name as dots instead of changing it to OS2. We didn't want to confuse

people and stop calling it OMOP. We have a schema, a vocabulary, conventions, all managed by an open committee structure. Next slide.

It's a deep information model. This is the schema. It's designed to be accessible. It is kind of like FHIR when that was invented, so that it could be easily recognized and understood. So our schema is similarly designed. Vocabularies are a critical part, especially when you're doing research around the world. Next slide. So, we have nine million concepts in our vocabulary, mapping from all the vocabularies around the world, mapping to the standard like SNOMED, RXNorm, and LOINC. I'll actually go into that in more detail on the next side. RXNorm only handles U.S. medications. If the medication is not given in the U.S., it's not there. So we run our RXNorm extensions, which is paired with the nationalized medicine to RXNorm and does all the other drugs. We use LOINC, and we convert everything to SNOMED CT. Even the ICD 10CM, although we always keep the initial version of the data, the source data, and then we also do the conversion so we can map it around the world.

In some areas, we're adopting several standard terminologies, like in procedures we're still stuck picking from the menu of the terminologies that people happen to pick it in. That's one thing we need to solve. Conventions, as people in this committee know, just because you have the standard schema, and then you have a standard vocabulary, everybody decides to convert their data slightly differently. So a lot of our work is in the convention, which says if you have a death diagnosis, what do I do with that? Where does that go? How do you interpret that? So, a lot of our time is how you convert that meta information, information that's important to get to a truly common central standard. Next slide.

Then we have tools that I'm going to be ripping through pretty quickly. You need to prepare your data. We offer a set of tools to get into the OMR common data bottle. Next slide. Data qualities is where a lot of our time goes. This is our dashboard. Next slide. Vocabulary support, this is how we traverse the etymology and find those nine million terms. Building cohorts using those terms and putting in temporal definitions. Next slide. Visualizing those cohorts. And finally, next slide, running analysis to do the actual research now that we've defined all our medical concepts. Next slide.

Now I'm going to talk about what we do with this. Let's go to the next slide. I'm going to give two examples. I don't want to go too much into the evidence we produce, but you'll see why I'm doing this toward the end of the talk. So this is on the left 2017 U.S. guidelines for hypertension treatment. There's also a European guideline that came out the next year. 58 drugs, supported by 40RCTs. The circle on the left lists those 58 drugs. The aux represents where we have evidence. But we make statements about all of the drugs. Therefore, most of that guideline is an expert opinion. So, we talk about evidenced based medicine, but our guidelines are actually based on expert opinion with a little bit of evidence thrown in. What can we do to help that? it's observational data. We have to interpret it with caution. But it is perhaps better than expert opinion. We ran a study, and ran a half a million studies to fill in that gap. And on the right, you see where we filled in the evidence gap. Next slide.

The data was published in various journals, Lancet, JAMA, Hypertension JAMA, Internal Medicine. It mostly supports the U.S. guidelines. So, expert opinion is very good, as far as we can tell. We had a couple of surprises related to ACE inhibitors, and which diuretic is best. Those are published in the Lancet and JAMA Internal Medicine paper. The JAMA paper is about a cardiac procedure, it's related. The evidence is beginning to be incorporated into practice. You see the medical letter in the background in the upper right where it's beginning to come into effect. Next slide.

COVID-19 research, that was and emergency. We now have 4.5 million COVID-19 patient records from around the world. We started off with academic medical centers. Those were the ones that were able to pivot most quickly and generate data for COVID so we could start generating evidence. We use data both from electronic health records and claim data aggregators. From the EHR, data are derived from clinical warehouses. We didn't yet use the FHIR. Some of them may have, but for the most part, it was traditional clinical data warehouses. We also use government databases.

In the last year we generated 41 studies that are either published or some minority are still in the review stage. Let me highlight a couple of them. Anyone can generate a lot of papers, the question is what effect does that have. One was on the safety of Hydroxychloroquine. It was given both to the European Medical Agency, that's the European FDA, and our U.S. FDA. The U.S. FDA doesn't tell you as much about how they used your evidence but the EMA publishes their evidence trail. So, the OHDSI study on hydroxychloroquine safety was one of two studies they used to come against recommending warning about the use of hydroxychloroquine, not just in the treatment of COVID-19 but in prophylaxis where you give to 100 million people. That was later published in Lancet Rheumatology.

Another study was on ACE inhibitors and susceptibility to COVID-19. It was feared that ACE inhibitors and ARBs might make you more susceptible. The other theory is it might make you less susceptible. That was published first on The Archive, used by the EMA in its determination of the safety of those drugs, later published in Lancet Digital Health. I highlight that the EMA, that bottom section, points out this study in part because of its database and it's network, so it's very relevant to the standards and the example of how other researchers should conduct this kind of research.

More recently, COVID-19 vaccine safety, remember March 11 to 15, 13 European countries suspended use of the AstraZeneca vaccine for fear of blood clots. 20 Million persons were vaccinated. On March 18, the EMA determined that the benefits outweighed the risk. There were 400 almost 70 Thrombosis Embolic events of the general type. It was determined that that was actually less than they expected on average. But there are rare cases, DIC and Sinus Thrombosis were smaller number of cases but probably above average. The numbers that were used in that determination were generated by OHDSI as shown below. That med archive paper is still under review and was part of that March 18 determination.

So, we have been able to pivot quickly and generate evidence that has affected policy for tens or hundreds of millions of people. OHDSI has also partnered with the FDA for biologics evaluation and research. We were carrying vaccine safety message research as well as doing studies.

Now, back to our use of our common data model. Other people are using our common data model. As I mentioned, the FDA is using our model in its vaccine safety program outside of our use of it. The All of Us research program is based on the OMOP common data model. The Emerge Network is similarly based on the OMOP common data model. You'll be hearing more delightful detail in a few minutes about N3C and its use perhaps of the OMOP common data model. There are also strong collaborations. You'll also be hearing about PCORNET when we collaborate with some for the PCORNET Nodes, start with OMOP and convert them to the PCORNET model, synch for science and so on.

Now, let me talk a little bit about the HL present OHDSI partnership. We announced on March 1 the organizations will align their standards to capture data in a clearly defined way into a single common data model. This will allow clinicians as well as researchers to pull data from multiple sources, compile it in the

same structure without degradation of information. We're early in that partnership and still defining our joint working groups and scope. We're starting with existing mapping work. And I just highlight a few Georgia Tech, Eden, Vericom, LYDM, Denmark, different projects that have been mapping between the two standard, FHIR and OMOP to make it so that it's easier to get data out if you happen to have an OMOP database to support FHIR applications. The range of what we can accomplish is varied. I think the least we want to accomplish is this mapping. But we note that we have shared knowledge engineering.

When we go to new area, OMOP has experts and FHIR has experts. And we're each doing all this work in parallel. Rather than do that, we hope to merge that more, so we do one semantics, perhaps using two different syntaxes. And perhaps moving as far as a common standard, which is alluded to in the paragraph but not promised yet. We want to say strongly that we welcome the feedback from this committee as we move forward on this.

Arien Malec
One-minute warning, by the way.

George Hripcsak
Thank you. One message to this Kennedy Research, it's not an afterthought. It drives healthcare and saves millions of lives. Jonas Salk invented the Polio vaccine. No one remembers his billing records. If it weren't for research, we'd be billing for leaches and doing it very well. We'd know how many leaches and how healthy they are. But it wouldn't be doing any good for patients. So, perhaps after patient care, research should become paramount and billing should make do. You can store data, or you can generate evidence, but you can't do both. What I mean by that, your mission has to be to generate evidence. If your mission is to store data, you'll end up with a data store. If your mission is to generate evidence, you will do that and store data as a byproduct as a means to the end. Therefore, there needs to be a tight coupling in the enterprise between evidence generation and standards development. OHDSI does this through its governance structure. You need analytic standards as well as data standards. How you analyze the data is just as important. The standards need to be tightly connected to the community. And we use open source as our basis to be connected to that community.

It is not magic. Someone has pay the data quality price and all of our research program. We found that conversion is best done as close to the day of generation source as possible. So, a FHIR dump of data is a good thing. But if it just goes to a distant central warehouse, it's going to be tough. We like having the generator do as much data quality assessment as possible. Five percent of the world's population is the U.S. Continued focus on U.S. only standards hurts U.S. citizens. Modeling causes incidents of data hungry. We cannot answer most questions just on the U.S. population. If we want to answer most questions, we need that 20-fold increase. And then the final slide is just to end on. Thank you very much.

David McCallie
George, this is David. Thank you for a whirlwind tour of a massive amount of information. I can't wait to go back over the slides now that I've got the big picture. One question, I'll take co-chair's prerogative to ask, you touched on it at the very end, but it was unclear to me where the mapping occurs. When you say you have 300 sites, does each site do their own mapping? Is it submitted and reviewed? How does that work? How do you distribute the mapping problem?

George Hripcsak

For the most part, we try to push the mapping as close as possible to the data generator, so the academic medical centers do their own mapping, yes. In some cases, there's a data aggregator, a commercial data aggregator, often EHR. They collect the data first then it goes to Optum. It's aggregated into one source and then turned to OMOP. So, we use whatever is most possible. But say the All of Us Research program where we have experience with both approaches, we know that we get better data quality in so far as the data can be a little bit closer to the source. That doesn't mean you can do it centrally and communicate with the source as is done at M3C. And we've collaborated on that. But in general, we want to get it as close as possible because the conversion to the OMOP data model is the easy part. It's the data quality assessment that's the hard part. That's what takes all the time, in general.

Arien Malec

David, why don't we move to the next presentation and pick up questions at the end.

David McCallie

Okay. I'm too easily drawn into the rabbit hole.

Arien Malec

I'm restraining myself, too.

David McCallie

Our next presenter, Russ Waitman from University of Missouri. Russ, go ahead.

Presentation on PCORNET (00:24:11)

Russ Waitman

Hi. Thanks so much. So, again, thank you for inviting to us to the talk. I'm going to give largely a PCORNET but also a CTSA perspective of many years in the CTSA world. Just as a way of disclaimer, I mainly receive honorariums. I'm on the board for the Association for Clinical and Translational science. And I've newly joined the **[inaudible] [00:24:34]** in October. I also work together with Cerner Corporation on a public private partnership, but do not receive any compensation from Cerner. More importantly, this is a big deck. I put a lot of material at the end that I'm not going to talk against because if you're interested and further intrigued, you can look at the information. But if you need any further information, glad to share my email and follow-up with people.

So, I'm going to go back to CTSA world. I was at Vanderbilt for a long time and came to Kansas in 2010. There we were pursuing a CTSA award. I'm going to assume everybody knows about the National Institutes of Health Clinical and Translational Science Awards. And so, our fundamental emblematic central aim was creating a data platform that I named Heron because KU has a bird as a mascot and our executive vice chancellor was a birder. So, just like the heron goes fishing, and everybody accuses us informatic data people as data dredgers or just going fishing. So, similarly, you've got to tell everybody, you've got to get a license to get data, you've got to get a fishing rod or bass boat to go pull it out, and then you've got to know what you're catching. So, you know if you're catching a bass or a catfish. But fundamentally, the researcher wants lots of fish. They want lots of different types of rich data.

Note in my comment about knowing what you're catching, we knew we wanted to map to the NLM, and this was a while back, to the medical source, but when you're local, that's often a secondary goal. So, then after one year you can kind of say we got DNA governance in place between non-profit hospital, non-profit clinic foundation and university, people agreed to share data with the university. And we can start doing queries to see how many people have diabetes with a high hemoglobin A1C and are a part of a volunteer registry to be contacted directly. And that's great and that starts taking off.

By the time we're hitting 2013, we built robust reliable ways to build on top of this I2B2 tool that I assume most folks are familiar with to do data cuts, to then cut data, give datasets out to customers, let people query it, query it locally, but now with N-Cap Act and other methods, query it without any informatics we need in the middle to find out what's happening around the country. And that process has been refined over many years. We find most of the requests are for identifiable data. About a 40/60% split was my experience in Kansas. And it is probably likely about the same in Missouri, which I think really reinforces George's observation. You want to get that stuff happening close to home because the people with the boots on the ground are supporting the clinicians there and clinical researchers there. And often times, they have full rights to go back and talk with their patients and find information, as well as can help you uncover data quality problems.

Another thing to notice in this picture is in that first grouper, Grouper No. 1, defining this sub population, it's using a flow sheet measure on total stroke score. And I am embarrassed to admit that is not mapped to LOINC or SNO-MED. But for the clinicians in that environment, that is the key variable that helped them define their population. So, a lot of valuable data to support people in their communities is not always codified to national standards.

So, then we move along, and this is what happens. So, you're the informatician and you're talking to your clinical researcher and you say, "You wanted anchovies on your pizza. I got them pal. I got them in a big bucket of data. You don't have to go around with your residents at night and hand them **[inaudible] [00:28:05]**. And then, people like George come along or people who know of George and they say, "Ah, that's great but I want to use Guy Fieri's study design recipe. And he is so charismatic, and he is going to spellbind the study section, the journal editor. So, I have to be in the All of Us Pizza making initiative. We can't be part of that." So, Guy, aka George, says, "Well, my recipe is the best, but it only works if you make your oven according to my specifications. And then you've got to sort and tag all your fish and put them in my special jars in ontology."

And then the institution and the vice chancellor of research and the informatics guy are scratching their heads because they're thinking, "Do I have to make separate ovens and jars for each national initiative?" So, this is a problem. We're highlighting that thing is when I was serving up fish locally it was fun. And it is still fun. But when I have to do this stuff where it has to match up nationally and I have to pre-coordinate the data, that becomes hard in several ways. So, that hits right about the time that PCORNET got announced as a fundable opportunity. So, a lot of us that were doing this work got excited about the chance to create a national network which is now a reality with somewhere over 66 million lives, about 30 million people where we got data accessible for trials and can contact people. So, I'd say the big distinction off of PCORNET has been it is hitting on both sides. It is trying to serve up observational data. But equally, and perhaps more importantly, it is trying to connect with patients and clinicians to design studies that actually recruit people post-speculatively as well as retrospectively.

So, the PCORNET for example, here are three examples. There are slides later on in the deck if you want to read specifically about them. But you may be doing a mid to small sized study. If I have patients on a new heart failure medication, can they achieve better symptom outcomes than with their former treatments? So, we can look at data retrospectively to find patients with this medication switch and enroll them prospectively and collect patient reported outcome measures to see how their live experiences on the drug and do that study faster than anticipated. We can also do retrospective work to say let's look at all the people who have had three types of bariatric surgery and say what are the pros and cons of the three approaches? And what looks like the best one for weight loss but perhaps there is a tradeoff in terms of rare adverse events. And then we can also do a kind of a mid-zone thing, a large prospective study where we randomize patients two doses of aspirin to figure out what is the right balance and effectiveness in bleeding if you've had a heart attack.

It starts with data. So in the PCORNET, largely, the data is sitting at each site. Although, there are some centralized networks like one in Florida and Reach Net and Insight, which George is part of, that consolidate data centrally. So it is a hybrid. I would say much of the mapping takes place in most CBRM sites at home, at their home institutions, similar to George's observation. The big thing I would say from the PCORNET emphasis to me that I knew going in was going to be painful but is really well out of the value is, although it is always a never-ending voyage, is it does foundational curations. So, there is a heavy focus on quality checking. What am I observing? Are people at least meeting a minimum bar standard in terms of their data mark? And then every study comes along and knows that it is likely going to need to be looking at studies specific elements to figure out if the data is fit for use for their specific study. And that's a continual activity.

There are later slides that show how the number of checks we run have increased over time, as well as the number of sites improving their compliance with these checks. Those could range from things that we would all think of like how much of your labs and meds map to LOINC and RX Norm. But they also can include things like you have an EHR system, but you really bill out of a separate system. What is going on if you can only tell me about medically related items in the EHR, but I am completely blind on billing diagnosis or on CPC procedure codes to understand my sub-population.

So, to just give you some nuts and bolts, there are some other examples of this later on. But what you'll see is often times people may have an EHR. They may even have a billing system which could even be split between ambulatory and in-patient. And then they'll have ancillary systems. And then they'll have a variety of ETL processes that may either put this into reporting warehouse or multiple warehouses. And then it may flow down into one research data warehouse, which could be OMOP, then push it into a secondary data warehouse, which could be the PCORNET. Or it could be flipped the other way around. People may populate their PCORNET first and then make their OMOP. That doesn't happen as much. But you will have cases where people do I2B2 first and then one or the other. But that is kind of the more complex workflow. Not everybody is that complex, but just to give you a feel for how things flow.

The PCORNET 3.0 just had an announcement for funding where we all submitted last week. Just to highlight, not all the highlights, but there was a renewed call for supporting federal agencies and their research portfolios. Notable, the PCORNET mobilized incredibly quickly in the spring of last year, starting in March, where everyone started updating their data marks on a weekly basis so that by April, May, we could be providing statistics to CDC directly and then started contracting with CDC in the spring. And there

is continued funding for the Centers for Disease Control to use the PCORNET for disease surveillance for the COVID efforts, which is kind of a common spirit because the PCORNET data model was built on the FDA Sentinel data model. There has always been a hope of increased collaboration between both efforts. FDA Sentinel also contracts with the PCORNET sites going forward.

There is a continued call for diverse populations with as completed data as we can get, embedding research in the workflow, MLP. So, we're all interested in things like rate cap on FHIR as a vehicle for supporting trials. There is an interest in quality and adaptability that we have of managing identifiable data to go back to source to resolve issues, and then linking data assets with Datavant using privacy preserving record linkage.

So, how is it going? What do people think? I email people. I say, "Hey, what do you think about this meeting? Give me some things you want to throw in the FHIR." So, Keith Marsolo at the Data Coordinating center at Duke says, "Love FHIR. Love all the stuff ONC has done. But what confidence do we have in any of the mappings? If we ask for all the data, how do we know we're getting all the data?" So, I love this as much as anyone else, but if we are not looking at quality and the whole picture, we may have challenges when you think about things. Chuck Brown up at Harvard, closer to George than Keith, seconds his impressions, "Standards are great, but they won't give us reliable data in the system. If we keep thinking about supporting CDM transformation, that is not where the action is. I really recommend we work on developing FHIR verification and characterization tools.

Ram over at Utah, very focused on PROs, capturing patient's centerness is supplementing the EHR. We really need to think about fair data principles of interoperability of this type of data with the larger data ecosystem, to paraphrase him. Paul Haros, he's done a lot of work on this with FHIR rate cap stuff. He's working on more standards. "Both FHIR sounds great but I can't figure out yet how to operationalize it, so I don't have much insight there. But Les Lenert is amazing and he is supposedly on your call. So, he will let you know more there."

Tim McClay who works very closely with HL-7, his concerns are, "A lot of this oversight with HL-7 doesn't have funding to really support it and engage it." And we are focused to date, to echo George's last slide, on things driven by administrative billing and quality reporting requirements. That is not clinical insights that as we move to precision medicine are going to be increasingly important. So, that is a real challenge there. So, you can read Jim's comments that were overly weighted on the financial and regulator rather than clinical elements.

Arien Malec
Three-minute warning.

Russ Waitman
So, my observations, we want all the data, especially for research. And we wanted it about our health and our patient's health. But if I am putting on my health system hat, I want to know how my team is doing or how is my health ecosystem working broadly. We are a rich, robust, diverse country, perhaps more so than many other countries in the world. Although it is great to have OHDSI covering the real. If I am a patient, how is my health team batting? If I swap in another second baseman or I change towns, how is the team there? If I manage a team, if I want to use a different bat, what is the impact going to be? Or how well do I

partner with people outside of my care team, whether they are primary care providers, or I am a primary care provider referring to a specialist for my patient. If I am a clinical researcher and I know we don't have the bat or glove for some plays, how do I devise new technology and know it is effective. And if I am a broad researcher, health is a complex game and we don't even just play baseball or understand what we are playing half the time. So, how do we advance our understanding of optimal health or in my horrible analogy recreation and sports fan happiness?

So, I think we are fundamentally behind schedule on the billions of dollars we've invested. FHIR's response ARGONAT has been a laudable attempt. Our domain is very complex, though, in comparison to Tel-Com and finance. I think we are in a phase of interoperability standards without measurements and improvement. It doesn't hit the mark. That is analogous to a lot of focus on evidence-based medicine protocol development without doing any measurement of numerator and denominator. So thus, we are flying blind a lot on what the real impacts of data and data quality is. So, if we are going to marshal data to advance research, I think we really need to look a higher level up at how we work in concert with our states and CMF to understand are we getting gall the data. What is the true numerator and denominator for data that is numerator compliant interoperable data relative to total available data.

I think the business of only focused on pre-coordinated standardization has to be complimented with the late binding and analysis that let us look at the overall environment. And there has to be some changes to incentivize data flow. I think often times blocking is viewed as a horrible vendor problem when in fact it is kind of a system bias because we are highly regulated. And when you are in a health system, often times, you always get in trouble, you are under resourced. That view that it is all malicious may not be true. But that has got to be addressed. So, very much, David, I think this issue of big data dump and really exploiting that combined with incentives at a higher level can be very important for healthcare going forward. Thank you.

Arien Malec
We are at time. This has been fantastic. Thank you.

David McCallie
Thank you, Russ. Thank you, especially for including those detailed emails from your peers. Going through those when we have time, I think will generate a lot of good ideas for us. So, our final pair of presenters is Chris Chute and Melissa Haendel. Guys, I assume you are online and ready to go. It is your show.

Presentation on N3C (00:40:01)

Chris Chute
We are indeed. And thank you for inviting us. I am going to start. We are going to tag team, Melissa and I. This is the National COVID Cohort Collaborative. It is a consortium of people around the country contributing data to a centralized repository from EHRs and common data models so we can all understand what is going on with COVID. It started very quickly. You can see it was spawned by the COVID epidemic, of course. But we did start in April. We had about 200,000 patients after our first data transfer agreement in May. You can see the growth and acceleration of this process increasing the numbers of data transfer agreements, data use agreements, and analytic approaches and participants. We are actually at five million patients with 1.2 million of those being COVID positive. We have 5.8 billion rows of data in the centralized data set. And you can see the distribution of other parameters of that data. That is coming from 50

organizations at present. 88 organizations have signed the data transfer agreement. So, we are a little bit more than half the way of getting people to sign up with us. We have a pretty wide national distribution, as you can see on this map. We are continuing to have people participate.

On this, we have 29 domain teams that are contributing in terms of analysis. George is correct, our goal is not to create a data repository. Our goal is to identify the evidence. And we are pivoting now towards focusing on our self-organizing domain teams, examining specific questions. It is important to recognize that we built this on the actions and success of the common data model community, specifically OHDS X, Trinity, and HL-7 FHIR. We do a combined manual mapping of those disparate data models into a common model, which is OMOP. And then we execute that model at scale to do an industrial transform of weekly dumps or deposits of data from other organizations in those common data formats. We anticipate having an HL-7 FHIR pathway directly, but that is not yet implemented. That is a future goal.

We have the distinction between centralized and federated data networks. Most of the common data models, as have been described today, are federated models. And they are extremely successful and add a lot of value. We have taken an alternative approach, which is to centralize the data. That also has advantages and disadvantages. We think these are not mutually exclusive mechanisms. We think they are complimentary. And Melissa is going to show an example of data quality improvement that is only possible with centralized data.

In terms of the normalization pipelines, we start with more than 100 contrasted transformations and over two million semantic transformation between and among these data model. Each of the contributing sites has a pipeline with these transforms wired in. They can be monitored and managed centrally on our enclave platform. At each site, data health and data quality is validated and established each time. When we discover concerns or problems with contributing site data, we iterate with that site to improve data quality pipelines so that we are ensured of getting as complete of data as possible and as high quality as possible. I am going to turn this over to Melissa. I can't hear you. There you go. Are you muted on your phone?

Let me just pick up what she was going to say. Speak up if you can, Melissa. This is an example of data harmonization where we have canonical units and target units and units that are submitted. But in many cases, for example, these are different laboratory measures, they came in with no unit of measure. The unit of measure was missing. We were able, looking at the distribution of the data across all sites, to make fairly reliable inferences about what the unit of measure should be for depositors of data that had information within the specific range. For example, whether it was kilograms, whether it was pounds in terms of weight. Whether it was degrees Centigrade, whether it was degrees Fahrenheit. And from that, you can see on this graph all that blue data was more or less rescued, that would have values that would not otherwise be interoperable absent a unit of measure that we were able to infer precisely because of the underlying distribution of the data.

Melissa Haendel
I'm back for a second.

Chris Chute
Oh, you're back. Please, go for it.

Melissa Haendel

I'm in a rural place and on the phone. My apologies. Thank you for jumping in. So, that great example is just one example of how we can actually leverage the work both at the individual site level as well as the aggregate data level. So, what I wanted to do was spend a little bit of time unpacking some of the actual things that happen all along the way. We were given the task of today really talking about what were some of the recommendations that we have from our lessons learned in creating the NC3, which, as Chris mentioned, the very unique resource in having aggregated and harmonized data from so many different sites. So we are already standardized according to one of the common data models. So, if we think about what do we mean by standardization, there's a lot of mapping going on. And the word mapping has been mentioned many times already today.

So, first of all, we have our source terminologies and our code sets. We have different organizations that I'm calling in quotes here "Mappers." So, we heard from George about the OHDSI terminologies and how they harmonize and bring together all the terminologies. But there are many others like the UMLS or the NCIs Enterprise Vocabulary Services. And then we have coded data, data that comes from sites that has been transformed using those terminologies and code sets. We also have a lot of trusty local data that has local codes or local code sets or data that has yet to be represented content wise in any given standard or terminology. And then at the other end, we actually create unified code sets to unify things because even though things might be coded, different sites still encode their data differently. If we want a unified definition of diabetes, for example, it might not be one code set or one terminological entity in any given terminology

So, there is really a lot of different transformations that go along along the way in all of these contexts. So, I will show you an example of why the actual mapping is problematic. Every one of those mapping transformations that happens can be lofty. So, we have too many mappings. We have too many combinations of mapping. The mappings are frequently conflicting. They are frequently stale. The semantics of the mappings are often unclear. Are they equivalent, exact, broad, narrow, related? Without precise equivalence mapping, merging the data across systems is very challenging. Almost in all cases we do not have enough information about what rules or providence were used in the creation of those mappings. So, what you end up with is N to the second order minus N sets of mapping. So, everybody is mapping to everyone without the full providence chain. If we really want to think about addressing standardization, we really also have to address the mapping problem in terms of all the mappings that everybody has to do in order to transform the data into common format but actually can provision that evidence. And that evidence then depends on the robustness of the full chain of providence for all of those mappings.

On the next slide I will show you what that meant for us in the context of N3C. So, this is the same slide that Chris showed. But here I want to show you all the potential spots where that lack of providence and evidence for a mapping can be problematic. So, the first case is the example that we saw that Chris did on my first slide, on the example of the units and the data quality issues. So, while I agree with George, that is absolutely necessary to have those people who are closest to the data performing data quality, it is not sufficient to ensure data quality in an aggregate harmonized form across the whole ecosystem. I think that applies to both the context of the distributive networks as well as in the context of the N3C harmonized data. It is just that we have been able to see it in a different way at this scale that really hasn't been possible before.

One of the biggest recommendations that I have is that first arrow, local code to CDM terminology code set mapping is really fundamental, helping sites with tools that will really support the way in which individual sites manage the mapping of their local content to a CDM. It is really critical. This is one of the major factors blocking the useful deployment of Bulk FHIR in my mind. The second spot is the field value set mappings to OMOP. So, we necessarily have to then map all the content that we get from all the CDM to OMOP. So that's a place where as fishers, we actually, in the context in the enclave that we have, have had the opportunity to have bulk providence in our graph structures for every release. And it has been a really, really wonderful resource to be able to look at it from that lens.

Then we have terminology mappings to OMOP concepts. So, we have the challenge of having to map to the OMOP terminologies. And for better or for worse, the rational for those mapping isn't necessarily as transparent to us as we might like. That is something we have been working with the OHDSI team on advancing. But also, it may not be the same as what was done in the prior two arrows that I showed you. So, we may have differences in mapping from ICD to the OMOP concepts that is actually represented by SNO-MED and then having to map that back to ICD can be lofty.

Finally, on the other end, we have the necessary creation of code sets because not everybody, as I mentioned, would necessarily encode diabetes in the same way. So, if we really want to have attachment of all patients for our evidence and analytics, we need to actually be able to create code sets. Those also require evidence and providence for their mapping. So, there's four places where mapping can break the pipeline of evidence generation. So, my recommendation is to really think hard about how do we systematize the way in which we capture providence and the way in which we perform the mappings and equivalence determination, and the way in which we share that information all along the pipeline so we can be assured that the data that we're analyzing at the other end has the robust quality that we need.

This is just our overall takeaways. So, what the N3C has revealed to us most, in terms of the needs and our recommendations to ONC in terms how can we advance interoperability, we need both cantactic and semantic interoperability. The FHIR to OMOP is fantastic but we absolutely have to have common vocabulary and code set mapping providence and management strategies, which is really what I just presented, which is really the semantics. And we have to approach data harmonization from the lifecycle perspective. We need to think about all the different steps and how they can be themselves harmonized so that we are not doing mapping with different recording of providence in one place from how we're doing mapping with providence in a different place.

We should leverage the USCDI, but we should build out that for interoperable semantic modeling and extensions to enable local codes to be computed on in an equivalent manner. And also to include more translational content that can allow us to do research in new areas. By limiting the technologies to only the USCDI, we actually diminish our ability to do research in very specific areas, for example, rare diseases. But at the same time, we, of course, absolutely have to have the USCDI to retain the core nucleus of interoperability. So, finding the right balance using interoperative semantic modeling and extensions for that is going to be key for the future. With that, I think it might be time for our discussion.

Discussion (00:54:27)

Arien Malec

This has been fantastic. David, do you want to tag team with chairs for other questions. And then I'm sure our team is going to have a ridiculous number of questions.

David McCallie

I hope they are getting their questions ready. Let me start off. There is so much information to ingest and think through that my question may not make sense. Once I say it I may decide I didn't mean it. It looks there are at the current state of multiple successful endeavors doing this kind of work, there is more than one starting common data model, let's call it. We have OMOP. We have the PCORNET's model. We have I2B2. There were several others listed in Melissa's slide. This, broadly speaking, is that a good thing or should there be an effort to try to get to one staging model, if you would? I understand the research demands will do different things with the data. But does it make sense to have one staging area? Or is this diversity actually a strength of our system. This is a high-level question, anybody who wants to weigh in.

Chris Chute

I am going to weigh in on that one if I may. As a chief research information officer at Johns Hopkins, I oversee creation of multiple data models. It is somewhat ironic that we call the common data model, we have a plurality of common data models. I oversee the transform into four of those data models. Russ is correct, sometimes they can be chained. And sometimes it is awkward to chain them. It is often, as Melissa pointed out, a lofty transform. And you just introduce another loss point along the way as a pragmatic reality. But it is very costly to maintain multiple data models. I think the energy that we as a research community put into analyzing, managing, maintaining multiple common data models is inefficient. I think there could be a strong argument that taking a robust, well-supported, well adopted data model, none of them are perfect, I would add. They are going to remain that way if we continue dissipating energy across them rather than focusing energy on a single common analytic research data model.

David McCallie

Other opinions? Thank you, Chris.

Russ Waitman

This is Russ. I would say it is less a technical issue than a golden rule issue, which is he with the gold makes the rules. We have had this thing where I would say there is a perspective that OMOP or especially OHDSI more dense towards pharma than the PCORNET because Rich Platt had the coordinating center grant from FDA. He wanted to build on the FDA piece. Then I2B2 has been around from a Harvard perspective. I think if we look at it form an honest perspective, because many of the sites contributing to all these have got the same people, like Chris says. It is the same guy writing the ETL down in Baltimore. There has been more sharing. And some of the work with the ACT team with the End Cap ACT effort to actually get it so you can leverage the PCORNET together with OHDSI has moved the ball forward. But I do think we kind of missed some opportunities circa 2013 and '14 to try to take a closer run at aligning OMOP at FDA. But I think they are closer than you think. That is not probably our biggest problem. I think with the work coming along with N3C and End Caps ACT it is kind of closer. I welcome further dialogue on how to harmonize that. But that to me is a small problem compared to the other problems we have as a country.

George Hripcsak

I agree with Russ. OMOP and PCORNET are kind of cousins and they are close to each other. Honestly, it is mostly they differ on the data schema, which is not the hard thing to translate anyway. Whereas the vocabulary is where a lot of the real work goes into it. And I2B2 serves kind of a different purpose. It is a

very flexible data storage. Its purpose was not from the beginning, although it does this, it wasn't so much to bring an exact same standard across the world. It was more how each site can store its data most efficiently. So, I think you do have a little bit of variety because of different purposes. As Russ said, maybe we can get to a point where there is fewer of them.

Arien Malec

Radical. So, I keep taking away and underlining this note, and I think you phrased it really well, that the actual data models are not the hard part. It is vocabulary terminology and data representation. So, I wanted to ask a question on observational versus perspective studies. George, I think you lauded some of the work that OHDSI has done on observational research. But it sounds like the OMOP data model is also used for prospective studies. I wondered if you could comment on usefulness of the same model for both observational and prospective research.

George Hripcsak

Tell me, when you say prospective, what do you mean? Do you mean enrolling patients?

Arien Malec

I mean anything up from we're going to design a protocol and run stations through that protocol to fully randomized and controlled trials, not necessarily sponsored trials.

George Hripcsak

So, our OMOP users use OMOP in that fashion. But I think it is really PCORNET that has focused more on that than OHDSI. OHDSI analytics focus has been observational studies, be they retrospective or prospective, but not reaching out and touching the patient. I think PCORNET has more taken that lateral.

Arien Malec

Okay. Based on the previous comment, you say it is not really a modeling issue so much as it is just an organizational orientation issue. I just want to follow on your impression on U.S. standards and where there are only U.S. only standards. Obviously, procedures is the standout. You mentioned RXNorm and some of the work you have been doing for international extensions for RXNorm. But I am not aware in that area that we have adopted a radically different standard from the rest of the world. There are a lot of standards. Are there other areas where there are U.S. only standards where the U.S. is intentional? I guess there is ICD-10 versus ICD-11. What are the areas where the U.S. is sort of intentionally created itself a very large island?

George Hripcsak

Those are the ones I worry about most. So, one is for diagnosing conditions and the use of ICD-10CM is in there. There must be some way of doing it so it can be international. That is the single biggest one. And it is often the most important code that you have. Then procedures is the other one you touched on. I agree, that is the other one I was thinking of. RX Norm, it is just that there is a gap and we saw that gap. But that is a different problem and an easier problem.

Arien Malec

Got it. Thank you. By the way, for team members, task force members, if you have a question, please raise your hand and we will attempt to get you in the cue. Hopefully, we will sequence in between data and my questions and your questions to give the task force members an ability to get the questions in.

Melissa Haendel

Can I jump in and just say one thing in addition to George's comments about the prospective data? I think that while it is true that these models are being used for prospective research, of course, I still think there is a large gap, both in the context of the modeling, as well as the terminological content and the way that data is collected in studies. You know what they say, if you go to DB Gap and you've looked at one study, then you have looked at one study because everything looks different. I think we are still in this space where we do not have good coverage in our CDMs for observational data over the many different flavors of research data. I think that is part of where the community really needs to go is to think about the modeling and the terminological content and how survey instruments and CDEs all can fit together more gracefully than the heterogeneity that we have now. Because we can stuff it all into FHIR. But that is not going to solve the evidence analysis problem if we don't actually have the models and the terminologies under the hood.

Arien Malec

Can I ask a follow-up question? Because I think it is an important point. I think it is also relevant to your point on rare diseases versus USCDI. If I am understanding your point, it is not that the models are incompatible with perspective clinical trials. It is that if you take a typical sponsored clinical trial, the range of instruments that are used for, particularly, efficacy and sometimes safety are fairly diverse and very specialized and unlikely to be expressed in your typical clinical care model. Was that the point you were making, or did I misunderstand?

Melissa Haendel

Yes, I think that is a good part of it. I work in the rare disease space, but almost none of what we collect is representable at the CDM now. So, there is just a lot of areas like that. We would like to have more standard ways of extending the CDMs as well as the use of additional terminologies in those context. The problem is right now is everybody when they try to do that, they just do it in one-off ad hoc manner. That is what I meant when I said we want to use the U.S. Core, but we also want to be able to extend it in a systematic way. The same goes for the CDM and the underlying terminologies.

Arien Malec

David and I speculated on the need for a secondary capture via plugins to EHRs. Again it is just unlikely that EHRs used for clinical care are going to have the specificity required for some of the particularly sponsored efficacy endpoints, even compared to the effectiveness clinical endpoints.

Russ Waitman

If I could comment. I think there is another dimension to this, which is we are essentially trying to sell clinical researchers on data standards and on data models. They are basically coming to you with a piece of paper saying, "I want this, this, and this." And you have to educate them, if we had a little bit of extra money, we could look them up in SNO-MED, right. So, there is that part of the problem. The other part of the problem is, which I think we are just starting to tap into, is they increasingly realize why am I putting this in Red Cap or Encore Velos or pick your CTMS when it is in the EHR? So, I think some of these early forays, what the

PCORNET has done to try to say I have a little supplemental table in my data model to track the trial and then trying to sell the researchers and say, "Hey, we could try to use pragmatic data for secondary and primary outcomes by purchasing claims data or looking at other data to get a deeper, richer picture." So, I think we really, our end of actually running studies that way is fairly new and novel.

But I would kind of piggyback on it a little bit. I would say look a little more at PCORNET in terms of how they are approaching it. I think other people are approaching it, definitely Paul Harris at Red Cap. It is that blend of when can I leverage existing data that I can see starting to coalesce via FHIR or in the large data sets. But also, I think the big dump download, David, is so important. And that is my big thing is we are only looking at a tiny sliver on the top of the iceberg that is getting standardized. When you look at the broad amount of data, and I have a slide on the data ecosystem that is kind of mapped out by Datavant, it is so big. Everybody I am talking to is now, "I want social determinants. I want linkage to that. I want to look at all kinds of stuff that is not going to be in these data models." And getting a sense of what the whole health picture looks like is really big. So, the targeted standardization is good. But recognizing where that is relative to everything else is important to keep our eyes on.

Arien Malec

We have 20 more minutes and I want to make sure that our poor task force members have the chance to get their questions in. Jack had his hand raised and then he put his hand down. I wonder if he just put his hand down in frustration or if we already asked the question.

Ming Jack Po

No, sorry, I accidently put my hand down. I guess I wanted to ask the panelists an explicit question because as George knows, I really love OMOP and I love PCORNET. But sometimes I am a little bit confused about what do you guys think the ONC can do? I feel like you guys are already doing so much and a lot of it is almost dependent on the open source communities, almost, like the grassroot community building up. For this task force, in particular, what do you think the ONC can do to either accelerate or mandate things that would actually help accelerate whether it is OMOP, PCORNET, or some of the newer efforts like the COVID-19 databases?

Russ Waitman

I'll speak. I think continued good work you are doing is good. But this business David introduced me to in the fall about getting all the data out and being required to get out is so important. Like I said, if we are going to actually improve, we need to know what the denominator is. And I think there is probably a lot of smart people who can apply various methods to extract and standardize that data instead of waiting for everything to be harmonized on the precoordinated outbound FHIR interface. I think, practically, especially when you get into underserved communities and rural areas, it is hard enough in the academic medical center convincing health IT to turn on a FHIR interface. Just even imagine what that would look like in a community hospital setting. So, I haven't see the spec on it or looked at it very much of how a vendor is going to do that. But that could be very important complimented by federal processes to incentivize data flow. And that to me is so important because otherwise we are talking in the ivory tower to the high-powered health systems that are now able to do this when we are touching the bulk of the country with the qualified health centers or other places around or small family practice clinics.

The other thing I'll just comment from standardization point is, I think, and I haven't looked at the latest HL-7 FHIR spec, but we may be underrepresenting non-billable providers. So, we can tell an awful lot about the MPI of the doctor. But if we actually want to study and look at the impact of physical therapy, nutrition, nursing roles I don't know that we are fully attributing the full activity to care team, so we can actually understand how the whole team comes together to impact care.

George Hripcsak

In addition to what Russ said, which is critically important, I'll just again emphasize on the vocabulary side. For example, the procedure vocabulary, pushing that forward so we get a unified rational procedural vocabulary. We rely on the nation and the nations to push forward the vocabulary standards. We are an open source community and we rely on you guys to push that forward.

Arien Malec

Are there other folks in the cue? Otherwise, maybe David and I will get another turn. David, I wonder if we go through the questions that you framed because I think some of them got addressed. But it might be worthwhile to go through those questions rather than just drain our curiosity, as much as I'd love to do that.

David McCallie

Yes, one of the questions that Arien actually suggested to the list that I thought was important was the scale up and scale out notion. You can argue about what is up and what is out. But let's just say broadly what could be done to engage more sites and less reliance on academic sites, engage smaller ambulatory LT packets, etc. Any thoughts on that?

Chris Chute

I am going to be radical, if I might. David, you remember back in the day when we talked about HIT Standards Committee and where standardization should occur. I think the compromise in meaningful use was the standardization occurs as the data goes out the door. You make no attempt to have standardization where the data is generated, where the data is stored in the EHR. When you create an API that is interoperable, the interoperability is baked in at that API level. That has led to the reality that we now confront this mapping problem that Melissa laid out so well and that Russ has correctly characterized, smaller hospitals may have difficulty implementing, even with vendor support, valid FHIR messages that confirm fully to the U.S. Core implementation guide, particularly at a terminology level.

I think ONC should re-examine, and this isn't something you are going to do in a year or five years or perhaps even 10 years, but as a strategic goal, I think this question of where does the standardization occur, and is it this last mile out the door problem? Or should we begin to have a national policy or ideally an international policy, as George has said, most of the population is not in the United States and we don't want to be an outlier. Can we contribute and support the notion of pushing back where the standardization occurs? There is no reason, rational reason, that every clinical laboratory should have a birthright of making up its own darn laboratory codes. That is just fundamentally irrational. And yet, it persists.

Arien Malec

So, if I am going to put radical words in your mouth, it sounds like you're saying we should collect standard data at the source. You might think about Analyte machines emitting codes. You might think about clinical information, clinical auditory information systems, normalizing online codes rather than their own proprietary

terminology. That is going to be a better way. And then we already talked about procedural codes and maybe not intentionally adopting a different set of procedure codes than the rest of the world. The more work we do at capturing source information in a clean and clear way, that is normalized to terminology, the les work that there is downstream in renormalizing it for analytical purposes.

Chris Chute
That is a profoundly radical statement, Arien, but you are exactly right.

Russ Waitman
I would put my money elsewhere, though. I think that is nice, but that is not going to get the data out the door. The problem is getting the data out the door because you can have a source system that thinks like upfront. But that still will not get you any data out the backend. So, I think if you are interested in scalability, it has to be tied to incentive programs that make hospitals share information. So, even though we kind of over emphasize the importance of billing in terms of driving the standardization, in other ways, if you made billing processes align with clinical processes, that would probably be potentially fruitful. So, imagine a world where when you submit a claim, when you ask Medicare to please pay for this lab panel, you actually pass lab results with it. That might help you with broad and might also ensure that you are only going to get paid if it is codified data. So, that is where I think you will probably see more impact because then everybody would realize, "Hmm, I have got to have the complimentary clinical data along with the billing data so that we know quality work is happening."

Arien Malec
Awesome. We have five more minutes before we go to public comments. I want to make sure that we heard from all the task force members. So, please raise your hand. Or if you are not in a place where you can raise your hand, feel free to call an audible and we will make sure to hear from you. David, can you go through the list of questions as well and see if there is anything that we missed in this amazing panel?

David McCallie
I think we covered them in a piecemeal fashion sufficiently. But I have one more sort of broad question. In the standards world, we learned through experience that just because you have a standard is not enough. You need an implementation guide that explains constraints on how to use the standard, maybe sub-selects out parts to say, "These parts are important. These parts we don't use." I'm wondering if we had another pandemic in 2020-X, would there be a template or sort of a broad implementation guide for how to gin up this data faster and with less cost and effort. Could such a thing be created? A top-down implementation guide for aggregating evidence generating data? Or do you consider that you already have that?

George Hripcsak
I think we did pretty well as a nation. I think that we had data in our databases not too much further after it was generated. If you look at the work that each of us did at NC3 coming up to speed, so yes. I was amazed in March of last year of how quickly the standards community came up with the codes we needed. Of course, it is not perfect. We didn't even know what the disease was at first. We were coming up with codes for the tests and the disease and the sequela. I think as a nation we got the data to the databases very quickly. But there were a lot of lessons and we would apply them the next time. Does it need a white paper on what we did is actually an interesting suggestion. There are papers out there. But just in phrasing it that way, I realize there may be one more white paper that actually goes through that experience in that context.

Russ Waitman

I would echo that. We were part of a 4CE effort coordinated by Zach Tohani in I2B2 and the U.S. sites I think were farther along than the Germans at getting a richer picture of health. That work was done in the early-mid spring. We couldn't have done what happened 10 years before. It is amazing how much all this work, even though it seemed a little disorganized and not all the same lock-step approach, the fact that the same data could come from PCORNET, OMOP, and I2B2 to all help people and then help investigators and clinicians on the site level is outstanding. I think the implementation would probably be along the lines of quickly getting the codes out. But then a little more work on how you help people codify data that wasn't coded in the beginning. So, there is probably some good work to be done in like this scenario with lab tests, everybody is so busy. How do you go back and try to tease out those signals.

I think for COVID, specifically, we are still a little blind on progression to intensive care and ventilation status. Where there are some of those markers of progression, there is probably some work to be done on representing that information, especially when some of those transitions are not necessarily billable events.

Melissa Haendel

I would agree with Russ. I think the combination of just rapidity in getting codes set up and the communities really coordinating and working together to do that was really profound. I do want to highlight also we are writing a paper about this. This dynamic between local data quality and the mapping issues that we see there and the ability to actually leverage the distributive research communities together with the harmonized aggregate data quality process really has advanced the overall data quality for everyone, for all the different purposes. So, I think one thing would just be, and we are strategizing approaches to it, to measure that change in quality is a little hard because the quality is at all those different steps. I think that synergy was not something that we really anticipated, the kinds of problems being addressed are different than we really had a good clarity on before. I think that has been one of the huge lessons learned. And tools that helped make that process go faster that are using the codes and code sets as they are quickly created as well. So, that is really important.

David McCallie

Thank you, Melissa. I think the word tools came up a number of times in your presentation. I wish we had more time to dive into the tool thoughts. We will pursue that in our subsequent discussions. Mike, I think we have public comment now.

Public Comment (01:21:43)

Michael Berry

Sure thing. If we could put up the public comment slide, please. Operator, can you please open the line for public comments.

Operator

Thank you. If you would like to make a public comment, please press star one on your telephone keypad. A confirmation tone will indicate your line is in the cue. You may press star two if you would like to remove your comment from the cue. For participants using speaker equipment, it may be necessary to pick up your handset before pressing the star keys.

David McCallie

While we are waiting for public comment, I want to again invite task force members who have questions to get in and ask some questions. I've got one more question and then I think we should also discuss what we are doing for next meeting. I think we've got a lull in the agenda and I am going to be out.

But my question was, Russ, I think you mentioned Red Cap. I was surprised to hear CDIS or any of the other standards for representation of sponsored clinical trials not mentioned. I wonder if there is a perspective on some of the representational issues between FDA and the OMOP and the PCORNET space on how sponsored and formally investigational clinical trial and the observational and real-world evidence perspective and randomized trials, if there is a perspective about how some of that stuff comes together. I heard Russ, in particular, note that investigational sponsors are often now wondering why they are doing extra work in capturing data that is always sourced captured in the EHR. Obviously, the perspective of using a central lab and using lab data electronically from that lab is now wide scale and standard practice. So, I wonder if the team can speculate on better mapping between some of the sponsored clinical trials work and the work that you are doing.

Russ Waitman

I'm not the guru on CDIS, so caveat. My sense is it depends on who is the sponsor. If it is NIH and you're not following an IMD, it is much more amenable for people to be saying I'm not as concerned about some of that. Though, if it is NCI, your toxicity reporting is using a lot more of that more world of reporting. Often times, that data collection is done actively. So, they'll use a standard dictionary in Red Cap or other electronic data capture systems. But it is kind of the rest of the data, especially for non-IMD seeking trials that you are seeing the thought of want to leverage the ONC standards that are being used for clinical care. There is probably other people, George might take a run at it or Chris on deeper knowledge of the terminology.

David McCallie

If I'm hearing you right, it is an FDA compliance issue in that context, not an applicability of use issue.

Chris Chute

We do have an active program looking at mapping CDIS projects and structures into OMOP in particular. Then it begs the question of whether FHIR to CDIS or FHIR to OMOP or FHIR to any CDM should be the preferred path regardless. It is important to realize that the CDIS vocabularies are maintained in the NCI thesaurus. They are pretty well structured and rather formalized and publicly available. So, it is possible to port that kind of mapping. Remember, CDIS has been around for close to 20 years and predated all the common data models, and certainly predated FHIR. Its future is something that should be explored.

Arien Malec

I was in the first CDIS meeting at DIA 20 years ago. So, the world comes around. This has been a fantastic panel. I think maybe we'll speculate offline about next meeting and whether we should cancel it. I just want to thank the panel so much. This has been exciting to sit through and listen. Hopefully it has been as exciting for the task force members as it is for David and myself. But this is a stellar panel. I really thank you for your time and for the thought and effort you put into the presentations, and also, obviously, for the work that you are doing on the ground. I am sure given some of the safety profile of the vaccines, you are hard

at work trying to answer some of the questions that are going on right now. So, we are just really profoundly grateful for the work that you are doing.

David McCallie
I second that. I appreciate you taking your time out of a Friday afternoon and sharing this really stellar work that everyone is doing. It is very impressive.

Arien Malec
I think, Mike, that brings us to the end.

Michael Berry
It does. And I do not see any public comments. So, we can adjourn. Thank you everybody. I appreciate you joining us today.

Arien Malec
Have a good weekend.

Adjourn (01:27:35)