Cyberseminar Transcript

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Session: An Introduction to VA Pharmacy Data: Sources and Uses for Medication Information

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Amanda: Hello everyone and welcome to Database and Methods a Cyberseminar series hosted by VIReC, the VA Information Resource Center. And thank you to CIDER for providing technical and promotional support. Database and Methods is one VIRECs core Cyberseminar series and focuses on helping VA researchers access and use VA data.

Sessions are held on the first Monday of every month at 1:00 PM Eastern. More information about this series another and other VIReC service seminars is available on VIReCs website. And you can to visit pass sessions on HSR&D VIReC Cyberseminar archive.

A quick reminder for those of you just signing on, the slides are available for download. This is a screenshot of a sample email you should have received today before the session and in it you'll find the link to download the slides.

And today's presentation is entitled VA Pharmacy Data: Sources and Uses for Medication Information. And will be presented by Dr. Bonnie Paris and Dr. Joshua Thorpe. Dr. Paris is a data knowledge analyst at VIReC where she manages VA REDcap and develops data knowledge products. Prior to joining VIReC she worked as a deputy associate director for the Central Partnerships in Healthcare Transformation group within the VA-Center for Applied Systems Engineering. Dr. Thorpe is a tenured associate professor at the Division of Pharmaceutical Outcomes and Policy, healthcare scientist in the Department of Veterans Affairs and director of analytics and research in the VA’s National Center for End-of-Life Care. And thank you so much for joining us today. And I will turn it over to Dr. Paris.

Dr. Bonnie Paris: Thank you so much Amanda.

And thank you everybody for joining us today, welcome. By the end of this Cyberseminar you should be able to understand the VA pharmacy data that we have available for research. And also appreciate the value of using non-VA data sources in concert to measure pharmacy use. You’ll also know where to find more information and resources about VA Pharmacy data and what you need to do to request the data.

So after a brief introduction we’ll talk about five commonly used pharmacy data sources. And then Dr. Joshua Thorpe or Josh will talk about an example of research that he did that's focused on pharmacy care at the VA. Then we’ll come back to me and I'll talk more about the resources that we have available to you and VA pharmacy data. And then we'll open it up to questions and answers, typically we receive a lot of questions so we’re allowing a bit of time for that. If you do ask a question at the end and we don't have time for it, we’ll try to follow up with you to get you an answer.

But first we want to know a little bit more about you. We have a poll question about your role as a data user. What is your role in research and in quality improvement? Are you an investigator, a PI, or a co-investigator? A data manager, analyst, or programmer? A project coordinator or other? And if you pick other please use the Q&A function in the chat window to let us know a little bit more about that. Some people wear a lot of different hats, just try to choose the role that's most representative of what you do. Thank you.

Moderator: The poll is open and I'm going to give it a few more seconds to let more people answer. If you cannot see the polling panel on the side click on the ellipsis at the bottom of your screen and it should be an option to open polls. Okay. So it has slowed down a little bit, I'm going to go ahead and close that poll.

[Silence 0:03:58 - 0:04:04]

And share the results.

[Silence 0:04:06 - 0:04:15]

So, there’s a timer on this. So the results are, let's see, we have 26% that have answered as investigators, 49% as data managers, 14% as project coordinators and 8% as other. And some of the other came in as a nurse informatic, and clinical informatics. Okay. And back to\_

Dr. Bonnie Paris: Great, thank you so much for sharing that and telling us a little bit about yourself. Thank you Whitney for walking this through the results. We have another poll about your experience with VA data. How many years of experience do you have working with VA data? One year or less, more than one but less than three years. At least three, but less than seven years. At least seven but less than ten years or ten years or more?

[Silence 0:05:18 - 0:05:24]

Moderator: And the answers are coming in, we’ll just give it a few more seconds before I close the poll.

[Silence 0:05:28 - 0:05:34]

And it’s starting to slow down, and I am gonna close that poll.

[Silence 0:05:39 - 0:05:47]

And the results are, one year or less, we have 25%. More than one, less than three years is 16%. At least three, less than seven is 22%. At least seven, less than ten is 13%. Ten years or more, is 19%. And I will send it back to you, thank you.

Dr. Bonnie Paris: Okay, great. Thank you.

It sounds like we have a good mix of people attending today. Thank you again for participating in the polls. We do have one more poll question but first, I'll briefly introduce some of the commonly used VA pharmacy data sources. The first four are national data sources for data on medications that are provided by or paid for by the VHA. They contain information from the Veterans’ health Information System and Technology Architecture. So if you take that acronym and pronounce it you get VISTA. It’s also sometimes called CPRS, the acronym CPRS stands for Computerized Patient Records System. So if you hear VISTA or CPRS, that's our Electronic Medical Record or EMR. And you can tell we love acronyms, right? And data from VISTA feeds into these four different sources. So the best source depends on your focus. And after the next poll we’ll go through each one and talk about similarities and differences between them. It includes the Corporate Data Warehouse or CDW, Observational Medical Outcomes Partnership or OMOP. And the MCA which stands for Managerial Cost Accounting National Data Extracts, or sometimes called MCA NDE. And the Pharmacy Benefits Management or PBM. And, let's see this- sorry the slide changed a little bit from what I was expecting. The fifth data source is from CMS or the Centers for Medicare and Medicaid Services. And the data steward for that is VIREC which is where I work. And that data set contains information on services that were received outside of the VA and paid for by Medicare or Medicaid.

And so our next and final poll is about your use of VA pharmacy data sets. Which sources of pharmacy data have you used in the past or plan to use in the future? Please select all that apply. CDW pharmacy data, OMOP pharmacy data, MCA NDE pharmacy data, PBM pharmacy data or the Medicare Part D Slim File or none.

[Silence 0:08:44 - 0:08:49]

Moderator: Okay. The answers are coming in a little bit slower, so we'll just give them a few more seconds to answer.

[Silence 0:08:55 - 0:09:05]

And I'm going to go ahead and close that poll. It looks like it has slowed down. Okay. And we have for CDW pharmacy data as 76%, the OMOP pharmacy data is 13%, the MCA NDE pharmacy data is 21%, the PBM pharmacy data is 33%, and the Medicare Part D Slim File is 16%.

Dr. Bonnie Paris: Okay, great. There's, that's actually a really great split between the different data sources and also a good mix between people who have experience with these datasets and those who don't.

So thank you again Whitney for walking us through the results and thank you to everybody for participating in our three poll questions. So now for, and just a note for those of you who have not worked with VA pharmacy data sets before. When you are going through and looking at the VA pharmacy data, it's important to look at what is considered a VA pharmacy item. The VA formulary includes prescription medications as you would expect, along with over the counter medications. But it also includes some supplies and equipment that you might not expect, like toothbrushes. So just a note that if you haven't worked with VA pharmacy data before sometimes you will see some items that you’re not expecting in there.

So now I'll go through the most commonly used VA pharmacy data sources, one-by-one. But I do want to make a note about the Cerner Millennium data that will be coming soon. And I wish I had a lot more information on this for you. But details are still forthcoming on exactly what that will look like. And the VA EHR modernization initiative to migrate from VISTA CPRS to Cerner Millennium, EHR is going to roll out over a ten-year period. And it’s already a lot of prep work has been done and implementation is starting right now. So the Cerner Millennium commercial system is going to support VA healthcare’s inner effort ability with Department of Defense and community care partners. And we're still working out data integration details. But in the short term if you're working with data from some of the initial sites that are going live with Cerner Millennium in the short term you should expect some delays in data availability. The ORD Strategic Initiative for Research and Electronic Health Records Synergy or OSIRES which I'm a project manager for. Is a cross service field-based effort to create a coordinated strategic plan, communication to the field and support the long-term sustainment of VA research throughout this transition. And at the end of the presentation I'll share some additional resources an EHR modernization. VIReC is also launching a new Cyberseminar series on research and EHR synergy to help keep researchers informed. But unfortunately I don't have any granular detail on what the pharmacy data is going to look like.

So I'll go through the data sources that we currently have. So the largest one that we have is the Corporate Data Warehouse, or the CDW. The data steward is National Data Systems and it's really central to VHAs strategic goal of increasing VAs capacity to use data and analytics for evidence based decision-making and research. And over time they keep transitioning more and more data into the CDW. And right now we have more than a 130 local VISTA systems that cover over a 150 VA medical centers and there are data feeds for each transaction. So if medication is ordered that data is collected in the local VISTA system, then sent into a regional data warehouse and then that night the data is pulled into the CDW. And the data in the CDW goes back to 1999, we have over 20 years of data and it’s just a massive amount of data that’s in the CDW. It’s in a Microsoft Sequel server that can be queried using SQL and it’s organized by different domains. So it’s, for me it’s the largest, most complex data set that I’ve encountered in my career. And for the pharmacy data, the two main domains are Bar Code Medication Administration or BCMA. And that contains data on medications administered to a patient within the VA system. Whether it’s in an inpatient setting or sometimes in an outpatient clinic. The other primary domain is outpatient pharmacy, which is data about medications that are dispensed by VA pharmacy. And the care delivered at all VA facilities regarding the prescription medication gets reported in the CDW. So there’s some information about prescriptions that were filled at non-VA facilities but paid for by the VA. And there’s also a really small percent of non-Veterans who receive care in a VA facility, for example humanitarian care provided to a visitor at a VA facility if they have a medical emergency they might be treated in the VA emergency department. So just something to keep in mind when you’re using the CDW data for research. Although a very small number are not Veterans you might wanna just make sure that that gets cleaned out of your dataset.

And I have an example of some of the variables that you’ll see in the CDW and I know that there’s a lot of data on this slide too. So it’s just to give you an example of some of the variables that you’re going to find in the CDW. It’s not an exhaustive list but I’m going to use the same example of a hydrochlorothiazide tablet with the different data sources just so that you can get a sense of some of the data that is available in the different systems. Hydrochlorothiazide or HTZ is taken for hypertension or high blood pressure. And the SIG, S-I-G, and I’m not sure what the origin of that term is. But the SIG variable has the patient instructions. In this case to take one tablet by mouth every day for blood pressure. And you can see that there are also variables with the dispensing units, which is the amount to take each time, which is one tablet and so on. And there’s a lot more information to be found in the CDW. If you want information on the original order for the medication, that’s actually in a completely different domain on orders.

And VIReC, on our website we have some information about pharmacy data and CDW data. In particular CDW structure and content and record counts and accounts and so on. And we have produced a number of researchers notebooks that give a more detailed look at different aspects of working with the data. That are generally by and with members of the VA research communities to help share vetted methodologies for using the data. So for example how to clean out non-Veterans out of your dataset. And I’ll talk more about other resources including how to request access to the data at the end of the presentation.

The next dataset is produced by the VA Informatics and Computing Infrastructure Department, or VINCI. Which transforms some data from the CDW into the Observational Medical Outcomes Partnership or OMOP common data model. The OMOP dataset is not a replacement for the CDW as OMOP does not have all of the variables that the CDW has. But a big advantage is that the OMOP data goes through a cleaning process. VINCI has informatics research nurses and they collaborate with other groups including VA pharmacy benefits management to map the direct data. They also work closely with the Million Veterans programs. And there used to be a lag in data availability due to the data cleaning process. But VINIC has worked to reduce the turnaround time significantly. The last OMOP data refresh was on August 12 and it includes data going back to October 1st, 1999 up through July 28, 2020. So you know it has a lot of data in it.

And here's an example of values that you may see in the OMOP dataset. So although the OMOP dataset does not include the full SIG or patient instruction, the data can be linked to the CDW to bring all of that in if needed. So OMOP is really meant as a supplement to the data in the CDW, and they make it very easy to link back to the CDW. Classes of drugs and ingredients of drugs are easier to identify in OMOP because it uses RxNorm, which is a normalized naming system for generic and branded drugs that the National Library of Medicine uses.

And this slide has a link to the VINCI OMOP Academy. The VINCI team posts a variety of resources for OMOP data. And VINCI also offers a concierge service if you need more detailed assistance. And they helped me to understand about the OMOP dataset as well. So I do recommend checking that out and learning more about the OMOP model.

The MCA National Data Extracts, or MCA NDE are another important resource for pharmacy research data. So the Management Cost Accounting National Data Extracts which when you turn that into an acronym and pronounce it MCA NDE. The data steward is VHAs Managerial Cost Accounting Office. So sometimes people that have been at the VA for a long time will refer to it as the DSS dataset. Because it comes from the Decision Support System and then we get the acronym DSS from that. And the Managerial Cost Accounting Office used to be called decision and support. So it kind of goes back to the history of how things used to be named. But the files themselves when you work with them are still labeled DSS even though we now call it the MCA NDE. So apologies for confusion to everyone. Even though the name has changed, and the data systems have changed over the years, the data extraction process has been updated to maintain the same representation of what the data means. So this data source was created for operational reasons to look at different aspects of clinical care in conjunction with the cost to provide that care. So as the name implies the Managerial Cost Accounting Office, they're looking at what do things cost. They use something called activity-based costing to get an idea of not just what supplies cost but the labor cost and overhead associated with producing and providing a surface. So the data in the MCA NDE, that's available from fiscal year 2005 and it includes records for inpatient and outpatient prescriptions from VA pharmacies and CMOPs, or Consolidated Mail Out Pharmacies. The VISTA systems are the data source. And this data is housed within the CDW, on a CDW RAW server. And this is a rare case where there's a dataset on the CDW RAW server that does actually have documentation. The data steward that manages the creation of the data and the curation of the data is the Managerial Cost Accounting Office.

And here are some example of some variables from the MCA NDE. So in this example an inpatient fill of 30 days hydrochlorothiazide 25 milligrams has the dispensing cost of approximately $24.16. Although the price for the drug product itself was only about $0.52. It costs you know over $24.00 to get the medication to the patient. And that total cost would be including any supplies that were used to do that. So in this example it's an inpatient fill. And that's part of why the dispensing cost is higher. So this same medication in the CMOP where it’s you know they have a lot of [inaudible 0:23:59] information and it’s a script being filled and mailed out the same price out of the CMOP would be lower. And one thing that I would like to highlight on this slide is that there is a VA product code and the National Drug Code as well which you can link back to other data and find additional information on the formulary about the medication itself. So it’s\_

[Silence 0:24:32 - 0:24:37]

It's just a lot of data that's focused I would say on the cost as the name implies. But it can be very useful, nonetheless.

So if you're looking at drug costing, some resources to check out when you're using MCA NDE our VIReCs webpage that has documentation including an updated research users guide to the pharmacy MCA NDE. The Managerial Cost Accounting Office also has a webpage on the National Data Extracts and reporting information that contains a lot of detailed information about each time the dataset is produced and the process that they go through to produce it. And then HERC, the Health Economics Resource Center also maintains a webpage, not just about MCA NDEs but pharmacy data in general. And just to note that HERC also has information on their website about non-VA medical care pharmacy files. Which we don’t cover in this presentation because those files do not contain clinical information such as the drug name, drug class or the quantity dispensed. But HERC is a valuable resource as the name implies, anytime you're doing health economics research.

And then the fourth source that's based off of VISTA data is Pharmacy Benefits Management or PBM data. The PBM service handles all VHA medication dispensing. They have a national database that contains extensive information about all prescription dispensed with in the VHA system starting in 1999. And again that source of data is local VA facility VISTA systems. And there are three prescription level extracts that can be used by researchers. The prescription extracts, the unit dose extracts, in the IV extract. And these three are often referred to collectively as the PBM three database. The data is available from PBM in a custom extract and it requires a request directly to them, which is a slightly different process than the other data sources. And there is a link to more information about that when we get to the resources.

This slide gives an example of some of the data that you would see from PBM including the medication dispensing, cost to the patient, et cetera. This data can be linked using a patient identifier back to the additional information on the patient or patients stay.

This slide has a link to the PBM formulary page. So and this gets updated I think about monthly, what changes to the formulary. And from there it has links to other resources as well.

So now that we've gone through the different datasets let's take a moment to think about some uses of pharmacy data in research. So think about who is prescribing the medication, who the medication is prescribed for, who filled the medication. Think about what did it cost? When was it dispensed? Where was it dispensed, and why was the medication prescribed. There are a lot of different uses of pharmacy data in research. And it can be good to look at trends in medication use, such as which medications are being used to treat a given condition or how use has changed overtime due to policy, renewed treatment options that become available. You can use it for a cohort identification of which patients are going to be included in your study. And it can also be used to examine quality measures related to medication management whether medications are being prescribed appropriately or what the adherence is to a given medication therapy. So I’m going to go through each of the who, what, when, where, why. And kinda talk through some of the different datasets that are available.

So when you're looking for the best sources for information on the ordering provider or the patient, you know, and that patient identifier is really important because it allows you to link back to other information. In general all of these different datasets have information that you can link back on. And keep in mind the ultimate source of all you know the CDW, OMOP, MCA NDE and PBM, the original source from all that data goes through different filters and gets coded differently. But it all originally it's from VISTA. So you will see a lot of similarities.

But when you look at the what and know when you're looking at the SIG it's available both in PBM and CDW. And the instructions for use include the schedule, unit dose and dispensing unit. And although there are elements of the drug cost in the PBM and CDW, the total cost to provide the drug to the patient is found only in the MCA NDE. So that includes the cost of the drug itself, the labor cost to fill the prescription, and other costs associated with filling the prescription such as packaging and postage. And when we start to look at what the medication is, in particular the directions for use as I said before I'm not sure why I filled in SIG. The reason why it’s in CDW and PBM but not in the others. Is that the PBM and CDW are more closely related to that clinical data where the care is being provided. And the reason why the total cost to provide the drug to the patient is in the Managerial Cost Accounting system is that the purpose of that system is really focused on cost. So really the purpose of the system really shapes the data that is in there. And you may find for your project that you need to link data from different datasets. So you needed to use RxNorm for your mapping then you'd bring in the OMOP if you needed to know the cost then you’d bring in the MCA NDE. And you might have other daily data elements of interest that are in the CDW. So you may end up with a dataset that branches across different sources.

Sorry, there is a little extra slide in there that I just flipped past. So when you're looking at when the time that the medication was dispensed or returned is available in the CDW, MCA NDE, and also the PBM. The schedule when dosage should be taken is both in the CDW and PBM. But only in the CDW has the medication administration time. Because the medication administration is done by nursing. And PBM is focused on pharmacy and not nursing activities whereas CDW includes all of that and more. And there are many, and up for the most part overlapping data elements including in all of these databases. You know for example where the pharmacy activity took place. So if you do a comparison when you do have the same data it comes out that they're [unintelligible 0:33:28] they're ultimately coming from the same source.

And then where the data is coming from is it a CMOP, or you know that's the Consolidated Mail Out Pharmacies. So they do a lot of outpatient prescription fills and mail them out to Veterans. They could be at a mail window or at a pharmacy window where they're picking it up as an outpatient prescription from a VA facility. It could be administered to the patient whether it's at an inpatient or outpatient care setting, if the care provider at the VA is administering the medication. And like where or you know what stop the patient was at. So all of those things get tracked in all of these different sources. But for OMOP it needs to link back to the CDW.

But really where you're not going to find a direct answer with your pharmacy data question across the board is when it comes to why the medication was prescribed. So none of these data sources can tell you that directly. Sometimes the reason why the medication was prescribed can be assumed from the indication for the medication. So for example metformin is prescribed to treat high blood sugar or diabetes. However you can use the patient identifier to link to additional information to help solve the puzzle of why a particular medication was prescribed for something that it might not be as clear for. So for example Wellbutrin might be prescribed to treat clinical depression, it could be prescribed for smoking cessation or it could be prescribed for both. And so there are a lot of things to consider there but we have additional material to get through.

So I'm going to hand it over to Josh to talk about the CMS Medicare and Medicaid files and his work that he's done with VA pharmacy data.

[Silence 0:35:55 - 0:36:06]

Dr. Joshua Thorpe: All right. Hello everybody my name is Josh Thorpe and I'm a health care scientist at VA Pittsburgh and a professor at the University of North Carolina at Chapel Hill. I'm hoping you're able to see my screen and someone shout at me if you are staring at a blank screen. But what I'm going to talk about today is about, Bonnie has done a great job of talking about prescription medications as they come through. The most of us here are VA clinicians or operations or we're doing research in the VA. So we are, we sort of know the landscape of what Veterans are getting from within our system. And you can see it's already complicated and how to go about getting medication data and how to clean it and use it. In January of 2006 Medicare Part D most of you know became a prescription drug benefit available too older adults age 65 and older and a selective younger folks with kidney problems. Which has created kind of unique I guess there are advantages to that in terms of access. But some unique challenges. Because our Veterans are eligible to get prescription medications from either through VA PBM or they can go to their local physicians and through Medicare Part D they can also get prescription medications. So what VIReC has done, has worked with CMS to basically say we need to sort of get all of the pieces of the puzzle in one place. So there's a data use or a sharing agreement between CMS and the VA to link all of the Medicare Part D data for our Veterans into a system that's available to us for research and quality improvement purposes.

So I'm just going to do a little background on what’s in the Medicare Part D and this is called the Slim File. It’s slimmed down because it removes a lot of pharmacy characteristics and some other things that are not necessarily useful or particularly useful for research purposes. But you'll see a lot of common ground here between Medicare Part D and the variables in what you see in PBM and VA CDW. Here you see they have a generic drug name so that's going to be similar and then they have quantity to dispensed, that's 30. They'll tell you how many days this supplies, so here's a 30-day supply. And this is all for something called Lipitor and drug strength. So while the variable names might be a little bit different for example the generic name at the bottom GNN, that's the generic name in the Medicare Part D file. There's a lot of overlapping information. There's one I wanted to highlight it's actually the product service ID, which under meaning is called the National Drug Code. For those not familiar with that it's a very handy, so National Drug Code, each medication or each prescription is assigned by the FDA a drug code. A unique dress code that tells you who produces it, who the manufacturers of the drug, its dosage form, its ingredients. So every single medication theoretically has a NDC code. So that is, in Medicare Part D that is a very useful code because it's very linkable to lots of other databases. So if you wanted to do you wanted to identify all anti-hypertensives without going them by name you can get a list of NDC codes that are anti-hypertensives and immediately kind of link those to the Medicare Part D data. That does exist to a limited degree, the NDC codes in the VA, in VA PBM. But it's not quite as extensive. But I wanted to point out NDC because we're going to come back to that, it's very important.

And I think we covered enough of just the background about what Medicare is, if you want more information it's on the Intranet. But the Medicare is the federal health insurance program for people aged 65 and older. And it essentially helps with out of pocket costs for community-based medications. So not necessarily the ones that you get in the hospital, but the typical ones when you go to your Walgreens or you go to your CVS these are the medications that you pick up. Well this is the Medicare federal drug benefit program that helps pay for those things. There's what we call the Part D Slim File, as I mentioned it leaves out a lot of information that could be useful but typically is not. It's information about what type of drugs are on a particular formulary, might get some information about prescriber, the types of plans, whether they are in a medication therapy management program. And those files are harder to come by, but you can get them, it just depends on what your research question is. But we find that for the most part the types of work we do that stuff Part D Slim File is sufficient.

All right. So I think I've given enough overview about what the data is and how it exists and what's in it. So I thought I'd spend my time on something specific we've done to maybe make some of these concepts more concrete.

And Bonnie had already mentioned that this list of how it’s being used or how pharmacy data is being used in research. But so I won’t spend much time going back over. But we do use it all the time for tracking trends and changes. There are many, many measures of prescribing quality that can be applied. So we can keep track of you know who, which VA facilities are doing particularly well, which might start prescribing maybe some medicines that aren't such a great idea at higher rates. So it's great for surveillance purposes. You'll see in the work that I’m about to talk about from our lab, how it's used for cohort identification and of course drug safety and outcomes research.

All right. So this is work that we're continuing to do but it's kind of ongoing for the past five or six years where we're looking at that impact of a Veteran’s ability to get medicines from the VA and VA providers and PBM. But also through Medicare and their providers. And what are the risks associated with seeking prescriptions and seeking care across two systems that don't talk to one another or don’t talk to one another very well. So I was really interested in the beginning in looking at how the duo healthcare system use impacted high risk prescribing in patients with dementia. I picked dementia in the beginning because that's perhaps the most challenging, puts the most pressure on patients to communicate complex medication regiment across systems. So I thought if we were going to see a problem anywhere we'd see it with them. But this work has also been extended to basically all older adults or all older Veterans. So the objective is to assess the Association between dual use of VA and Medicare drug benefits and the receipt of potentially unsafe medications in the elderly.

And a little bit of just to kind of set up the story so the punch line makes at least a little bit of sense. If we think of this sort of black pieces of a puzzle here as this is everything we can know about the quality of care from the VA healthcare systems perspective. Which is fine if the Veterans getting all of their care from just one system. But what do we really know or what are we missing? Of course we're missing all the Medicare Part D or Medicaid drugs that they're getting. We are missing diagnosis and lab results, ED hospitalizations and so on and so forth. You get the idea that there's really this whole other world out there that you can think of this as a big missing data problem for our Veterans. And without this information we don't really have a complete picture we can't say that we guarantee high quality care to Veterans if we don't know what they're getting outside of the VA system.

So here's how we used it in this study and again remember it's the effects of duo VA, Medicare use an unsafe prescribing. So first we used the pharmacy data for cohort construction and of course most of our, we identified those who had dementia. We used ICD-9 codes as our primary diagnostic selection criteria. But we also added if basically the Veteran had two or more prescriptions for an anti-dementia drugs, something like donepezil. And then we will call them, we would flag them as potentially having dementia, we played around with a sensitivity analysis and it's pretty much right on. And just kind of going through these, you go through the PBM. So VA PBM you look for the anti-dementia meds, you do the same thing through Medicare Part D. if they're on combined two in VA or two or more in Part D or one in each they got flagged as someone who is likely to have dementia. And then the outcomes that we were interested in, these are our measures of medication safety. One is the key to potentially unsafe medication list in the elderly. So this is a set of medications, some of you may have heard it as called sort of a Beers Criteria. It's a list of drugs that are particularly unsafe as people get older. And a lot of times there are just safer substitutes or alternatives. And a given example here, so you would look through PBM, VA PBM and diphenhydramine is on the list of potentially unsafe medications. Diphenhydramine is in your Benadryl’s, it's what makes you feel sleepy and loopy. When you take Tylenol PM or Benadryl. And it can be very unsafe in terms of dizziness and falls and cognitive impairment for older adults. So you're going to look through both PBM, and we looked through both Medicare Part D do identify those drugs. So that's one measure that we used. Another 1 was, it’s a little more complicated to calculate, which is potentially unsafe drug-drug combinations. This is a measure developed by the Pharmacy Quality Alliance. And it essentially says let’s identify a list of medications that are really risky if they're taken in combination, they shouldn’t go together. And so I'll get into a little details on that and how we calculated that.

So step one how do you go through this process? Identify the anti-dementia and the unsafe medication prescriptions in both systems. In the PBM side on the VA side of the used VA, pretty much VA generic names. So we searched strings, text strings for the drugs we're interested in like diphenhydramine. And they also have limited NDC codes, so where they had NDC codes we used them. We did the same thing with Part D but there we had the luxury of having both generic names and NDC codes. And one thing for medication use researchers that's handy as kind of a tip. Is the HEDIS measures, if you were to just Google HEDIS and NDC codes. They have provided all of the NDC codes for maybe a dozen or more medication safety and quality measures. And they come down, they are free downloadables in Excel file. And they’ll give you the, you see at the bottom here, the NDC code, the name, the generic product name as well as some other descriptors of what it is like anti-cholinergic which are bad for dizziness. So these are really handy tools for anybody who does medication use research because you can very rapidly, you don't have to hand code anything you can just apply, they have every single NDC code for every single one of every version of diphenhydramine you can possibly imagine. So it's a really handy and we use that when we can.

So Step 2 is creating the common definition of all drugs. So we wanted to map the PBM and the Part D particularly because we liked that the VA formulary gives us some guidance. And there's some other reasons why it's beneficial to bring information from VA to the Medicare Part D file. Also what we found is that we matched Part D data to the VA National Guard file again using the NDC codes and we got a 95.2% match. So that’s pretty good. So but what did we do to get that last sort of four or five percent? Quickly here’s what we used inside the data set. This is in the Slim File and as well as we made comment to the VA PBM file. The generic drug name, the NDF, NDC code. So there’s your NDC code. VA product, which is the generic drug name, that’s their version of it. And as well as VA drug class, that’s a nice thing that goes along with the using the VA formulary data even when you’re linking it to Medicare Part D. Because it’s a standardized drug classification system. So your anti-hypertensives are all going to end up in the same place. You can quickly identify all of them without knowing the specific drug names. So we were matched to the remainder 5% using the generic names. And then if we had to go deeper we have to look at dosage forms and then the strengths. So in the end we go to something like 99.9% with a few that we just couldn’t figure out, we were missing some information and we just left out. For the most part we got a really good match. So the benefits of using this common definition, the benefits of bringing in the VA to your Medicare files if you’re doing that. One we can use the VA drug classification codes. Two we can perform drug-based comorbidity adjustment. There is a you know most are familiar with Charlson and Elixhauser. There's actually an Rx Risk comorbidity calculator where you can use drugs to identify people who have certain chronic conditions. We get the benefit of extra dosage information, we can do drug counts and we can identify non-drugs which was going to come up in just a second.

All right. So here’s the example. Here we have all prescriptions, I’m looking for all prescriptions containing diphenhydramine. And here you see the list here comes in a lot of different forms that are really not easy to track. And so what do we do? We do a text string search. But I wanted to highlight this one, and this is why you need to make friends with a pharmacist if you're going to do this kind of research. You'll see a million of these little exceptions, like here is diphenhydramine but it's actually a topical spray, yeah, it's a topical. Or you will see lotions. You’ll see one of every crazy thing in these datasets and you need somebody who knows what the heck they're doing. So I know it listed me as an MD, I'm not an MD I'm a PhD. And so I don't practice medicine and I don't know the drugs. So if you're going to do this kind of work do you really want to have a pharmacist on board to adjudicate the tricky ones. And when you finally linked them you get a linked NDC code and then it’s linked to a VA product name and now these are our standardized. So this look exactly the same whether you’re in VA PBM or Medicare Part D. So now that we’ve got everything matched up and doing apples to apples.

That was just an example, I think we can kind of pass through that. There’s just a lot of different versions of things.

So let’s get to the results of the work that we did. So we identified this cohort, now this is not specifically dementia patients anymore. Four to five thousand, roughly 405,000 older Veterans that were dually enrolled in VA Medicare. And we require that they have at least one VA outpatient visit, and this is in 2014. You can see it’s an older sample, which makes sense meaning ages 80, on average they have four different comorbidities, taking ten different types of unique prescription medications. So they're on a lot of different drugs and you can see the breakdown of six or so on average come from VA PBM and another four come from Medicare Part D. And on the right is our distribution of dual use. So anyway we’ve got 25% are dual VA Part D users, and what does that mean? They got at least one prescription through Medicare Part D and through the VA. One and only one. We played around with that, but that’s basically our definition. And then we have VA only users and Part D only users. So the overall majority are VA only users. But we're really worried about that 25%.

They differed in some interesting and significant ways. but I won’t get too much into that. On the right here, these are more likely to be dual users. And you can see being Medicaid eligible, having multiple dementia diagnosis listed. These are all things that tended to be associated with being a dual user. And on the left side are more likely to be VA-only users, they tend to be a little older and sorry, a little older and sicker than you're Medicare users, your dual users.

All right. So what did we find? Well we talked about the PUM-HEDIS medicines here on the left you got three bars. The red is the dual users and that's the percent of exposed to any bad drug. It’s about 21% for those who are dual users and only 10% for, this is in green, the VA-only users. And then Medicare Part D-only users are somewhere in between. And that was an adjusted odds ratio of about 2.4. On the right are the mean number of days of exposure. And again it's much higher for people getting medications across systems.

And then for the drug-drug interactions, this is a little bit more complicated. Here we have got to find two drugs and see if they're taking them at the same time. So what do we do? We search the generic field for target, what they call target drug names. So over here they might be MAO inhibitors. And then there's the drug that shouldn't go along with that, you shouldn't be taking both at the same time. They call that the precipitant. So in this case it's anti-depressants.

Now how do you flag one of these? This is where you got to, it becomes a lot more complicated. So flagging a DDI, you got to identify overlapping days of target and

precipitant drugs. So for those familiar with calculating refill adherence this is similar. You use the prescription dispensing day, which is a field in both files, the day supply that are dispensed. And you define these coverage windows that are, you can look at the calendar and say, okay for these days this person had coverage for that drug. And then you flag Veterans with overlapping days. So I look at the target may be MAO inhibitors and anti-depressants, and I see which days do they overlap and I count them up. I just count up the number of days that they had an active prescription for two counter indicated drugs. And that's what we call a drug-drug interaction as potentially, yes.

And final sort of summing up what we've seen, so actually across a lot of different quality indicators. So this is a little bit different way of looking at it, this is a percentage of total prescription, so the Veterans’ total number of prescriptions from VA PBM. So the numerator is the PBM medications and then the denominator is the combination of both PBM and Part D. And you can see, so somewhere in the middle here, 40, 45, 50, 55, those are pretty evenly split. They're getting sort of half their drugs from VA and half their drugs from Medicare Part D. And the red crosses here, this is the any drug-drug interaction. And you can see kind of the more they are in the middle the more balanced their drug seeking is across two unconnected systems the greater the risk or the greater the prevalence. And that's true for drug-drug interactions. And I plotted the HEDIS on here as well. So there's some kind of in a weird way a dose effect of dual use that we're seeing. And it sort of makes sense if you think about it. And those on the far right, these are our VA-only users they get all their meds through the VA and they have across all the different measures that we looked at they have the lowest rates of potentially unsafe meds.

So that is what I have. And I'm happy to provide the citations and things like that. But I’m handing back to, stop sharing.

[Silence 0:56:10 - 0:56:19]

Handing back over to somebody. Thank you for your attention.

Dr. Bonnie Paris: Yes, thank you so much. This is Bonnie, and thanks, you gave some of the best advice ever doing research with pharmacy data which is to make friends with a pharmacist. Because although I’m not a clinician but I've been working with pharmacy data for over a decade now. But there are definitely things, many, many things that I do not know. And it's always a good idea to talk to the pharmacist or if you're seeing something unusual in your data to go and trace through and see where that came from. And we are coming up at the top of the hour. So there are a lot of slides in the deck that have various resources that you can refer to. And if I'm able to stay on for a little while to answer any questions, but you can contact Josh or me directly, at the email addresses listed there on the screen.

Dr. Joshua Thorpe: And I'm happy to stick around too.

Dr. Bonnie Paris: Yeah, great, thank you.

Dr. Joshua Thorpe: Mm-hmm.

Moderator: Okay. So the first question we have is for Josh, why did you use the PBM data source in your dual use study?

Dr. Joshua Thorpe: Well, so okay, so there's not a really great, this isn’t going like a smart answer. When we first started doing work on this PBM was considered I guess sort of superior from, superior in its completeness and its accuracy now this was maybe 10, 12 years ago now. So in the beginning we used PBM because it was kind of considered a slightly better, cleaner version. Subsequently the work that we have done since then we use CDW because we've done plenty of work now at this point to say that it's actually they overlap beautifully now. And frankly the CDW data just a little bit easier to work with. So part of it was for practical reasons that are now obsolete because I think the CDW data is now very much in line with PBM data.

Moderator: Great. And are non-VA meds included in the CDW?

Dr. Bonnie Paris: Yeah, there’s\_

Dr. Joshua Thorpe: [Unintelligible 0:58:57]\_

Dr. Bonnie Paris: \_ actually a separate domain that’s non-VA meds in the CDW, and VIReC has a factbook on that. So if you go to the CDW resources for VIReC you'll see under the CVW factbooks one that's on the non-VA meds. But the limitation is that those are just what is reported by the patient and recorded in the record. So it's not necessarily there at all for every patient and what is there is based on self-reports and has those limitations.

Moderator: Okay. And Josh do you have any tips for handling missing order start stop dates when trying to switch together, stitch together, excuse me, a time window that a drug was administered?

Dr. Joshua Thorpe: No, I don't have any standard advice because it’s very drug specific and population specific, some have very, very low rates. So you'll have very low rates of missing data. Others have higher rates. And then it's just a judgment call on what you're going to do with that. We have done, we’ve played around with some imputation schemes, we think about can we come up with a good guess based on the characteristics of the patients. And can we come up with a reasonable guess and impute an end date or a dispense date. But there's no, it's like every missing data question, there's no really satisfying answer to that. But it's a great question it's something we always worry about.

Moderator: Okay. And I think we'll go with one last question. Are the non-VA meds included in any of the other resources listed?

Dr. Bonnie Paris: No, I don't think they are. Although really you could look at all of the CMS data set, as a non-VA meds because they are paid for outside of the VA.

Moderator: Okay.

Dr. Joshua Thorpe: I do, can I add one more caveat that I should have mentioned, really quickly. VA, the Medicare data that we have, there's 2 flavors of Medicare there's Medicare fee for service that is the majority of Medicare patients are on fee for service. Then there's something called Medicare Advantage, that's more like a privately, private insurance administers Medicare, we don't have that data. So when I'm talking about Medicare data in the VA we're talking about Medicare fee for service which is the majority of Medicare patients. But it's an important limitation to remember that these are not all Medicare beneficiaries.

Moderator: Okay. Well Bonnie and Joshua, thank you so much for taking time to present today's session. To the audience if your questions were not addressed during this presentation you can contact the presenters directly. You can also email the VIReC Help Desk at VIReC@va.gov. And please tune in for the next session in VIReCs Database Methods Seminar series on Monday, October 5th at 1 PM Eastern. Dr. Maria Souden will be there to present Overview of VA Data, Information Systems, National Databases and Research Uses. We hope to see you there. Thank you once again for attending. We will be posting the evaluation shortly, please take a minute to answer those questions and let us know if you have any data topics you’re interested in and we’ll do our best to include those in future sessions. Thank you and have a wonderful day.

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