Radiation Doses in Consecutive CT Examinations from Five University of California Medical Centers
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U.S. National Diagnostic Reference Levels: Closing the Gap
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James A. Brink, MD • Donald L. Miller, MD

Herbert Y. Kressel, MD  Hi. This is Herb Kressel, and welcome to the October 2015 Radiology podcast. This month we’ll be speaking with the authors of 3 interesting manuscripts. In the first segment, I’ll be speaking with Dr. Rebecca Smith-Bindman, who with colleagues from the University of California system hospitals, reported on their registry of computed tomography consecutive exam radiation dose data from 5 University of California medical centers. In addition to Dr. Bindman, we’ll also be speaking with Dr. James Brink, radiologist in chief, Massachusetts General Hospital, who wrote an insightful editorial on the manuscript. I hope you’ll find this discussion of interest, I believe there’s a lot of work for us to do in optimizing CT doses and hopefully this discussion will be useful for those embarking on this effort. Next, my colleague Dr. Deborah Levine, senior deputy editor, will be speaking with Daniel R. Murphy of the Veterans Affairs Medical Center, Veterans Affairs Medical Center in Houston, Texas on their study on the development and validation of electronic record-based triggers to detect delays in follow-up of abnormal lung imaging. This is an important problem that we all face. There have been a number of proposed methods to address this and the use of triggers is an intriguing possibility. We hope you enjoy this month’s podcast, and as always we welcome your comments.

Herbert Y. Kressel, MD  Hi. This is Herb Kressel and welcome to this month’s Radiology podcast. Today I’m joined by Dr. Rebecca Smith-Bindman who is professor of Radiology and Biomedical Engineering and professor of Epidemiology and Biostatistics and a member of the Center for Health Policy at the University of California at San Francisco. Welcome Dr. Smith-Bindman.

Dr. Rebecca Smith-Bindman.  Thank you.

H.Y.K.  If it’s okay I’ll call you Rebecca for this session.

R.S.B.  Please do.

H.Y.K.  Joining Rebecca is Dr. James Brink well known to many of us in Boston. Dr. Brink is the Juan Taveras Professor of Radiology and Chairman of the Department of Radiology at Massachusetts General Hospital and of course a professor at Harvard Medical School. Dr. Brink wrote an editorial regarding Dr. Smith-Bindman’s paper. Welcome Dr. Brink.

Dr. James A. Brink.  Thank you.

H.Y.K.  May I call you Jim?

J.A.B.  Of course.

H.Y.K.  Great. Okay Rebecca, tell us about the University of California Dose Optimization Endeavor. I thought the term endeavor was kind of interesting. Who established it, what’s its purpose and what does it actually do?

R.S.B.  It’s called UC dose for short, a little easier to remember, and it’s basically a collaboration across the five University of California medical schools. So we have University of California San Francisco, Davis, UC San Diego, Irvine, and UCLA. It’s a collaboration that I established about four years ago to try to create a sense of sharing of best practices across the University of California campuses. We all have the University of California in our names, but we’re actually pretty disparate institutions. There’s a wide effort to try to bring what we do together. And so there was a call for applications, it actually was focused on cost reduction from a quality initiative from the University of California, Office of the President, and sort of quickly rounded up, we have enormous expertise in the University of California for radiologists, medical physicists and brought us together; we put in the application and basically it supported our collaborative work over three years and what we said we were going to do is learn about our practice, share best practices, and see if we could optimize and standardize dose.

H.Y.K.  Okay I’m jumping ahead a little bit, but just to help us kind of understand what you all did and reported on, you note that the data that you presented can be used to help develop diagnostic reference levels for CT...
R.S.B. I feel pretty strongly, which is what sort of motivated that project, that it's really important for individual facilities to look at the radiation doses they use and to compare them to similar doses that other people use to know how we're doing. We have this broad principle in radiology that we know about, ALARA, which is basically we should use the lowest doses as are reasonably achievable, except without knowing what those doses are, every institution reinvents the map. Everyone starts from scratch. I said well we have some experience, let's share that experience, let's pool our data and that would provide some evidence of what our attainable dose is. So as part of the project, the first part was to pool the data which took a little bit of work, but not as much as you think. So I currently get at my server at UCSF, all of the exams across the five University of California hospitals and it allows me to then summarize them. So we summarize the results, we did it looking at doses by anatomic areas so what are the doses across the five UC campuses in the head, in the chest, in the abdomen; and started to sort of notice a lot of variation. Now we've done a lot of work to tease apart the causes of that variation, but it gave us a starting point. These are doses that other people could potentially use as achievable doses.

H.Y.K. Okay and what were some of the key findings of your study.

R.S.B. I think first that there is, even within our University of California system, there's considerable variation in dose. We didn't come up with sort of very narrow ranges. And we had in person meetings to tease them apart and the differences were not because of the case mix of our patients, but rather because we make different choices. How should we image patients with suspected PE, how should we image patients with stones? So first there was considerable variation. Second, we compared our doses to some other dose ranges that have been out there. Most of the ones that are published have been published in Europe; and our doses, and we all consider ourselves really cutting-edge medical centers in the U.S., and our doses were higher than many of the European numbers that are out there so the dose were variable, higher. Doses were about twice as high in adults as children which is what we expected and we actually were able to do sort of a pretty nice job of creating dose ranges that were very stable. So our samples size is about 200,000 exams, We currently on our server have a million exams. 200,000 is big enough to get a pretty good estimate of what those doses are.

H.Y.K. Good. Jim any thoughts about sort of organizationally about the issue and particularly in terms of establishing DRLs, first of all can you just remind us what these are and ADs is the other thing that comes up in your manuscript and what do we need to establish these?

J.A.B. Okay so diagnostic reference levels were first defined and proposed by the ICRP, the International Commission for Radiation Protection, back in the '90s as a means of providing benchmark dose data very similar to what Rebecca has just described where dose data is collected either by survey methods or registries or what-have-you, to aggregate doses from a variety of institutions and then look at that histogram of dose data for a particular exam; set a threshold that says okay this is what we want to set as the reference level, and that's typically set at the 75th percentile within the histogram very similar to what Rebecca did in the UC study. Those form the diagnostic reference levels. The idea is that you compare yourself to those levels and you try and get below them and the process repeats every few years such that as technology advances and there's more opportunity to reduce dose, then you continually iterate, sort of like a limbo dance where everyone tries to get under the bar and then the music stops and the bar is lowered again. Achievable doses are a concept that we came up with, I think that we came up with them in the NCRP Report 172. I don't know that they existed in the literature before then where we recognized the people that were below the DRL still had some value in comparing themselves to something and we then set arbitrarily the 50th percentile as the achievable dose and just as another point to compare. I know Rebecca also reported the 50th percentile in her study.

H.Y.K. Now in your editorial I thought it was kind of that you noted that the findings from the combined UC group are comparable to DRLs recommended by the NCRP in a number of areas. Were you surprised about this or what's the underlying substrate that's making this all look so similar?

J.A.B. You know actually I think that UC's data, UC's system should be complemented on their doses. They actually are lower in many areas than what we were appointed, but it's important to understand where DRL data came from in the U.S. because it's sort of a sad story. When we put together the NCRP Report 172 published in 2012 which defined DRLs for the United States, not just in CT but in radiography, nuclear medicine and fluoroscopy. We had very little data to draw upon unlike our counterparts in Europe which had been doing surveys of dose exposures for quite some time. We basically had two sources of data, the American College of Radiology CT Accreditation program data which of course is a skewed sample because these are data extracted from people who want to become accredited so it's a bio-sample. The other data came from the National Evaluation of X-Ray Trends sponsored by the Food and Drug Administration. This was the saddest thing because the FDA had last surveyed collected survey data for CT in 2005, 2006 through the CRCPD. That data had not yet been analyzed by the time we were writing our report and we basically had to ask them to analyze a subset of the data just to get some sense of it and they did a subset of 40 data points for us. I give big credit to Dave Spelic at the FDA who did this on his own and so basically years had gone by and the data had just languished without
any analysis. So the U.S. has done a poor job in really producing data, survey data, for DRLs. Going forward I think the work that was done at the UC system for a local or regional registry or through the American College of Radiology through a national registry, will provide much more real time data from which we can look at DRLs and calculate DRLs and adjust them over time.

R.S.B. Herb can I add one thing about DRLs?

H.Y.K. Yes.

R.S.B. Which is implicit in Dr. Brink’s comments, there’s nothing optimum about the dose levels of a DRL. It’s a place to start and some countries, Germany for example, sets their target at the 25th percentile with the rationale being by the time we create those levels several years have gone by, technology is better; we should be able to do better. So it’s really a place to start, not a place to end. And the amount of variation at least at UC certainly involve a data that’s come out of the DIR recently, there’s a lot of variation and so there’s a lot of opportunity to get that limbo game going faster and faster to sort of keep pushing them down. We have a lot of room to continue doing that.

H.Y.K. Sure one of the things that I’ve noted when we have these dose reduction papers using new reconstruction techniques and the like, we commonly send them to reviewers in the U.S. and in Europe and almost invariably from Europe they say your reduced dose is too high, I don’t understand the meaning of this paper, so I think the two continents are really in different places in terms of dose optimization. Jim, I note that you’ve been active both in Image Wisely and the ACR Dose Registry, in your view what’s been the impact of these programs to date?

J.A.B. So Image Wisely recognize I think the value of participating in the dose registry whether it be a local registry like the UC registry or actually one could argue that’s a regional registry because of its distributive nature throughout California, or the national registry and so Image Wisely pledges that we created, as you may note, do include participation in the local, regional, or national dose index registry as a principle of best practice. I think we were disappointed when we saw some results from the ACR dose index registry published, particularly the renal flank pain study that came from Yale University which after many years of trumpeting the need to pay attention to these issues, that data show that only two percent of practices reporting flank pain CTs in the registry really control their doses or produce low dose exams if you will, so a very low percentage of compliance which is disturbing. It has prompted the Image Wisely campaign to revisit its charge and its action plan which is ongoing as we speak and I know that although I’ve stepped away from that organization, its current leadership is formulating new plans which are now being considered by its member boards, the ACR, RSNA, ASRT and AAPM.

H.Y.K. Good. Rebecca any thoughts about this? The Yale study in particular?

R.S.B. Well I have two series of thoughts. We did a study and found the exact same results, but basically ours were data from a 15 percent to randomize trial across the U.S. We looked at the doses patients got to CT and five percent of patients got low dose studies and the range of doses for kidney stones, it should be two or three or four milisieverts ranged up to 75 milisieverts for one exam. So the results were probably more disappointing for me than for Jim because this was my study that I did not put close oversight into how the CTs were done and I feel terrible about it because I could have, but I thought well everyone knows you’re supposed to use low dose for CT for stones. There was no education needed. I think there’s enormous disconnect between what we know we should be doing and what we’re doing. I think the reason for that is we haven’t put any structured systems in place for making sure that people assess their doses and know what they’re doing in comparative benchmark. I think there’s really a role for more than telling people good practices or publishing papers in your journal and saying this is what you can do, I think rather we need to put much more clear expectations that in your patients you shouldn’t have doses above that range and I think part of the difficulty is we have so many different names for different metrics, we haven’t made it easy for people to really keep track and I think it’s incumbent on us as radiologists to take the lead in this and really try hard to make it simple and I don’t think it’s that complicated saying these are the doses I use in my patients and this is what I should be doing and if I’m not reaching those milestones I need to do something different.

H.Y.K. The practices that I know that have been most successful, they actually have a structured effort in this regard, they review their doses regularly, they discuss them and they monitor it. It’s not a passive activity. Rebecca, where does the UC effort go from here? You’ve gotten our attention and presumably you’ve got the attention of all the departments of radiology and medical imaging, but where is your group going now?

R.S.B. So I’d answer that a few ways. First our group, so the group that I run is called the Radiology Outcomes Research Lab, we currently have expanded on the UC efforts and we’re collecting data from 150 hospitals from across the country and in Europe to look at data. And then to make a pitch on this, but if anyone would like to do that, we don’t charge people, we basically you give us your data; we tell you how you’re doing. That project is focused on working with centers to try to optimize the dose, so going beyond looking at your data, to trying to optimize it. Part of the problem in the optimization process, is we’ve made it so complicated. Instead of having ten ways to image abdominal pain, we have a thousand and they’re really subtly different and it’s not being driven by patient need, it’s being driven by nuances of physician preferences at different institutions. So I really think the UC dose has
sort of expanded and all the UC collaborators, nearly all of them, are collaborating on this work to see if we can sort of spread best practices within the UC system.

H.Y.K. How are you doing that Rebecca? Are they meeting regularly, do you have a newsletter? How are you actually doing the communication?

R.S.B. So for the project I just mentioned, it’s funded by a combination of the NIH, a dissemination implementation work, and PCORI also a dissemination and implementation work, and we’re meeting on WebEx during this intervention weekly. We’ve divided our hospitals into three groups, and we’re doing what I’m going to tell you we’ve done for the University of California. For the University of California, we basically got people around the table. We had a meeting with the head of chest, abdomen and pelvis, from all of our sites. Almost everyone came, medical physicists from each site, the lead techs, and I gave them their doses ahead of time and I said come prepared so that you can defend why your doses are three times higher than mine or to change them. And we got people around the table and tried to explain what we were doing, that they can do it. I saw some images that I’m glad that I don’t have to read because the doses were too low for me to read, but I’m not reading them and the neuroradiologists felt good about them. So we basically are getting the right people around the table and I think by far that’s the most important thing so they can share best practices. We’re not telling them what to do, they’re telling each other and that’s the model we’re using for the bigger trial.

H.Y.K. So are you going to re-measure the UC dose participants or has that been put to rest?

R.S.B. No absolutely. So we have one project that you will get on your desk very soon that looks at the change in dose before and after that intervention I just described and the doses at the University of California went down 30 percent after that intervention which I’m quite proud about.

H.Y.K. Congratulations.

R.S.B. We have another project that we’re finishing this week which is looking at doses for PE study. For that one we have room to improve, but the idea is we’re working on it by trying to simplify the variables, understand where the practice variation occurs, and the practice variation doesn’t occur because of our patients. The patient’s symptoms are pretty similar. It doesn’t occur because of weight because we account for weight, it accounts because of different decisions the doctors make at their institutions, and they’re willing to do a little better if they realize they’re coming out kind of high in the dose.

H.Y.K. Good. Jim we’re going to have to wrap up soon, so thinking about this whole issue of dose and dose management and the efforts that have been made. We have technical efforts that are enabling us to get better image quality with less dose. We have more reporting. The machines are providing some data. So is the glass in this half full or is it half empty. When you wake up in the morning are you happy or are you depressed?

J.A.B. Actually I think it’s half full. I’ve seen so much progress over the past several years particularly in the realm of dose reporting as I just mentioned having tried to pull together survey data in our country to form DRLs just a few years ago and having such a (inaudible) of data to draw from. Now between data such as the UC data registry, the ACR data registry, we have real time data with real patient data that we can draw upon to really set the benchmarks appropriately and continually lower that limbo bar, keeping in mind that we have to maintain adequate image quality for diagnoses of course, but that’s just a terrific advancement for our specialty in this country. And also the technical advances that the manufacturers are making and have made and will continue to make I think are very, very encouraging and I’m very excited about continuing a decline in radiation dose for our imaging studies.

H.Y.K. Thank you. Rebecca you can have the last word. Is the glass half full or half empty?

R.S.B. I think it’s mixed quite honestly. I completely agree with Jim that the idea of having more data and more dose awareness is wonderful. So this is now on radiologists’ table. That’s something they have to do. What’s lacking is our ability to get them to lower the limbo bar, not so much because they don’t want to, but because they don’t necessarily know how. I think the next step is the awareness is awesome. In California by state law we have to put in the medical record the radiation dose of every study. As a result, our residents know the doses. They didn’t used to know the doses, they now know them. That doesn’t make them get lower. It just increases awareness. So the next step is to really require people to assess the doses, look at your doses, but then the piece that’s missing is how do we get them to lower them. You know sort of do we have some checklists that we can hang up that’s a relatively easy way to get quality. And we know across medicine quality is hard to come by. You don’t just have to know you want to reduce the infections; you have to figure out how to do it. And so I think there’s a real opportunity and a willingness to go down this path, but now I think our efforts really have to focus on providing the tools to give clinicians, radiologists, the ability to really optimize doses when they’re using them.

H.Y.K. Very good. I want to thank you both, Rebecca, Jim, for a very stimulating discussion. I’m sure our viewers and listeners will benefit both from your articles and from the discussion. Thank you again for participating.

R.S.B. Thank you so much for including me.


J.A.B. Bye-bye.
**Development and Validation of Electronic Health Record–based Triggers to Detect Delays in Follow-up of Abnormal Lung Imaging Findings**

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Daniel R. Murphy, MD, MBA • Eric J. Thomas, MD, MPH • Ashley N. D. Meyer, PhD • Hardeep Singh, MD, MPH

Deborah Levine  Hi. I’m Debbie Levine. I’m the Senior Deputy Editor for Radiology and I’m here today talking with Dr. Dan Murphy who is an Assistant Professor at Baylor College of Medicine and who works also at the Houston VA Center for Innovations and Quality Effectiveness and Safety. He and his group are publishing a very interesting study in our October issue of Radiology that’s entitled “Development and Validation of Electronic Health Record-based Triggers to Detect Delays and Follow-up of Abnormal Lung Imaging Findings.” Dr. Murphy, welcome.

Daniel Murphy, MD, MBA  Thank you very much. Thanks for having me.

D.L.  Can you tell me a little bit about what you did and what you found?

D.M.  Sure. So basically this study came out of research that shows that about between seven and nine percent of critically abnormal test results don’t get timely follow-up. In this study we basically built what we call a trigger. It’s basically an algorithm that searches through a large clinical data warehouse to look for instances where there is a red flag and in this case a basically an abnormal chest x-ray or an abnormal CAT scan where the radiologist specifically flagged the report as having a finding suspicious for a malignancy. Then it went through and basically excluded people who had what we would expect to have typically occurred after that in terms of follow-up such as a pulmonary evaluation or bronchoscopy biopsy, etc. and it also excluded people who had reasons why you wouldn’t need follow-up such as terminal illness. The goal of this was basically to narrow down the vast amount of data in the electronic health record to something manageable to find these high risks for delayed so that in subsequent studies we can find ways to deliver it to either clinicians or patient safety personnel to basically act on this information. So what we found of about 90,000 visits at this particular facility, we found about 530 red flags and of those our computer algorithm was able to automatically narrow that down to 131 records where there was an apparent delay from the computer perspective and we subsequently did chart reviews to find out which were these true delays and we found that there were 75 of those. From 80,000 visits we’ve narrowed this down to a manageable number of 131 reviews that someone can take a look at and act on if need be.

D.L.  Well very impressive and then you end up with your 131 records that need to be manually gone through. How much time did it take for this kind of review that you did with the manual records?

D.M.  So during this study we basically had one part-time chart reviewer. He basically worked about eight hours a week and he was able to basically work one day a week. In fact most weeks he only worked about four hours in order to review these and so for this entire year I would say if you have someone who is working ten percent of the time doing this and probably even other similar test results, it would be plenty to be able to handle this type of work load.

D.L.  And when you talk about coming up with the 131 records at risk and then finding 75, were you surprised at all by these numbers? Was that higher or lower than what you expected?

D.M.  Well it’s about what we expected, and part of that is on an x-ray when you say suspicious for malignancy you can mean a lot of things. You can mean what we’re really looking for which is a possible lung cancer and so that’s our trigger with design to look for typical follow-up of lung cancer, but there are other things that can be flagged as willing to see better and other places in the thorax, the mediastinum, the chest wall. In prior work we had obtained about 60 to 70 percent, but given this sort of variability in x-rays that is not apparent in a structured field. For example a positive fecal blood test that is positive or negative, there’s no sort of room for interpretation. I would say this is probably a little better than we expected to receive a positive predictive value of almost 60 percent.

D.L.  And you ended up finding that half of those true positives had no explanation for the follow-up. Were you surprised that health care providers weren’t acting on these reports and did you find that number either comforting or disturbing?

D.M.  I found it a little bit scary. I think if it was documented that we decided actively, together, me and the patient or based on whatever clinical factors are going on at the time, we decided not to pursue follow-up, that would be a lot more comforting than the fact that there’s somewhat of a black hole that the patients sort of fall in and they don’t get follow-up and it is a little concerning that these patients don’t have any evidence of follow-up or an active plan not to follow these up. I think there’s a lot more work that this brings us to that says we need to look into why this is happening, talk to providers, and see what we can do about it.

D.L.  So talking to providers is one end of the spectrum, but we’ve got the radiologists generating the report. From your position as an internist, what do you...
think we as radiologists should do to make our reports more so-called actionable?

**D.M.** Well I think you know this study was done at the VA and they have one thing that really facilitated this study that is not present throughout the rest of the country necessarily and that is the use of these structured suspicious for malignancy codes. And really that’s what allowed us to take what might be coded as an abnormal radiograph or CT scan and narrow it down to just the subset that we’re really looking at, and in some places they don’t even use their normal codes so that would make it even more difficult for this trigger to be put in place. So I think as radiologists, probably the next step to make use of this type of software an algorithm and technology, is to kind of put together on a list of code that can be incorporated with the x-ray rather than just the text report and that allows researchers like me as well administrators and clinicians to make much better use of the data. So I think it’s similar to how BI-RAD codes are done. I mean if you have a BI-RAD 2 it’s very different from a BI-RADs 4, you kind of know exactly what you’re looking at and if similar codes could be agreed on by radiologists and clinicians and probably in this case pulmonary specialists, I think that would be a great start in allowing this type of work from a research and a quality improvement perspective to proceed.

**D.L.** So this was done at a VA hospital and you did have that trigger field, but you also have a population that’s very different than a general population in the United States, for example, because the positive predictive value is really going to drive how useful triggers like this are given the manual need to go through reports. So how generalizable do you think results like this will be to use in other parts of the country and even other diseases?

**D.M.** I think it will be very helpful. So on one hand other than the structured data code, we basically used standard CPT codes and ICU9 codes. We didn’t apply this to sites outside the VA but we have applied other triggers outside the VA and we have basically been able to be just about as successful with outside VA facilities as we have here with these other types of codes. So that’s one thing we want to look for in the future. A lot of the criteria that we used are standardized; they can be customized for facility. For example, we use 30 days based on how the providers felt that follow-up should occur, no later than 30 days, but then that still gives providers enough time to complete actions that they would have put into place. So I think customizing it for facility and using these standard codes I think it would be very easy to move these to other facilities once that first part is put into place with these standardized radiology, abnormality codes.

**D.L.** Are you aware of other software programs that could provide this kind of follow-up and triggering for people or does it always need to be some home grown program?

**D.M.** So I’m not aware of any software that does what this particular algorithm does. In fact I think this is very early. The original triggers were basically very simple, one line criteria. So for example if you received an overdose of narcotics, a lot of times the trigger itself would be the order of Narcan that is not done in the ER so we can assume just because Narcan was ordered, it’s not in the ER, the patient received too much narcotics in the hospital. This is the first that I’m aware of in terms of using more complex triggers to look for these diagnostic delays. What we did is we applied this to a data warehouse that basically use a SQL based server. I’m not aware of any software that is able to do this right now and I think a lot of this hasn’t been done simply because there isn’t widespread use of these abnormal radiology codes and much to apply them to.

**D.L.** So this trigger algorithm in your manuscript you mentioned that it was developed through literature review and expert input; and in radiology we have so many different guidelines for follow-up of lung nodules. We’ve got Fleischner Society Guidelines, we have ACR Appropriateness Criteria, just to mention two for example. So how did you decide if the triggers used and the radiologists who are reading these reports, if these were appropriate lesions for follow-up?

**D.M.** Well that was probably the most difficult part and I think any time you have to get clinicians to agree on something that’s the most difficult part and you’re going to have to make a decision whether you’re going to sort of meet in the middle or if you’re going to go with one site, I mean we basically did the literature reviews, we looked at what typical follow-up should occur particularly in terms of the diagnostic steps that occur after a normal imaging result, and we took this to the clinicians that practice and this includes both primary care physicians, that includes oncologists, that includes pulmonary physicians, that included radiologists; and we tried to come to some consensus and I’ll admit we went around and around and around quite a bit until we could find something that all the clinicians that this particular facility could agree to. I think as this particular type of work moves to other facilities, they’re probably going to have to do the same thing. There is no standard in terms of what is required for timeliness follow-up in terms of the number of days, and so we had to make a decision and we felt you know 14 days wasn’t enough time to necessarily get all the testing done and we felt 60 days was too long and so you know if you tell a patient it’s been 8 weeks since your x-ray and we’re now just getting these to pulmonary, they’re not going to be too happy. So we had to kind of find a medium that from the clinical perspective, everyone could agree on.

**D.L.** Any you applied your data to studies done in 2009 and then followed these patients for two years and you actually found some cancers in this cohort; but your data is still a little bit old at this point and I’m wondering what have you done with this trigger since
that time? Have you continued to use it and have you modified it at all?

D.M. So yes we actually learned quite a bit. So the reason that this data was applied on a 2008 and 2009 data set is because when we started this that was all the data that we could get for radiology. Fortunately, there has been great steps forward in data warehouse management and extraction of data from the actual day-to-day electronic health records that providers use and formatting them into something that we can use in the data warehouse. I think that we have a lot more data available to us now and it’s much more, I wouldn’t say real time yet, but we’re getting very close. If we wanted to run the study again on 2014 it would be much easier to do now, now that the data warehouse has caught up. The VA data warehouse, I mean it’s not exactly new, but it certainly hasn’t been around for a while, and it took a lot of time in order to format the data that comes in from all these different facilities across the VA so that we have sort of a standard baseline to use. We learned other things. For example we have modified the triggers a little bit to try to account for issues that have come up. In this particular trigger we used an age between 40 and 70. Since then we have found cases where a 20 something year old had an abnormal x-ray didn’t need to be follow-up, so we have adjusted the trigger to be able to apply it to more age groups. There are other little tweaks that we have made along the way in order to make a better trigger. Going forward what we really want to get into is something like national language processing. Like I said at the beginning, sometimes the reports of the x-ray indicate that this malignancy is not in the lung, and so if we could be able to sort those out and have those processed differently, that would make for much more useful data to clinicians and patient safety officers.

D.L. You did this at your local VA and did you expand it beyond to other VAs in the country or just your regional area?

D.M. So originally we did just that one VA using the data warehouse just for that VA, but we have since then, we are working on several other triggers for other types of cancer that we are trying to apply to entire regions of the VA and we’ve also worked on a project outside the VA to other facilities who are using data warehouses.

D.L. Thank you so much for the time that you took not only to talk to us today, but also to conduct this study. I think it brings out some really interesting points about how we as radiologists should try and be more standardized in the way that we report and in our recommendations because that’s probably how we can have the greatest impact with this kind of electronic health record data mining as you talk about. So I really appreciate you bringing forward those points. Thanks so much for your time.

D.M. Thank you. Thank you for having me.