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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

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ADVISORY COMMITTEE ON THE MEDICAL USES OF ISOTOPES

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OPEN SESSION MEETING

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TUESDAY, APRIL 16th, 2013

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The Open Session portion of the meeting was convened in Room T-2B3 of Two White Flint North, 11545 Rockville Pike, Rockville, Maryland, at 8:00 a.m., Leon S. Malmud, M.D., ACMUI Chairman, presiding.

MEMBERS PRESENT:

LEON S. MALMUD, M.D., Chairman

BRUCE THOMADSEN, Ph.D., Vice Chairman

DARICE G. BAILEY, Agreement State Representative

MILTON GUIBERTEAU, M.D., Diagnostic Radiologist

SUSAN LANGHORST, Ph.D., Radiation Safety Officer

STEVEN MATTMULLER, Nuclear Pharmacist

CHRISTOPHER J. PALESTRO, M.D., Nuclear Medicine Physician

JOHN SUH, M.D., Radiation Oncologist

ORHAN SULEIMAN, Ph.D., FDA Representative

WILLIAM VAN DECKER, M.D., Nuclear Cardiologist

LAURA WEIL, Patients' Rights Advocate

JAMES WELSH, M.D., Radiation Oncologist

NRC STAFF PRESENT:

BRIAN MCDERMOTT, Director, Division of Materials Safety and State Agreements

CHRIS EINBERG, Chief, Radioactive Materials Safety Branch, Designated Federal Officer

SANDRA GABRIEL, Ph.D., Acting Medical Radiation Safety Team Leader

ASHLEY COCKERHAM, ACMUI Co-Coordinator, Alternate Designated Federal Officer

SOPHIE HOLIDAY, ACMUI Co-Coordinator

NEELAM BHALLA, FSME/DILR/RPMB

STEPHANIE BUSH-GODDARD, Ph.D, RES/DSA/RPB

SUSAN CHIDAKEL, OGC/GCLR/RMR

JIM DWYER, RI/DNMS/MB

SARA FORSTER, RIII/DNMS/MLB

CASSANDRA FRAZIER, RIII/DNMS/MLB

MICHAEL FULLER, COMM/OCM

LATISCHA HANSON, RIV/DNMS/NMSB-A

VINCENT HOLAHAN, Ph.D., FSME

DONNA-BETH HOWE, Ph.D., FSME/MSSA/RMSB

DEBORAH JACKSON, FSME/DILR

ED LOHR, FSME/DILR/RMPB

KEVIN NULL, RIII/DNMS/MLB

PATTY PELKE, RIII/DNMS/MLB

GRETCHEN RIVERA-CAPELLA, FSME/MSSA/RMSB

MOHAMMAD SABA, RES/DSA/RPB

SAMI SHERBINI, Ph.D., RES/DSA

RONALD ZELAC, Ph.D, FSME/MSSA/RMSB

MEMBERS OF THE PUBLIC:

PAUL BESSETTE, VIEWRAY

DAVID BREUNING, VIEWRAY

ROBERT DANSEREAU, NY STATE DEPT OF HEALTH

WILLIAM DAVIDSON, UNIV OF PENNSYLVANIA

JAMES DEMPSEY, Ph.D., VIEWRAY

DANIEL DUVALL, M.D., CMS

LYNNE FAIROBENT, AAPM

RILLA HAMILTON, NNSA

KAREN LANGLEY, UNIV OF UTAH

ANDREW MCKINLEY, ASNC

MICHAEL PETERS, ACR

JOE RODGERS, THERAGENICS CORPORATION

MICHAEL SHEETZ, UNIV OF PITTSBURGH

PARRISH STAPLES, NNSA

MICHAEL STEPHENS, FL BUREAU OF RADIATION CONTROL

CINDY TOMLINSON, ASTRO

NANCY WERSTO, FDA

PAUL YURKO, VETERANS HEALTH ADMINISTRATION

TABLE OF CONTENTS

1

P R O C E E D I N G S

CHAIRMAN MALMUD: Good morning, everyone, and today's session will be on the new agenda that was distributed yesterday so that the first item on the agenda is being presented by Ms. Bhalla and Mr. Lohr, which is 10 CFR Part 35 rulemaking update.

MS. BHALLA: Good morning, Dr. Malmud, and members of the committee. This is Ed Lohr and me, Neelam Bhalla, and we are from the rulemaking group from FSME. We don't have a lot here to say today except for -- give you and update for this proposed Part 35 rule making. Next slide. Okay.

I'm just going to, as I said, provide the rulemaking update. Basically we have had, as you all know, the ACMUI review of the proposed draft and then we had also said the proposed draft to the agreement states for their preliminary review. These -- as you know, the draft has just now gone to the Commission, but you did have the opportunity to review and provide your comments. So we have received the comments from the agreement states as well. Besides that, we have our internal process where we send to -- within the agency to different groups for their reviews. So now we have all the comments and the working group has started to resolve those comments.

The next step that's going to happen is a comment resolution, how we convey this proposal to the Commission is -- we call it a SECY paper. So in this SECY paper, so as far as ACMUI goes, so we would be providing your report that

you provided to us the last -- the final report came last week, April 9th, and we do want to thank the committee and Dr. Zanzonico on that for the very thorough review and the comments.

So what will go to the Commission is that report, the way it is, as an enclosure, and along with that will be another enclosure which will provide to the Commission how the staff resolved ACMUI's comments and the comments that we did take, and perhaps there may be some comments that the staff perhaps did not accept. But we would have to give a pretty good reason as to why the staff did not take those comments.

So the scheduled proposal -- rule is still on schedule to go to the Commission mid-2013. That's this year, in a few months. And then final rule is due to the Commission late 2014 because as you know once we -- once the rule goes to the Commission, the pending Commission approval, the rule will be published in February 2014 for certain time period, and for this one we proposing 90 days, but that's again up to the Commission. May extend it for a little bit longer or make it shorter. And then that same process will start for the final rule. We will be going over the comments, resolve the comments, and again the final rule would come to the committee as well. And then we do the comment resolution and eventually the final rule would go to the Commission and that plan is late 2014. Ed, do you want to add anything?

MR. LOHR: I think you've covered it very well,

Neelam. And of course we want to entertain any questions that the committee may have on the process and know where we are.

CHAIRMAN Malmud: Are there any other questions from members of the committee? Dr. Langhorst.

MEMBER LANGHORST: I would just request that at least 90 days be given for a comment period, if not a little bit longer, because I think the length of our discussions on teleconferences gives you an idea that this is a pretty expansive change and we want to make sure that the licensees have plenty of time, and others, to comment on the many changes that are being proposed, so I would hope it is at least 90 days.

CHAIRMAN MALMUD: Any other comments? If not, thank you. Ms. Bhalla, Mr. Lohr, thank you very much. I'll say personally that it's been a pleasure working with you over these years. You've been very helpful to us in clarifying issues, patient with us, and understanding our perspective, and we're very supportive of the effort. Thank you both.

The next item on the agenda is the status on data collection on patient release. And we're a bit ahead of schedule. Is Mr. Saba here?

MR. SABA: Good morning, Dr. Malmud and members of the committee. I'm Mohammad Saba, the project manager for the patient release study, and it's my pleasure to give you an update on the project this morning.

Basically, in the first few slides -- oh, it's not

this -- this picture shows how difficult it is, the job for balancing the situation if it needs two groups. There are two groups. One group that believes we are too conservative in assumptions, methods, calculations in Reg Guide 839, and we should revisit that objective. And the other group thinks we are too relaxed -- oh, and we have to relax that. We should change the regulation to what it was before, the old rules that was more conservative.

Basically, for the next few slides I give you an update. I'll give you a brief background, and history of the subject, just to refresh your memory, and then give you updates on what we have done and what we are going to do on the project. Previous rule -- the current rule was -- it became effective in 1997. And before 1997 patient release was based on the following. I just extracted it from the old regulation. The licensee authorized release from confinement for medical care and patient and all human research subjects, administered a radio pharmaceutical unit until the measure dose surveyed of the patient or the human research subject is less than five millirems per hour at a distance of one meter, or the activity in the patient is -- or in the human subject is less than 30 millicuries.

A major advantage of the old rule was the release was based on directly measurable criteria, i.e. the activity of volume at the time of release, or the dose rate of one meter from the patient. A significant disadvantage of the previous rule was that it was not flexible. It didn't allow for the specific conditions of patients fall and release.

If we knew the patient -- was not -- is not going to be in contact with anybody after release, we couldn't release her yet.

On the other hand, the current rule is the same. A licensee may authorize the release of control of any individual who has been administered radioactive material or implant containing radioactive materials if the total effective dose to any other individual is not likely to exceed five millirem. The current rule is based on the -- goes to members of the public. It does not provide the licensee with a measurable quantity to be used for releasing the patient. Therefore, a model is required to translate the release criterion into an operational quantity. That's why NRC came up with guidance. The model suggests that -- by NRC by use of licensee to determine the release criterion is described in Regulatory Guide 8.39. Release of patient administered radioactive material.

The model provides two options for the licensees. The first option is to use the old parameters. The second option is to use specific parameters. So it's more flexible.

The other parameters include effective half-life of radioisotopes, duration of exposure of the member of the public, attenuation of radiation in the patient, and the target, et cetera. It is very interesting to note that the use of the default parameters in the model leads to a release criterion that is nearly identical to the 30 millicuries retained activity criterion in the old rule, and

of course this is not coincidental -- we didn't push.

As you know, the Commission last year directed the NRC staff to review publicly available data and see if any data is missing. Either reproduce the data or -- and so we had to do some collection of data if you need to do.

Assessment of the rule is not within the scope of this work. Basically, the objective of this work is to see how well a patient release practices are working, and to what extent the 500 millirem limit is met. In addition, the Commission directed the staff to examine the methods and use in Regulatory Guide 8.39 to calculate the dose to members of the public and to recommend this as appropriate. The items to be reviewed include use of point source and point target, use of gamma ray constant. No credit for self-absorption in the patient or target. No credit for biological elimination, occupancy factor .25.

Now, I give you an update on the project. So far we have reviewed so many papers including the guidance from ICRP, NCRP, and IAEA. There appears to be sufficient data in the literature to reach reliable conclusions on exposure of the member of the public, both for external and internals. But we didn't find enough data for one area: the exposure to workers in nursing homes and hotels. As you know, some of the patients decide to go to hotels after release from the hospital. NRC is -- and we found it very difficult because of different reasons to go through these facilities and collect data, and so the NRC staff came up with another approach to stipulate the situation. The NRC

staff is conducting calculation using state of the art phantoms and Monte Carlo calculations to represent the patient and the target, and to calculate doses.

We are -- currently we are doing some QA tests on our patient -- on our phantom, and we are confident that the results are close, very close to what experimental data is. Calculations are designed to assess doses in various situations such as public transportation, hotels, at home, et cetera. After this point, it is unclear if any NRC initiative measurements will be needed. This will be clear at the end of our literature review. The NRC staff has been in contact with so many medical centers to get more information to -- about the patient release practices and calculations, and any data that they have concerning exposure of members of the public. This will really help us to come up with a good quality reg guide in the future.

The work is scheduled to be completed by the end of 2016, but maybe we can finish it earlier. Our first report would be a draft NUREG. We are going to send it to FSME and ACMUI for your comments at the end of this year.

And the last slide, I provide this flow chart which is a summary of the project. As you can see, for both internal and external data for family members, we think we have enough data in the literature for the family members, how much exposure they get. But for hotel and nursing home workers, we may need to perform calculations, time and motion studies, and also get some information about procedure of data from medical centers. And for general

public we still will need -- we may need to perform some calculations and time and motion of studies. Once we are done with this first phase, we use the information we have from the first phase to develop Reg Guide 8.39. We use the information from our literature review and we use those calculations that we do with MCNP [spelled phonetically], and we also use information that we get as a result with interaction with medical centers. Okay, that's the end of it. Thank you so much.

CHAIRMAN MALMUD: Thank you, Mr. Saba. Are there questions?

VICE CHAIRMAN THOMADSEN: Mr. Saba, the time and motion information you're getting for nursing homes and hotels, how are you gathering that data?

MR. SABA: We should contract it out --

VICE CHAIRMAN THOMADSEN: Okay, that's not --

MR. SABA: It's not our --

VICE CHAIRMAN THOMADSEN: -- not set yet?

MR. SABA: No, not yet. It's -- there are questionable -- there are some questions about funding. We are not clear on that yet. And we don't know that we need it if we have enough data. We might not need it at all.

CHAIRMAN THOMADSEN: What sort of data would --

MR. SABA: Oh, for nursing home we might get some permission from the licensees, or maybe we are hoping that we might get some papers still in that area, but if we don't find it we have to do it.

CHAIRMAN MALMUD: Dr. Suleiman, you had a

question?

MEMBER SULEIMAN: Yes. Orhan Suleiman. Why not just badge some of these sites with all their personnel in a prospective study, including maybe the carts they carry around, including themselves, just to do a pretty comprehensive sweep and collect some real data? I think it'd be easier

MR. SABA: Yeah. That's what we were going to do, but there will be some legal issues. It should not be done by NRC, it will be done by contractors. But that's what we are going to do it with, yeah. I just wanted to tell you that there are -- we think that there are lots of difficulty in doing that.

MEMBER SULEIMAN: In a former life I remember having to tell sites to go ahead and badge employees that we suspected were getting below minimal. I did just for legal purposes. Go ahead, document it, and then you can feel safer later. So, yes, why couldn't anybody take that kind of approach?

CHAIRMAN MALMUD: Yes?

MEMBER MATTMULLER: Steve Mattmuller. I'm curious. Parts of 1997, when patients were hospitalized, I know, at least at our facility, we badged the nursing staff that took care of those patients, albeit the care was minimal. But have you considered use -- or maybe trying to find some of that old exposure data to nursing staff for those hospitalized patients as part of assimilation to what a hotel worker would get?

MR. SABA: We have been contacting with the medical centers. Yes, eventually, if we can't do any -- if we can't go to nursing homes, yes, or hotels, we can't do it that way and we -- yeah, most of the hospitals they have some data, but the only problem is we give instructions to the patient in the hospital, but when they go home, they are not instructed as much as they are in the hospital, so it's not the real case. That's...

CHAIRMAN MALMUD: Dr. Langhorst?

MEMBER LANGHORST: Mr. Saba, you did not mention whether you were looking at ACMUI's paper on this topic.

MR. SABA: Yes, we actually read that.

MEMBER LANGHORST: Okay. And looking at our calculational method --

MR. SABA: Yes.

MEMBER LANGHORST: Okay, so you -- I did want to note on your comment concerning the 30 millicuries as far as the old rule versus current, you really should say that's only limited to I-131 and it does not necessarily apply to any other --

MR. SABA: Yes.

MEMBER LANGHORST: -- isotope.

MR. SABA: Yes, thanks.

MEMBER LANGHORST: Thank you.

CHAIRMAN MALMUD: Thank you. Yes?

MEMBER ZANZONICO: Pat Zanzonico. Hi, one question. When you say that the work of your group is outside the scope or addressing the rules outside the scope

of the work, can you just clarify what that means?

MR. SABA: Oh, I'm sorry.

MEMBER ZANZONICO: You said that the assessment of the rule itself is not within the scope of this work.

MR. SABA: Yes, yes.

MEMBER ZANZONICO: What exactly does that mean?

MR. SABA: Clearly they told us don't touch regulations.

MEMBER ZANZONICO: Does that mean that the .5 rem dose is not in play?

MR. SABA: Yeah. It's not that.

MEMBER ZANZONICO: So now these are a couple of comments. One is I'm sure you're familiar with NCRP Report 155 --

MR. SABA: Yes.

MEMBER ZANZONICO: -- which dealt in depth with this whole issue, and among the components of that report were occupancy factors other than the .25 value for different cohorts of exposed individuals. I still think that's the most comprehensive treatment of this subject. I have a biased view of it since I was on the committee that wrote the report. The -- and just to follow up Dr. Langhorst's comments, it's the 30 millicurie conformity between the old and new rule is not just for I-131, it's really just for I-131 hyper thyroid patients who have a very long biological half-life; it really doesn't apply -- you would at least apply the effective half-life to thyroid cancer patients in whom the biological half-life is much,

much shorter. So for .5 rem dose individuals, when needed, you'll get a much higher releasable activity.

Just one final point. Wes Bolt at University of Florida has really has been developing, publishing state of the art models, anthropomorphic models that are remarkably realistic and are very adaptable to all sorts of situations. And I know he's aware of this ongoing effort by NRC because I told him about it. And he would be very willing and certainly able to assist in adapting some of his models to this sort of calculation, and I can give you his contact information and so forth. But those I think really are considered state of the art anthropomorphic models for these sorts and other sorts of the dosimetric analyses.

MR. SABA: Thank you. Again, I told them that benchmarks are phantom against ICRP data and other experimental data, and we came really close to what they had. But thank you so much.

CHAIRMAN MALMUD: Ms. Weil?

MEMBER WEIL: The common motion studies and the other use of phantoms presupposes, I assume, that patients are being given good discharge -- will be using -- the model will use discharge instructions that are given to patients about keeping certain distances from certain members of their family and certain member of the public and other more vulnerable populations. And I question whether that's a good assumption to base this research on.

MR. SABA: Based on the --

MEMBER WEIL: Based on the understanding and

following of those instructions.

MR. SABA: Yeah, but we wanted to see what's in reality because the committee directed us to see how -- to what extent the 500 millirem has been met?

MEMBER WEIL: If people follow instructions.

MR. SABA: Yes --

MEMBER WEIL: But there's a large cohort of people --

MR. SABA: Yes.

MEMBER WEIL: -- who don't follow instructions.

MR. SABA: Yes

MEMBER WEIL: So you won't be capturing that information? About the people who don't follow those instructions.

MR. SABA: No.

MEMBER WEIL: So you're looking at a best case scenario as opposed to realistic scenario?

CHAIRMAN MALMUD: Perhaps it should be characterized as a compliant scenario versus a non-compliant scenario on the part of the patient.

MEMBER WEIL: No, I disagree with you, Dr. Malmud, because there's a question as to whether good instructions are being provided by the licensees in a way that patients can understand in a language that they understand with the time to discuss at a time when the patient is perceptive to instructions. I wouldn't put this off on the patient.

CHAIRMAN MALMUD: Well, I'm projecting, perhaps, to the general physician group, my experience since I treat

patients with I-131, and I go through great detail of what they should be doing and what they should not be doing, but noncompliance patients in the old days, when we treated them as inpatients, we found noncompliant inpatients as well who leave the room, walk down the hallway, urinate on the floor. So there's always a possibility of noncompliance whether in the hospital, to the hospital staff, and other members of the public, or at home. That risk always exists. Under any circumstances the risks exist.

I do agree with you, though, that part of the treatment plan includes detailed radiation safety precautions. My own personal feeling about it is that when the patient goes home, he or she understands the risks to the family and tends to be very, very compliant. Even asking questions about what they could and could not do, how close they can be, et cetera. The risk is always that the patient will not go home and check in to a hotel without calling us that they're doing it. That risk exists. In the hospital the risk is that treating patients on an inpatient basis will give to the nursing staff and to the ancillary staff in the hospital radiation burdens over the course of a period of time, which are greater than anyone in the public, including the medical staff, would receive exposure casual exposure through the individual patient. And this was all discussed at length by this committee prior to my joining the committee, more than 10 years ago, and that's how the current rules came to be. So what's being asked for now is actual calculations and numbers for the models that are

shown there. So we will see the data. The data should be interesting. And as one of my colleagues here pointed out, the 30 millicurie rule is generally for patients who are being treated for hyperthyroidism, with just smaller dose compared to 100 millicuries for cancer, but the half-life -- the biologic half-life in the patient's body is longer. Whereas, with a high dose, 100 millicuries of I-131 given orally, for thyroid cancer the biologic half-life was quite brief. Most of the dose doesn't go to the thyroid tissue, or other target organs of the body is urinated out with 24 hours.

The situations are quite variable and there is no single perfect solution to the problem, but hopefully the data will help this committee to come up with a deliberation which results in the least risk to members of the public including nurses and other ancillaries, and try to achieve what you are pointing out to us which is not giving an unknown member of the public radiation exposure which could be prevented. We're sensitive to it.

SUSAN LANGHORST: Dr. Malmud?

CHAIRMAN MALMUD: Dr. Langhorst.

MEMBER LANGHORST: I wanted to just clarify one thing that you said. You mentioned occupational staff getting radiation burns and I wanted to ask you if you meant radiation exposure?

[talking simultaneously]

[laughter]

MEMBER MATTMULLER: I heard that too.

MEMBER LANGHORST: Sorry, I heard -- I apologize. I heard that incorrectly.

CHAIRMAN MALMUD: Apologize for my pronunciation, but the word was "burden."

MEMBER LANGHORST: Thank you.

[laughter]

CHAIRMAN MALMUD: I'm glad you were listening.

[laughter]

MEMBER LANGHORST: I was.

CHAIRMAN MALMUD: Any other comments? If not, thank you very much. Mr. Saba, the committee will look forward to seeing the results of these studies --

MR. SABA: Thank you so much.

CHAIRMAN MALMUD: -- and coming up with a solution which meets the needs of not only the patient but members of the public, and as soon as possible. Thank you. We're a bit ahead of schedule. May we go on with the next item?

MS. HOLIDAY: Dr. Malmud, this is Sophie. I don't believe the next two presenters have arrived yet, so if possible could we hold off until they arrive?

CHAIRMAN MALMUD: In that case, Sophie, may we used these next 15 minutes for you to deal with us with some issues that you'd normally bring up at the end of the meeting such as travel and time?

MS. HOLIDAY: Certainly. Okay, so I guess I will flip to the very back of our big handout here, which is when we start looking at dates for the fall meeting. So I know that early on I sent out a MeetingWizard request to poll the

committee members as to their availability for a fall meeting. Initially, we had offered up both September and October dates, but I think it was a couple weeks ago staff came to the conclusion that an October meeting was not feasible with all of our schedules here, so I think we are going to look at September dates. I believe out of all the responses that I've got -- correct me if I'm wrong -- but I believe September 9th and September 10th, that's a Monday and a Tuesday, worked for everybody. Dr. Langhorst, correct me. I think that was the date I asked you for or --

MEMBER LANGHORST: Yeah, it's only a Radiation Safety Committee for me so -- maybe mid meeting for my own RSC, so I will have someone else cover it.

MS. HOLIDAY: So I would like to thank Dr. Langhorst for bending her schedule for us. I guess I would like to reconfirm with everybody that September 9th and the 10th work for everybody for a fall meeting date. Hopefully there are no objections, or I should wait another minute so everyone can check their calendars?

MEMBER SULEIMAN: I have a conflict that's resolvable, so that's fine.

MS. HOLIDAY: Sure. Okay.

CHAIRMAN MALMUD: It's looks as if it's acceptable to everyone. Is there a conflict for anyone? Dr. Welsh?

MEMBER WELSH: I don't anticipate any conflict, but I do need to clear it with my medical colleagues that I would have coverage. So I'm anticipating this will be okay. I will let you know as soon as I get a reply.

MS. HOLIDAY: Sure. Okay. So I will tentatively pencil September 9th and 10th as our first choice and then I believe the next set of dates that worked for everyone, and Dr. Welsh, thank you for already bending for the second set of dates, is Monday, September 16th and Tuesday, September 17th. So if I could just get a confirmation that those sets of dates works for everyone as well.

CHAIRMAN MALMUD: Has everyone had a chance to check his or her calendar?

VICE CHAIRMAN THOMADSEN: Much less well for me, but there are possibilities.

CHAIRMAN MALMUD: Looks as if that's an acceptable alternate.

MS. HOLIDAY: Okay. So for the record I have September 9th and 10th as our first choice for the fall meeting and September 16th and 17th as our second choice, our backup meeting.

We are still a little bit ahead of schedule. I guess at this time I could just as the committee members, during the presentation I gave yesterday, if you'd like to go ahead and write down the hours that you would like to submit for this pay period. Your pay period ends on this Saturday and then I'll just collect those and I'll enter them in for you. And also, if you have not turned in your biennial evaluations, please do that also. Thank you.

[break]

CHAIRMAN MALMUD: Please introduce yourself.

MR. CRANE: Yes, please. My name is Peter Crane.

I am NRC's Counsel for Special Projects in the Office of General Counsel, now retired.

CHAIRMAN MALMUD: Thank you.

MR. CRANE: And thank you. And I'd like to have to opportunity to make some comments on a Mr. Saba's presentation.

CHAIRMAN MALMUD: You're invited to do so.

MR. CRANE: Thank you. First, I'd like to say that I'm indebted to Dr. Malmud for having so cogently described in 2007 the practical effects of the current rule and the reasons that hospitals are unwilling to hold radioactive I-131 patients. It's never been expressed more concisely or forcefully.

I'd like a few points. Mr. Saba says that, "We're torn between those that think we're too conservative and those who think we should go back to the old rule." Well, there's things to be said on both sides of that. The one thing the pressure that says that it's too conservative is come in large part from The Society of Nuclear Medicine. There's a paper by Carol Marcus and I think Stabin on licensee over-conversatisms. Well, on January 31st I got a letter from Chairman Macfarlane responding to a letter from me, and it is clear that for the last nine years, The Society of Nuclear Medicine has been advertising its guidance as having NRC's blessing to be used in place of NRC's and licensees are encouraged, although it's far more liberal.

A quotation is attributed to the NRC that the NRC

never made. The result is that if people have been operating under the false belief that this document can be used by licensees in place of NRC's, they may have been sending patients out the door with as much as 457 millicuries of I-131 in them; which is a pretty daunting idea. It turns out that the statements attributed to it by SNM were not true, the NRC intervened with SNM to find out where these statements supposedly came from, and the SNM has now altered its advertising. I think it's important to get the word out to the licensee community that you cannot rely on this SNM guidance from 2004 and be confident that you're in compliance with Reg. Guide 8.39.

Secondly, as to whether the whether my argument is for going back to the 30 millicurie rule, that was what my initial petition asked for, to be sure. But that was a rulemaking conduct -- petition being handled under rule forum, which was a brainchild of the late Bill Olmstead of OTC. And the idea was that petitioners, participants, et cetera, could interact, modify their views in time. And after talking with their Ernie Mazzaferri, the then head of The American Thyroid Association, I modified that because I think that there is room for greater flexibility about sending people home, for one, thing in accordance with NCRP number 37 from 1970. And it's also true, and this is a point often made, that the athyreotic patients getting 100 millicuries may be less of a radiation hazard than the Graves' patient getting 15 millicuries because that patient -- the Graves' patient got an intact thyroid that is

retaining I-131 longer. So, I'm willing to see flexibility and I would not want to be caricatured as simply a reactionary asking to go back to pre-1997 days.

Another point is that I think it's important to note that our 500 millirem standard, which is not being touched, is five times what the NCRP and the ICRP recommend and it's very much out of step with the world community.

I have a question for Dr. Saba. I mean, I'm quite sure he's right in his major point. And I applaud that in saying that we don't have enough data on hotels and nursing homes. I guess my question would be, "Are you considering collective doses?" This is a point that Jim Luehman of the staff made in an ACMUI meeting in October 2010, that although the individual dose to the house keeper who cleans the room may be small, we don't know if they are, perhaps, getting many treatments in a year. If you are working in the hotel down the street from the Mayo Clinic or associated with the Mayo Clinic, or if you're working in one of the eight hotels to which Sloan-Kettering feeds patients because it has preferential rates arranged with them, you might be cleaning a number of radioactive hotel rooms in a year and accumulating a dose from each one.

So my question would be, "Was he considering collective dose?"

I'd also say, the question was asked, and it's a very reasonable one, "Why not badge people?" The problem with badging people is that when you do that you put them on notice that there's a radiation hazard. Our problem in the

hotel context is that they don't know. And how do people behave when they are unaware of the hazard altogether? Our problem is that we do not have informed consent; we've got ignorant people being exposed, and the creation of dangerous working environments. I'm told that there are hospitals that are hospitals where radioactive rooms are left vacant for a week before anybody even goes in there to clean in order to let them cool down. And Dr. Malmud made a point in his -- at the ACMUI meeting in October 2007 that hospitals leave the rooms on either side empty because of the radiation coming through the walls. And, you know, yet we're having people going in there and cleaning right away. We've also got hotel guests moving in in a matter of hours, which I think should be a source of concern. I don't know whether the charter of the committee goes to the possible dose that could be absorbed by the subsequent hotel guest. We've seen at the Braidwood Hotel incident -- motel incident a hotel guest who needed to be decontaminated.

Finally, to Dr. Weil's point of questioning of whether patients are getting instructions, I made a suggestion at a meeting a couple of years ago, and Dr. Welsh expressed the thought that it was a positive idea, which is that the industry and the NRC could collaborate on preparing information for patients contained on a compact disc or DVD. It could be in different languages which could be played for the patient before they ever consulted with a doctor. It would give them preparatory information. They could take it home. They could play it over again if they had any doubts,

because frequently patients are in a kind of upset state when they are given instructions. They don't always remember it, especially if they're hypo-thyroid.

I think Jim Luehman came back reporting from a psych conference that sometimes the safety instructions are simply one piece of paper in a stack of pieces of paper that are handed to the patient on discharge. I'm sure Dr. Malmud is as conscientious as he says in going through these issues with patients. But again, that's a best-case scenario and not, necessarily a realistic scenario. But, that's essentially what I wanted to say.

CHAIRMAN MALMUD: Thank you, Mr. Crane. You made a number of points, and we will ask Mr. Saba's committee -- team, excuse me, to consider these, and when the data is collected regarding exposure of members of the public, that these issues be revisited.

MR. CRANE: Very good, I appreciate it.

CHAIRMAN MALMUD: Your comments are appreciated and will not be ignored.

MR. CRANE: Thank you, and if I could ask one more thing, it used to be that there was a Federal Register Notice -- or not a Federal Register Notice, an NRC news release announcing upcoming ACMUI meetings, which was quite helpful in -- to the public in knowing in being put on notice. Those seem to have been discontinued more than a year ago. I think it would be a benefit from the standpoint of public participation if that practice were resumed, and I want to thank you all for your patience and receptivity,

willingness to listen to me this morning. And to you, Dr. Malmud, as you leave the committee I wish you everything good in private life.

CHAIRMAN MALMUD: Thank you. And we discussed your concern earlier and Ashley Cockerham has a response for you with regard to that concern. Ashley?

MS. COCKERHAM: This is Ashley Cockerham. We were advised --

MR. CRANE: Hi, Ashley.

MS. COCKERHAM: -- last year that NRC press releases are issued at the discretion of the NRC Chairman and they were -- regular meeting notices are not typically done in press releases. I would note that that is standard practice also for the Advisory Committee on Reactor Safeguards; they do not regularly issue public notices for meetings --

MS. CRANE: So, was that --

MS. COCKERHAM: -- press releases for meetings. We do issue notices in the Federal Register per FACA regulations.

MR. EINBERG: Ashley, can you also point out that where else this was noticed so that members of the public can access the meeting notices.

MS. COCKERHAM: Yes, this was noticed on March 6th in the Federal Register notice. This was also noticed on the ACMUI medical list -- or not the ACMUI -- just the NRC medical list server on March 11th, I believe. It was also noticed -- the ACMUI public agenda was posted on the ACMUI

public website on March 11th. And it was also published on the NRC public meeting notification page, where all public meetings of the NRC are posted --

MR. CRANE: [affirmative]

MS. COCKERHAM: -- and it was posted on March 11th on that website, as well.

MR. CRANE: Well, thank you, Ashley. I'm not one of those who spends his days thumbing through the Federal Register, and I gather it was a decision the previous chairman's. It dates from then. I don't think that that was a change for the better, but I realize that it's not -- I appreciate being told that this was not an ACMUI decision but a chairman decision. So, thank you very much.

CHAIRMAN MALMUD: Thank you, Peter.

MR. CRANE: And good morning to you.

CHAIRMAN MALMUD: Thank you for your participation, Mr. Crane.

MR. CRANE: Thank you, goodbye.

CHAIRMAN MALMUD: Goodbye. And if we may, we'll move on to the next item on the agenda, which is the NNSA's efforts to minimize the use of highly enriched uranium in molybdenum-99 production. And that will be presented by Dr. Staples and Ms. Hamilton.

DR. STAPLES: Thank you very much. I apologize for coming in a few minutes late, but it appears you had some questions going anyway.

So, I would like to thank you very much for presenting -- or allowing us to present this information to

you on our efforts on moly-99 production associated with efforts on HEU minimization. The title slide, as you can see, we're part of The Department of Energy, the National Nuclear Security Administration, with the Defense Nuclear Nonproliferation Branch, the Office of the Global Threat Reduction Initiative.

We've gotten involved in this mission, to begin with, to reduce and protect vulnerable nuclear and radiological materials that are located at civilian sites worldwide. There are three technical polars within our office. First, to convert research reactors on isotope production facilities from the use of highly enriched uranium to low enriched uranium, to achieve a threat reduction perspective; to complement the conversion of these facilities to LEU; and to ensure permanent threat reduction we also provide services to remove and dispose of access nuclear and radiological materials.

There's a U.S. origin disposal program. There's a Russian origin disposal program. And, in fact, just about a week ago there was a lot of publicity associated with the disposition and the significant quantity of nuclear material from the Czech Republic back to the Russian Federation. I think it was even on the Rachel Maddow show that this was associated with that effort.

Until these permanent threat reduction activities can take place, or in circumstances where these materials continue -- is continuously utilized, we also provide physical protection support, internationally, for these type

materials to protect them from theft and/or sabotage.

The focus of this presentation today is on moly-99. Historically, HEU has been utilized to produce moly-99, one of the most widely used medical isotopes in the industry. And I think, looking at your titles at the table here, I have a feeling that you're much more familiar with this utilization than I am. So I'm not going to try to bore you with those details.

But our efforts are to work to achieve the production capability of the industry while at the same time achieving our HEU minimization missions. Medical isotope production -- this is something that we've been doing, roughly now, for about 15 to 20 years. We've been making significant progress, lately, in due to the failures of several parts of the industry for regular, reliable production. So we have actually assumed the mission, in addition to the HEU minimization, of working to establish a reliable U.S domestic supply of moly-99 that is produced without the use of HEU. And this is the complement of two efforts, both internationally and domestically. And due to the fact that we are, for lack of a better term, interfering in commercial activities, we have to keep very careful balance or how we work with our international partners, how we support domestic efforts. All the while, we work with the international community to provide this important medical isotope for patient needs that I think are used, roughly, 50,000 times a day here in the United States alone.

In our international efforts, we only assist with

converting their facilities from LEU targets or to LEU targets from HEU targets to achieve our HEU minimization objective. It is their obligation as existing commercial entities to increase their production capacity or update their facilities.

In addition, there are some new entrants coming in in the international market. We simply work to make sure that they adhere to their nonproliferation goal statements and priorities of utilizing a non-HEU based production process to implement their technologies. Domestically, where there's currently no commercial HEU or non-HEU based production, we're working with a number of cooperative agreement partners and working with the industry, in general, to support all activities that are taking place to produce moly-99 for the needs of patients. And that is part of our objective to establish a reliable supply of moly-99 produced without HEU.

The current situation of the industry shown below -- and this is certainly a very simplified cartoon schematic. Each one of the rows of the bar chart represents some time in the current, or projected future history. Today, we're at the top bar chart where Australia produces solely using LEU. NTP Radioisotopes in South Africa is in the transition process and they've recently advertised significant progress towards the conversion of their isotope production towards LEU. Covidien, IRE, and AECL Nordion all continue to produce with HEU.

At some point in the near future, we know that NTP

will fully transition to LEU-based production. And we have from a recent nuclear summit, led by President Obama, and from the United States, with approximately 50 international leaders, we've received a pledge from both the Netherlands and Belgium that they will work with us and France, who is the target producer, to convert the processes to LEU-based production by the 2015 to '16 timeframe.

The most significant issue, and the bar in any -- in no cases to these bars represent market share, other than the implication that the Nordion -- AECL Nordion bar is significantly larger than the others. They are the current largest producer of medical radioisotopes. They have made continuous and regular statements that they will cease medical isotope production in the 2016 timeframe. That's the one very important issue that we're facing. Part of that is due to the fact that they were not able to get their projected future production process, the Naples facility, operational. And the current facility that they utilized, the NRU reactor is a very aged facility and has had numerous operational issues over the past several years. So in 2016, there's going to be a significant gap in medical isotope production, unless the international community can step up their efforts to produce isotope, or we're successful with U.S. domestic moly-99 projects.

We have four current cooperative agreement partners that we're working with to develop that replacement capacity. In addition, there are other commercial entities that are not associated with funding with our program that

are also working towards domestic production.

So the support that we have both for internationally, as I've mentioned, is for conversion from HEU targets to LEU targets. We developed the technology and we provide that at no cost to entities that are interested in implementing them.

I've already stated about the four-party joint statement at the 2012 Nuclear Securities Summit, which was a very significant accomplishment and a pledge at the highest levels to support this effort. In addition, we have provided South Africa with a significant amount of support for their conversion process, from HEU to LEU targets, and they're making significant progress; as indicated here's the June 2010 timeframe when they first had LEU based production and was received commercially in the United States later that year.

In addition, we are providing some support to Belgium and towards their conversion commitment by 2015. Netherlands and Covidian, they're leading their own effort towards the conversion project to LEU targets in that same timeframe. And as mentioned, Canadian reactor -- and we can't state that more often -- cannot state that enough about their cessation of isotope production in 2016.

To develop our cooperative agreements and to try to avoid a single point of failure, we looked at the straightforward or the most straightforward production technologies, methodologies for production of moly-99. And to ensure that there is no single point of failure, I've

developed our cooperative agreements to support each one of these pathways towards production. First, there is the traditional fission based methodology showing in the top chart. In the middle is neutron capture, which is historically how moly-99 was made in the industry when this first started 30, or so, years ago. And then the last one, the bottom, is an accelerator-based production which has received attention also for the production of moly-99. Each of them have their benefits, and each of them have their impediments towards production.

The four cooperative agreements that we have with domestic partners in the United States are shown on this slide. In no particular order, first and foremost, is the NorthStar Medical Radioisotopes Program, which we have awarded a total of $25 million to NorthStar Medical Radioisotopes to pursue the accelerator-based technology. Before I go further, I should point out that each of these cooperative agreements are limited to a $25 million cost share arrangement and a 50/50 percentage basis with the U.S. government.

Second, is the Morgridge Institute for Research, also known as SHINE Medical Technologies, or associated with SHINE Medical Technologies. We've thus far awarded a total $10.7 million to Morgridge to pursue their accelerator based LEU fission technology.

Third, is Babcock and Wilcox, which we've awarded thus far $9.1 million to pursue their LEU solution reactor technology. Currently, they are looking for a commercial

partner to continue that process towards the implementation.

And last, is the General Electric Hitachi process. We've awarded them $2.3 million to pursue their neutron capture technology. However, what was a significant issue to us is that on February 7th of 2012, they announced a business decision to suspend progress on the project indefinitely due to the market conditions. And this is something that we identified for a long period of time of how the industry operates and the imposition the current market practices have on reliable, long-term projection. It's one of the things we're working with the -- I apologize, I'm staying on this slide. It's one of the things we're working with the international community through the Organization for Economic Cooperative Development to, at a high level working group, to address that situation both from an economic standpoint and a technology standpoint to ensure the long-term, reliable production, not just for patients here in the United States, but globally, for patients that require this very important medical radio isotope.

To further support the program, and going back, as I've mentioned, several decades, is the significant amount of U.S national laboratory technical support that has been developed for the production of moly-99. And we make that expertise from the national laboratories available to all of the different moly-99 technical pathways. And we ensure that this expertise at the national laboratories is available for any commercial projects that are utilizing

non-HEU technologies, both domestically and internationally. These work packages are funded by NNSA, our program, through strong support from Congress for these technologies.

Recently, and in very close cooperation through the entire U.S. interagency, the White House issued a statement on encouraging reliable supplies of moly-99 are produced without highly enriched uranium. And there were several significant statements, one of which I think we're going to spend a lot of time on in the next presentation by Dr. Duvall. But first, we are calling upon the moly-99 industry to voluntarily establish unique product code or identifying marker for moly-99 based radiopharmaceutical products that are produced without the produced without the use of HEU.

And it's as much a marker for LEU or non-HEU based moly-99 as it is for what we refer to as full cost recovery moly-99, which is something that we're working has helped working to address the impact of subsidies on the industry. And we're working to transition the entire industry towards full cost recovery from the beginning of the supply chain to the end.

As from your perspective, you're probably aware on the downstream side of the supply chain, full cost recovery's probably, you know, has to be the way that you operate. Unfortunately, the early part of this supply chain does not operate that way and that has significant impacts on how the industry produces the isotope that you receive for production and it's something that we need to address.

It's slowly being addressed throughout the industry. But the rate of uptake is certainly not as rapid as we had hoped, and it does have impacts for how we will achieve the 2006 scheme success of the program.

The second bullet is the U.S. government has decided it is very important not just to ask others to do things that we are not willing to do our self. So, we want to lead by example. And so, we're working through the interagency, and it will probably be through the Veterans Administration. We'll start the process hopefully in the next several months, and this is preferentially procuring moly-99 based products that are produced without the use of HEU whenever they are available, and this will be in a manner that are consistent with our U.S. obligations under international trade agreements. You can imagine that's something that's very difficult to do, but at the same time, it's work that we are undertaking to ensure that we lead by example to help transition this industry for long-term, reliable supply.

The third bullet is something that Dr. Duvall will talk about, which is -- at the time the statement came out, was worded as such, and it's that examining potential health insurant payment options that might promote sustainable, non-HEU supply to moly-99. And last is something that we are going in close cooperation with the interagency, and in particular with the NRC, and it's about how we can take steps to further reduce exports of HEU that will be used for medical isotope production when sufficient supplies of non-

HEU produced moly-99 are available to the global marketplace. To provide further clarification on that, the U.S. exports HEUs -- the international producers. We have legislation in place that authorizes and directs us to do such. However, there are significant limitations, and obligations, and requirements on the export of that material, and we work with the international commercial community to ensure that all of their obligations and requirements are met while we do provide for the regular reliable supply of HEU while they are transitioning their industry to LEU materials.

The last two bullets on the U.S. government Public Statement -- I've already mentioned to some extent, is that we are continuing to encourage domestic commercial entities in their efforts to produce moly-99 without HEU during the transition of the moly-99 industry. It's a full-cost recovery, and some cases, if you're aware, right now the HFR reactor, the second-largest producer in the Netherlands, has experienced a prolonged outage, and it has significant implications on the supply. We are monitoring that closely and working throughout the entire interagency to determine at what point in time we might need to take extraordinary steps to support production to ensure that patients receive medical isotope in timely and reliable fashion.

And lastly, we are working with the international producers to assist their projects however they request within certain conditions towards the conversion of moly-99 production facilities from HEU to LEU.

We were in meetings earlier this morning in some part coordinating with our NRC colleagues here, and we're going to be in a variety of meetings throughout the rest of the week with other colleagues throughout the interagency to understand how to implement the requirements therein recently passed, American Medical Isotope Production Act of 2012. It was a very good New Year's for us; there's been a number of parties that were involved in the passage of this act. It goes back starting first as H.R. 3276 from approximately three or four years ago if I remember correctly, through Senate Bill 99. But recently incorporated into the National Defense Authorization Act on January 2nd, 2013 is the American Medical Isotope Production Act. First and foremost, it requires the secretary of Energy to establish a technology neutral program to provide assistance for production of moly-99 in the United Sates without HEU. We obviously knew this was happening; this was developed in close concert with our existing program. So, that box is already checked off, and we've made significant progress in that direction over the past number of years, but we now have a law that helps to authorize us to implement this program.

It does require public participation in review of the program. In some part, it will be through a large topical meeting similar to what we just had a week ago -- two weeks ago in the Chicago area with many members of the community and stakeholders. The Office of Science and Technology Policy of the Executive Office of the White House

has significant involvement in the program. They're also bringing together stakeholders on a quarterly basis -- or roughly a quarterly basis to review the program. We're also working with the National Science Advisory Committee through the Department of Energy's Office of Science program to review the program.

The third bullet is it requires the development assistant for fuels, targets, and processes. Again, this is a long-standing part of our program that we've been implementing through the national labs.

Establishing a Uranium Lease and Take-back program: This is probably the newest part of the program, is similar to what we've implemented in terms of disposition of research reactor fuels, both U.S. and international origin, but this bullet is for domestic utilization only, and it enables the department to provide uranium, for production of, and if a commercial disposition pathway does not exist for the material after production, the U.S. government will provide adequate cost recovery disposition pathways for that material after production of the medical isotope. It does require the Department of Energy and NRC to coordinate our NEPA, our environmental reviews where practicable, and that is something that, if you're familiar with government process and procedure, can be difficult and onerous, but it is part of the process that we go through, and we're closely coordinating and have also been coordinating with our NRC colleagues to implement these requirements.

To support the program -- does provide a cutoff in

exports of HEU for isotope production in seven years with the possibility for extension in the event of a short supply. And this is something I have to say: I think with close coordination of the interagency, everyone recognizes the importance of supply, and there are no actions that we are taking in any of these activities that will actually impinge upon the ability of the industry to provide isotope. We understand first and foremost is the supply of isotope to the patients, and then we will achieve our threat-reduction objectives. We are very optimistic with the pledges we have from the international partners, and the commitment from Canada -- or the statements from Canada that they'll cease isotope production in 2016, that we will achieve the minimization of HEU in this industry within the next several years. It's simply a direction that we have to go in, and I think everyone in the industry recognizes that the more important issue is the transition of the industry to full-cost recovery so that it operates as a true commercial industry rather than with government subsidies at the initial parts of the supply chain, which have actually impinged upon the ability of the industry to provide maintenance and replacement capacity for production.

And last and not least on that is it does require reports to be submitted to Congress on an annual basis, which -- very honestly, those are very complicated and require a lot of interagency coordination with all of these activities taking place, and literally as soon as we complete one report to Congress, we start the annual process

to submit the next one; we're on an annual basis.

Here are some documents that were used in the presentation, and I hope that I did not go too fast, but I think I got back about five minutes on your schedule, and I believe the process is that we are very happy to take any questions. Also, at this point in time, I would like to introduce my colleague Rilla Hamilton. She actually is the project manager for the moly-99 program. And for domestic activities, Joanie Dix, who was not able to attend with us today. She is providing her civil service by attending jury duty. Thank you very much for your attention.

CHAIRMAN MALMUD: Thank you, Dr. Staples. Did you wish to make any comments [unintelligible]?

MS. HAMILTON: Oh, actually I'll defer to Dr. Staples, so -- I have nothing further.

CHAIRMAN MALMUD: Thank you. So if I may summarize Dr. Staples on -- a very complete presentation on your part. Number one: The Department of Energy recognizes the importance of molybdenum-99 to the medical community and to the patients whom we serve. Number two: The program is looking forward to converting the source of molybdenum-99 from highly-enriched uranium to low-enriched uranium for reasons of homeland security. Number three: that there will be costs associated with this transition, and the Department of Energy is aware of them. Number four: that there's encouragement to put this in the hands of private industry without government participating, other than in regulation of issues with safety. Number five: this is an

international effort, and that the government is coordinating that. Number six: that if the timeline cannot be met, that there will be flexibility with regard to continuing recurrent sources molybdenum-99 so that the medical practices will not be interfered with. Does that summarize it?

DR. STAPLES: That's an excellent summary, and I don't think I could state that better myself.

CHAIRMAN MALMUD: Well, you did state it better.

[laughter]

You stated it much more completely, but I was just trying to summarize it. Well, thank you very much. Thank you, both. Are there questions now? Yes, Dr. Van Decker?

MEMBER VAN DECKER: A couple of questions if I might, just I've heard it from different sources. From your perspective right now in the current timeline, what percentage of moly's being produced from LEU?

DR. STAPLES: It's a difficult number because it's somewhat variable, but I would assume it's roughly and probably about the 10 to 15 percent range.

MEMBER VAN DECKER: Okay, so we have a significant way to go?

DR. STAPLES: A significant way to go.

MEMBER VAN DECKER: Second question is if we need to fill a hole by 2016, and there needs to be a lead time for a manufacturing process to be in place and get all of the regulatory blessings, what do you think that lead time is to have a source ready to go in 2016?

DR. STAPLES: That lead-time is consistent with the stage of our current production projects, to some extent. There are some projects that are obviously ahead in the race versus others, and there are also projects that are not associated with our funding that are also making significant progress where we have much less insight because of our lack of contractual insight and association with those programs. But at our recent moly-99 topical meeting we held in Chicago two weeks ago, we got some indicators of progress being made by both those entities that are associated with our programs, those that are not associated with our programs domestically, and also the status of international production. I don't want to be overly optimistic about the status, but at the same time I think we can be realistic that, given the current rate of progress, and if we maintain the intention and focus of the entire interagency from the regulatory and approval standpoint, we should have regular, reliable supplies of moly-99 in the 2016 timeframe to replace those that we will lose when the Canadian reactor ceases production.

MS. HAMILTON: And to add that a little bit, if I may. Each of the technical pathways has been selected because of that lead-time consideration. Some of them don't require as much as others, and that's why we have diversified the types of technologies that we're supporting to consider how much lead-time that takes.

CHAIRMAN MALMUD: Dr. Van Decker?

MEMBER VAN DECKER: So the follow up to that would

be diversification and a race to good, solid technology is always a good thing, and as you pointed out, industry feeling that there's a government partner in this aiding to them still being in this race is an important piece of keeping things going, and there is a timeline. And so, will there come a point in time, will you help create a winner and a loser? I mean, if one is clearly ahead on a funding basis, will you shift priorities to create patient access, as opposed to -- what did you call it? The marketplace model, or something like that?

DR. STAPLES: Just in terms of full cost recovery continuing to operate. Obviously, if we have to take extraordinary actions because the current industry collapses prior to 2016, it won't necessarily be picking a winner and a loser. It will be developing a reliable supply in the near term. Regardless, our long-term intention is to ensure the transition of this industry to full commercial activities that's operated under full cost recovery principles in accordance to international trade obligations. It's why we work closely with the OECD to implement this. The amount of funding that were currently providing is not considered a subsidy by the OECD. We've had careful discussions about the amount, the type, the duration, the quantity of funding that's provided; but at the same time, we do realize a significant government intervention is required at this stage of the industry to ensure the transition in the next two to three year time period.

MEMBER VAN DECKER: Thank you.

CHAIRMAN MALMUD: Thank you, Dr. Staples. Any other comments? Dr. Zanzonico?

MEMBER ZANZONICO: Question, from a preventative point of view, it looks like lead technology is the accelerator producers, based on the dollars awarded to the respected companies. So, it's frightening then that it's no longer a byproduct issue, what's become accelerator produced. So, who's the -- who has the regulatory responsibility for overseeing that? Is it still NRC?

DR. STAPLES: I believe that the -- for NorthStar is the project that you're referring to, their regulatory requirements are handled because they're an agreement stakeholder, of how it works through the regulatory process from a nuclear aspect.

MEMBER ZANZONICO: So, it would still -- but it would still be regulated essentially as byproduct material? In most cases, the agreement states that are overseeing it, who are not NRC states.

MS. HAMILTON: There are some NRC actions that are involved in the NorthStar project as well, that from the operation standpoint, that's all handled through the state regulator.

CHAIRMAN MALMUD: Dr. Howe?

DR. HOWE: If I could clarify. As long as the producer is using an accelerator and not using uranium as a target, that would be regulated by whatever state they are located in. If they are using an accelerator, but uranium is the target material, then that would bring it under NRC

jurisdiction, because it would be a -- we're looking at it as a Part 50 production facility. And so, that would be NRC, regardless of what state it's located in.

MEMBER ZANZONICO: Right, so -- but even if it were a non-agreement state, if it were not using uranium, it would be under state regulation, not NRC?

DR. HOWE: Okay, a non-agreement state is a state NRC regulates.

MEMBER ZANZONICO: Right, correct.

DR. HOWE: Okay, so if it's in a state that NRC regulates and it is accelerator produced, we would regulate the production of that isotope under the Energy Policy Act, because we now regulate byproduct material which can be produced by either reactors or by accelerators. But we would not regulate the accelerator. Once the material is made, we would regulate, but we would not register or regulate the accelerator.

MEMBER BAILEY: And if I may add, the states do register the accelerators -- the machine-produced.

CHAIRMAN MALMUD: Other questions? Dr. Palestro?

MEMBER PALESTRO: Yeah, Chris Palestro. I have a question. You may have already partially answered it, but GE has dropped out, and my sense is, from what you've said, is only due to the -- it really didn't make a lot of financial sense for them to continue. Is that something unique, say, to GE because of its massive size and this comprises such a very small component of GE health care? Or is it possible that other companies, corporations also will

look at this as being not finically viable and drop out as well?

DR. STAPLES: Well, that's actually -- that's a very good question. They each have their own different perspectives on how they develop their business model, and part of the evaluation we go through when we develop the agreements is we evaluate what their business models are. But it's their own independent evaluation for the risks versus the benefits that they want to assume of how the market will transition. What I would simply take is that they looked at the current market conditions and realized that, if they remained as they were, that it would not be economically viable. We have expectations that the market conditions will change in the future based upon the transition of full cost recovery. I do want to also ease any concerns when we're talking about transition to full cost recovery and the actual costs that are associated with it.

At the consumer side, we're estimating the cost is going to be less than a 1 percent change at the patient level. However, as you go through -- you know, back through the supply chain, you know, similar to the, you know -- the farmer can experience a doubling in costs for producing his material, but when it ultimately ends up at the store shelves, it's a fractional change of the final cost, because much of the costs were associated in the distribution and the transportation, or the finishing of the product, which that won't change as we address the full cost recovery

issue. So, I don't want to, you know -- I don't want to cause any undue alarm that the costs are going to significantly change, if we fix the downstream side. That's the one caution -- or response I hopefully provided some clarification on with that answer.

CHAIRMAN MALMUD: Other comments or questions? Dr. Welsh, and then --

MEMBER WELSH: Yes, thank you. I'd like some clarification on one of the slides -- or two of the slides that you presented regarding the U.S. domestic cooperative agreement partnership, and the slide afterwards, which was the National Laboratory Support. My understanding is that those are independent of each other. Is that correct?

DR. STAPLES: Correct, yes.

MEMBER WELSH: Thank you, and the associated question is regarding that second slide; the statement that all work pack -- at the bottom -- all work packages funded are open source, prior caring, non-critical path activities. I didn't fully comprehend what you said. What does that mean?

MS. HAMILTON: To clarify, all of the work packages that NNSA funds the National Laboratories to do are for the greater common good, if you can conceptualize it as what we're intending to do. We're supporting the development of technologies, and those technologies that we're supporting with the commercial cooperative agreement partners, a lot of that work is on those particular technologies. However, the NNSA direct-funded work packages

are also something that can be open source and shared to any commercial entity that wishes to develop these types of technologies. We don't get into that proprietary space for that particular purpose. We also don't do anything that's on the critical path of our cooperative agreement partners because we want these projects to be fully commercially viable.

We don't want to be any reason for any kind of a stall on their project, or any technical reason, or any financial reason. If our budget does not allow for continued progress on critical path activities, that's a risk, and we want these cooperative agreement partners to be fully viable. So, for those reasons that's why we put this on the slide: to invite others that are interested in understanding what the National Labs are doing in this technology development to ask. We are happy to share who is working on these and what they're doing in case there are any other entities out there that are looking to develop these technologies:

CHAIRMAN MALMUD: Thank you. Mr. Mattmuller

MEMBER MATTMULLER: Hi, Steve Mattmuller. A couple questions. The first one, in regards to the NorthStar project, it's my understanding that their production facility is under construction in Wisconsin, that the meeting -- no, not yet -- or can you comment on that? Or maybe I should be asking NorthStar how far along they are with that.

MS. HAMILTON: Yeah, NorthStar is the best one to

ask about that, but their site has been announced in Beloit, Wisconsin, and the groundbreaking has not officially taken place yet, if that's what you're asking.

MEMBER MATTMULLER: Sure, yes, okay. And then, my other comment -- questions would be in regards to cost, and I agree with your farmer analogy as far as initial cost versus downstream cost, and also looking at the next talk and how CMS intends to help with all of this, and I would agree with all that if right now everything was non-HEU moly. But during this transition phase it's going to be difficult and complicated, and there's not going to be that quick, easy transition -- or, not transition, but efficiency in keeping despite the higher cost here from non-HEU having minimal -- minimizing the cost increase to the patient.

So, looking at all of your activities on your website, and looking at your success stories with the Czech Republic, and even locally with the blood irradiator of [unintelligible] in Philadelphia, you're paying for those activities. Why not pay for the additional costs of the non-HEU moly that goes to two generator manufacturers here in the U.S., and then -- I mean, because you deal with the audit that easily to see what the difference is, and then, you know, wean the, you know, the industry off of that subsidy over time, but during this transition phase.

DR. STAPLES: I think actually you touch on -- a very common topic of conversation we have is about the difficulty during the transition phase, and then the non-equity among the different players in the market, and I

think that's actually a very good lead-in for what Dr. Duvall's going to talk about next, of how, again, as the U.S. government is trying to lead by example of providing this additional payment available to the industry. I don't want to speak too much for Dr. Duvall, but, you know, we can only work with the CMS process. We're hoping that private insurers will follow that lead. That's what we understand that they will do. We also realize, as we gather financial data on an annual basis that the reimbursement process will be adjusted. There is some lag time, we recognize that, but as also how we expect the system -- the reimbursement system will catch up with the costs. Honestly, where we see the larger cost differentials are associated, as you can imagine, when there are shortages.

Any cost that we've projected is going to be associated with either the conversion cost or full cost recovery is swamped by the cost differentials that take place when there are shortages and the charges that are applied when there's lack of material or not. It goes all over the map, as you can imagine. So, we realize there is a certain amount of flexibility within the system, but we also do recognize very much the position that we're in to not just impose traditional costs on patients when these type of things are always, you know, scrutinized heavily. But we are trying also to educate the entire community about the two benefits that are being provided by this transition. One is taking dangerous materials that could be within reach of terrorists out of their reach, and two is really

transitioning this industry for reliable supply. What gave this program a tremendous amount of momentum, in some part, was the, you know, September 11th, which is what caused the formation of GTRI and other activities, you know, from a threat reduction perspective. But what really gave them momentum was the kind of concurrent outages of the HFR and the Canadian reactor about three years ago. That's when we really got momentum to start to implement this program, and we realized the impact that the subsidies had on the ability of the industry to reinvest, and it is not operating as a true commercial industry. And that is also why we have, you know, limited support over a period of time to help transition the industry. We also take very seriously the cautions from the OECD about the amount of subsidies that we are providing -- or if I want to say it carefully, about the amount of support that we are providing, that it's not actually subsidies. We don't want to propagate the problem. You know, we don't want to transition this to the next generation. We want to try to fix it and step out of it such that this industry can operate as other parts of any industry do; you know, minimal government intervention. But unfortunately, were not there yet, and it's not anything that was set up maliciously by any one government. It's just the way the industry evolved, and it's the way it's produced. So, we recognize that, and we're simply trying to undo what was not a good situation for the medical community.

CHAIRMAN MALMUD: Thank you, Dr. Staples. Your

statement in response to Mr. Mattmuller's question serves as a perfect segue to our next speaker who will be Dr. Duvall. I thank both of you, and Ms. Hamilton, for your participation today with us, and I will introduce Dr. Duvall, who will discuss the federal government Center for Medicare and Medicaid services, and the 2013 reimbursement policy for non-HEU produced medical isotopes.

DR. DUVALL: Thank you very much. I am actually really thrilled to see the PhD after my name, but I have to confess that I don't own one. I'm just a medical doctor, but I'm going to keep this and look at it periodically and think of what I could be.

[laughter]

Okay, I'm Dan Duvall. I'm one of the medical officers in the CMS Hospital and Ambulatory Policy Group, and our job is actually to look at payment policy for a large part of the really half a trillion dollars that CMS is paying out. I guess our area -- my area only deals with about a quarter of a trillion dollars. So, it's maybe not quite as big, but we do deal with quite a good bit. And I'm going to talk a little bit about our reimbursement policy as far as technetium-99m goes. The -- as Parrish mentioned, the United States is part of the high-level group from the Organization of Economic Cooperation Development. That's the international group that's been trying to coordinate an international response to creating a stable supply. They have a number of principles -- six principles, and three of those were particularly applicable to CMS. Those were

promoting full cost recovery, encouraging a marketplace that would be amenable to a stable supply to moly-99, and promoting this conversion to non-HEU sources. Specifically, the U.S. made a commitment to examine health insurance payment options, and that's where CMS came in.

So, the U.S. goal is a stable supply of moly-99 based on non-HEU sources, and one of the main functions, or one of the main components of that is this marketplace protection. We don't, in the U.S., intervene in the market as much as other countries -- you know, some other countries do. We tend to take a very hands-off approach, and health care is no different than any other aspect of the market. So, from CMS's standpoint, we looked at it more as encouraging the market.

Specifically, with CMS we have something called the Triple Aim that is trying to promote an improvement of health care population in the United States, improve the health of the individual, and do this at an affordable cost. So, we have these three things that we have to consider. Specifically in respect to moly-99, two of those come in to place. On the one hand, you need to encourage the market to make sure that we have the tests available for patients as they need them, but on the other hand we need to promote efficiency, and efficiency from our standpoint means providing services at the lowest cost. That means that, in this particular environment we're creating kind of a balance of making sure that enough money is flowing from CMS into this particular segment of the health care environment that

the industry will be able to stay healthy. On the other hand, we don't want to drop any penny that we don't absolutely have to. And we do support presidential initiatives; the Global Threat Reduction Initiative is one of them. But have to note that things like this are only to the extent allowed by law, and that comes into play as I start to discuss a little bit of our constraints.

First off, there's a lot of discussion about a CMS incentive, and so it's very important to bring up over and over the difference between a reimbursement and an incentive. I would look at an incentive as some sort of bonus to create a new behavior; reimbursement on the other hand is compensation for existing behavior. Because anything that we do must be consistent with our statutory authority, we can get into reimbursement. We don't have any statutory authority for incentives. So, if there's any incentive in our payments, it's an incidental benefit. The other things is, and this gets into a comment that was made in a question to Parrish, is that we can only pay the kind of the end users of the health care delivery system. So, we can pay hospitals; we can pay physicians; we can't pay pharmacies, at least other than Part D, which is a little different entity; we certainly can't pay manufacturers, processors, and reactors.

And then the last thing is that CMS is a large payer. We are the largest payer and the largest user in terms of the dollars that are coming out from moly-99 towards health care uses -- or actually, I guess towards all

its uses. On the other hand, our market share is still on the order of 20 percent or so. Depending upon how you calculate it, it's some fairly wide ranges, but we're not talking about a majority of the market; we're talking about being a large player in a very diversified market.

In terms of economic constraints in addition to our statutory constraints, in looking at payment options, we also considered a number of things. One important point was that full cost recovery is something that is not easily audited and not easily tracked; in fact, it's also very difficult to define. If you have a company that has fully amortized a capital expense -- its reactor. We're now past, let's say, the 40 years that they paid for the reactor. Are the additional costs of that capital expense something that needs to be in its pricing? Various arguments of full cost recovery would say no, but yet that creates a disparity in the market of the sorts that exist right now. So, what is full cost recovery? How can audit it? How can you track it? That was something that we really could not find the solution for, and we had to deal with that in a different way that I'll discuss.

Another thing is that one of the proposals that's been made over and over to us has been that we could solve this problem -- create additional stability by unbundling the radiopharmaceutical. Now, in terms of cost, it's important to know that the cost of the isotope in terms of the final test per person is on the order of $10. Is it $2? Is it $20? Again, it depends upon your accounting

principles, but it's on the order of $10. The cost of the radiopharmaceutical varies considerably depending upon the pharmaceutical-specific drug that's being attached to the radioisotope, but it's on the order of $50. Again, $30, $130, wide variation, but on the order of $50. The cost of the overall test: on the order of $500. So, we're looking at something that, for the isotope, a very small part of this very large expense for the test. Now, even unbundling that relatively -- or approximately $50 radiopharmaceutical doesn't really create a factor that can differentiate between non-HEU or HU moly, or full cost recovery/non-full cost recovery moly. In fact, even unbundling the radioisotope itself doesn't. If we paid for the average cost of the radioisotope separately, it would still be cheaper for someone that was not using full cost recovery; they could underbid someone else, and if there's additional costs -- and there are additional costs of using non-HEU sources, that would be a competitive disadvantage for those producers.

So, these unbundling proposals don't really get to the root of the problem. The other thing from our standpoint is that unbundling is not really consistent with our general reimbursement models. Our approach is that -- really going back to the DRGs, or Diagnostic Related Groups of the 19 -- introduced in the 1980s is that if we pay large bundles, large packages to care of someone who's had a heart attack, then the individual hospitals and physicians can make choices about what they want to include, what they want

to provide, and that's where the efficiencies come in the health care system, as opposed to the government saying, "Thou shalt provide this, and we will pay that."

So, the solution -- the approach that we took was a couple of things. First off, we determined that we would link this non-HEU conversion to full cost recovery at the consumer level, the way that we're looking at our payments. And part of the reason for that is that there's a very strong correlation between full cost recovery and non-HEU sources. The non-HEU production facilities are newer, and generally being implemented without the support of the government; certainly without the legacy reactor instead of already -- are kind of into their twilight periods where capital cost has been accounted for. Second is that: non-HEU sourcing is something that is much more easily tracked, thanks to the Food and Drug Administration, which keeps really detailed records on everything that goes into the drugs that you put in your body, and really anything else that we use in the health care world for patient purposes. There is a record that says, "This particular dose came from this source, and that was a non-HEU source." And then the last thing is that because of both of those and one other factor, that's non-HEU sourcing creates an artificial benefit that we can use as a proxy. If you -- I talk about it sort of like dolphin-free tuna. It's something that you can -- in talking to hospitals, and in talking to physicians, and in talking to patients, you can say that this is safer source of your medical test. This has

implications for the safety of the world, which is not something you can do at full cost recovery. That's -- patients really have no interest in that kind of discussion. So, by packaging these two things together -- linking these two things together, we felt that we could have a benefit when we were creating our payment options. So, this is now a defined and visible payment differential, and we can reimburse hospitals for that differential. The weakness is that we pay hospitals, as I mentioned before. Only the industry can take that payment differential and move it back through the supply chain to the reactors and the processors where the real cost differential occurs. So, our intent with our payment option was to create a payment to cover the increase cost -- so, increased cost holding, not incentive -- of the Medicare portion of full cost recovery non-HEU sources. We can't pay for non-Medicare patients.

In addition to paying for this increased cost, we wanted to create a signal, and I think that in many ways that's the most important factor, is sending a clear signal that Medicare backs a sustainable pricing model. That is, our belief that increases in cost due to either movement to full cost recovery or movement to non-HEU sources is something that can be easily absorbed by the industry, and will not, from the end-user perspective, create significantly higher costs that would cause problems with the health care industry. We also wanted to make sure that we minimized the hospital administrative burden. We're talking about a benefit that's going back up the supply

chain to producers and processors, not to hospitals. On the other hand, our payments go to the hospitals, so we wanted something that would not create a significant amount of effort for the hospitals.

And then the last thing was that: we realize that during the transition process, there are going to be a number of administrative issues that won't be in place once this transition is continued -- is complete. Looking at this transition as happening over a four- or five-year period, it was our expectation that there may some administrative costs of, for example, keeping track of non-HEU doses versus your HEU doses. We did not feel that that was something that needed to be built into our model, because we were targeting the model towards the difference in total cost to the end user of the conversion, not of the process that converted them. So, in explaining the amounts that we came up with, we were not looking at pharmacy costs for paying one source versus the other, keeping their doses separate, or anything like that. We're only saying, "What's the additional cost of the non-HEU sourcing at full cost recovery?"

The payment that we introduced -- we used HCPCS [spelled phonetically] to -- which is a kind of coding that hospitals use to report procedures and pay on the basis of those. So, we created a code effective 1/1/2013, this Q9969 code, and this is a payment -- allows a payment of $10 per dose for any dose -- for any diagnostic test using technetium-99 that was produced from a non-HEU source using

full cost recover principles. So, again, we're trying to package this together.

As a practical matter, this is an outpatient payment. The inpatient system that has huge diagnostic related groups, or a single payment for your entire hospital stay, really isn't conducive to a $10 payment addition. If you've got a $9,000 payment, $10 one way of another doesn't make a whole lot of difference. Additionally, the legal authority for this payment has to do with the difference between the costs to one hospital versus the costs to another hospital. So, we did not have legal authority to extend that -- this particular payment to a physician office. That limits the environment.

And so, as I've said, we really are paying for some increased costs, but in a much larger fashion, this is a signal to the industry more than it is real dollars flowing into the pipeline, because we only control one small part of the pipeline. On the other hand, where CMS goes a lot of the health care industry follows. We create a code; other people use the codes. So, it is not -- would not be unexpected to find that many, if not most, Medicaid programs would follow the Medicare lead. Commercial programs are perhaps slightly less likely, but having previously worked for a large commercial insurer, I know that we, in general, tend to import payments and make payments. It depends upon the individual contracts with hospitals, but there should still be a significant trickledown effect among private insurers.

The impact of the individual payment. Looking at the added cost of a conversion as being something on the order of $3 or so up to a high end of about $10, we felt reasonably confident that this $10 per dose payment was covering the added cost of full cost recovery -- of additional conversion of full cost recovery, and of conversion to non-HEU sources.

Looked at another way, if you multiply this by the number of doses that can come out of a generator, and you looked at expected increases based on some generators that are already out there, of generator cost, this type of level of payment would allow radio pharmacy to absorb a doubling of the generator costs. Now, that's assuming that the payment was made for all doses in the generator, which is not the case. But one way or another -- again, this is a signal that, at least from Medicare standpoint, we believe that the health care industry can absorb whatever cost increases are necessary. And the final point is, again, this is targeted at reimbursing real costs; not at creating an incentive to induce people to create a conversion. Our feeling is that this conversion is going to happen. We want to make sure that we can remove roadblocks to that conversion. In creating this payment we did a fairly comprehensive analysis of the industry, of the models, of the supply chain, and we based a lot of this on both prior National Academy study and then a more recent OECD analysis.

The OECD analysis was very detailed; carried out over a couple of years. There are actually a number of

different components to it. And a lot of what we did was apply that analysis to the United States, and determined that really, we have not found any particular reason to feel that the United States is any -- in any way unique relative to the rest of the world; that it is basically a world market, and that the information that was provided to the OECD and went into their models really is equally applicable to the United States.

Another thing that we came up with is in looking at the model of both past payments and past production, and future payments and production is that unfortunately, a competitive advantage for subsidized production, whether we're talking about HEU or non-HEU production, is going to continue in the supply chain in the future. Putting more money in at the end of the chain doesn't address that -- those potential inequalities at the beginning of the chain. We think that there will be modest increases in payments that will cover the costs. Again, significant increases in cost at the reactor and the processor translate to very small increases in cost -- percentage increases in cost at the user end.

So, we see no problem with the payments increasing as costs increase, but there's no guarantee, and in fact little economic pressure, to ensure that those increased payments are actually going to translate back to the producers and the processors. And that leads to the conclusion that the payment initiatives, whether it's ours or any payment initiatives, really cannot promote full cost

recovery. We can promote an industry-wide movement to full cost recovery, but we actually can't do anything other than really make sure that there's money at that -- the table at the end of the line.

Since there's no difference in benefit between full cost recovery doses to a patient, it doesn't matter where the moly-99 or where the technetium came from. It's really -- market reforms that are going to promote a stable environment for production are going to depend on equalizing user costs. So, we're talking about taxes, subsidies, or some sorts of passthrough payments that we don't haven statutory authority to do. And that's because of the cost differentials at the reactor level, and so any payment differentials have to be passed up to the reactor. But that can't happen, because in the middle of the supply chain is this generator, and the generator is a step where one generator creates many, many doses, and there is not a one-to-one or one-to-x relationship. So, there's a break in the relationship between cost and dose, and cost and supply of moly-99.

What that means is that: a payment differential -- and our payment differential in specific -- can provide a tool, but it doesn't really directly use the tool. Any benefit for a stable supply really depends on the way the tool is used. And again, there's the acronym [inaudible], and at this point, if there's any questions, anything that I could clarify further, I would be happy to answer them.

CHAIRMAN MALMUD: Thank you, Dr. Duvall. Are

there questions for Dr. Duvall? Dr. Van Decker?

MEMBER VAN DECKER: Thank you, Sir. I have a handful of questions, if I might. First of all, Dr. Malmud is always the greatest summarizer of someone's presentation, but I would look at this presentation as, I am a reluctant participant in this process, because I'm not sure how far what I'm doing gets back to the initial part, but I'm willing to try to be helpful.

DR. DUVALL: I wouldn't say reluctant. I would say our eyes are wide open; that we can't control how far it goes back. We'll put the money on the table or, as I was telling Orhan a few minutes ago, we can put the food down on the table. Whether people eat and who eats, we can't control that.

MEMBER VAN DECKER: Okay, so a couple of comments, if I might. You now have one quarter's worth of high computer data on this queue code. Can you give us some sense for what percentage of times it's being hit so far? Are there pockets that are hitting it? Are the pockets related to their access to LEU? How do you see that playing out in its early stages so far, just epidemiologically?

DR. DUVALL: Our data at best lags by about a month. So, the most that I could see would be January and February data. I haven't actually looked, because we're actually looking at some different sets of data right now for other purposes. Our expectation was, and from what I've heard in talking to people, is that they're -- the code is being used some; very little, and that was actually

according to our model. Because we're introducing additional costs a year at a time and then balancing in future years, if we had expected a very rapid adoption of this side and a, you know -- a -- let's say a 25/50 percent utilization, I would have head some really heavy-duty explaining to do OMB, and this wouldn't have happened.

So, keeping in mind that, as Parrish, maybe 10 percent of the supply is eligible for this payment, you then cut that down to, say, half to look at what's being provided in a pure form as opposed to being blended, because we had to look at a payment differential for hospitals, and paying for blending really wouldn't work. We're now down to two or three percent, and adoption is probably on the order of 10 percent of that. So, we're talking a few handfuls of doses, but they are out there, and as near as we can tell, scattered around.

MEMBER VAN DECKER: Okay, so we know the commercial industry hasn't picked up the queue code at all. So, what's your sense for Medicaid as a partial partner of yours at the state level for picking it up right now?

DR. DUVALL: The -- there's a difference between adoption of the code as a payment mechanism and utilization of the code to actually achieve payments. I actually don't know -- I don't know whether any Medicaid plans have or have not. It depends on the specific plans. One of the ones that I was associated would have adopted it by now just as an automatic one because it's out there.

MEMBER VAN DECKER: Okay, it's not like a CD

[unintelligible] answer. That's good; I like it. Code difficulties, obviously. You know, you recognize that, you know, your point of not paying for the administrative burden of the transition point -- you know, $10 for somebody changing a charge master in the hospital setting, actually tracking all these codes, is not a small number. And so, I would just put out on the table that, you know, as we look what goes back the food chain, you know, the administrative burden is, unfortunately, about a small percentage of this. And hitting on two more, if I could: Number one, hitting on the crux of this issue being a trust but verified kind of guy, you know, in a complicated model of where things are coming down where the generator obviously is the big catch point, you know, how do you see we should look to be sure that this current policy has actually had an effect? Once you put a policy into effect with a trial to see if something happens, how are you sure -- what parameters do you use to see how it affected things?

DR. DUVALL: Which affect are you speaking of?

MEMBER VAN DECKER: For cost recovery, or shifting of the LEU, I guess, towards full cost recovery.

DR. DUVALL: Okay, from our standpoint, remember that our particular requirements -- authorization from Congress doesn't allow us to promote full cost recovery. That would be -- gets into that incentive world. So, from our standpoint it is making sure that the reimbursement is there. I think the way that we would measure that, and the way that I expect that we will continue to measure because

we will be monitoring the utilization of the code over the next five years, we're looking at it, again, as a five-year time horizon. And what our expectation is, is that over the course of the five years, we will see the utilization of the code go from very small to very large, and essentially, that's tracking industry conversion.

MEMBER VAN DECKER: And then my last question, if I could. Now, obviously, from your seat it's pressure-control -- pressure price controls, and bundling is a key word in life. How do you see transition ending? You see the queue code just being added in at its base cost to the base reimbursement? You see a percentage of it being added back in? You see a percentage of the utilization of the code being added just to the total codes? How do you see that playing out?

DR. DUVALL: From the way that the payment systems work, if the industry decided today that it expected its cost to increase by, say, $10 a dose in two years, and the industry as a whole, you know, without collusion and monopoly collusion and things like that, decided that it wanted to proactively raise its prices by $10, those costs would pass down, and we would pay them. So, what this is actually doing is, assuming that costs are going to go up, and, in a sense, prepaying costs -- we're saying that we expect the industry cost to go up, so we're going to earmark some money right here and put it on -- out in front. Now, as the costs actually do go up, then within five years, the full cost of conversion will be part of the system. At that

point, the queue code goes away.

MEMBER VAN DECKER: Right, but the statutory requirement of HOPs is based on hospital claims data from two years prior. If the percentage of the cost hit the hospital level is only half a percent, or one percent, because it's not at the farmer level, then the amount that that cost had seen the claims data to recover back along the line is going to be much harder to get to.

DR. DUVALL: The -- if it's -- if the cost is being passed to the hospital even though it's only 1 percent of the total hospital payment, that full 1 percent of -- that full 1 percent goes in. So, the entire cost is going to be accounted for. Now, in terms of this --

MEMBER VAN DECKER: Saying that the hospital finds it and does it appropriately, yes.

DR. DUVALL: Assume -- that's the whole supply chain thing, and that's actually the market forces that create problems for someone who has full cost recovery compared to somebody who can offer a lower cost product without full cost recovery.

MEMBER VAN DECKER: I thank you for your time, sir, and I thank you for your patience.

CHAIRMAN MALMUD: Thank you, Dr. Duvall. Are there any other questions? Now, thank you for the --

MEMBER WELSH: Yes.

CHAIRMAN MALMUD: Oh, excuse me. Dr. Welsh?

MEMBER WELSH: Thank you. At the risk of sounding like a broken record, having said this many times at the

ACMUI and various other meetings, I do have a bias as a radiation oncologist who appreciates the challenges that my diagnostic brethren are experiencing with this moly-99 shortage. But as a radiation oncologist involved in radiotherapy, I have a vision-based bias, number one, because I don't want to see the isotopes that I need disappear, and therefore, I'm an advocate of diversifying technology. But my question might be, is this exclusively for technetium-99m? I think from the discussions it sounds like it is. And would it be possible for this concept that you're developing to apply not just to the diagnostic isotope, but to any isotope that is used for diagnostic or therapeutic purposes that is produced without the use of HEU when non-HEU alternatives may present themselves. So, I suppose it's a question that is, can we use the idea for therapeutic isotopes in addition to the moly-99 isotope?

DR. DUVALL: The answer is that it is possible. It was extremely difficult to find authority to actually create this payment in the first place. We had to base it on the fact that some hospitals would have -- could have a non-HEU source at higher cost than another hospital, but have a different source, you know, through different suppliers, and had HEU sources. We had an authority equalize payments to hospitals. The biggest reason for limiting it to Tc-99 was that this is a -- really, the biggest elephant in the room. Expanding it further gets into services that are used much less frequently, and as you're aware of, the administrative difficulty for the

hospital, even with the frequency that this is used and even at $10 dollar amount there's a lot of hospital resistance to, you know, why do we want to get into this. So, it was a balance, it could've been done, but it was felt that getting that through Office of General Counsel and getting acceptance by the hospital industry probably was not something that would happen. There was achievable, so we limited it this year. In terms of comments to future rules and things like that, you know, that's always something that we could consider further.

CHAIRMAN MALMUD: Thank you. Dr. Welsh?

MEMBER WELSH: If I might add a follow-up comment. I think one of your points was that patients might not really be too concerned about where their isotope is produced. I might challenge that simply because as a radiation oncologist all my patients must provide informed consent, and with the therapeutic isotopes I could envision in the future asking the patients that if there is an alternative that uses non-HEU-produced isotope, would you check the box in this consent form; if not, don't bother with it. It's just a comment. I suppose I would challenge that assumption that patients wouldn't prefer the dolphin-free tuna.

DR. DUVALL: Clarification: that was actually our assumption as well. We felt that patients would prefer the dolphin-free tuna; Patients would not prefer full-cost recovery tuna. That was something that would not resonate with them.

CHAIRMAN MALMUD: Thank you, and there's a question from Mr. Mattmuller.

MEMBER MATTMULLER: Hi, Steve Mattmuller. In regards to the OECD analysis of, I guess, I would challenge the assumption that the European market is identical to the U.S. market given the huge differences in health care being government-sponsored over there versus our system here. So there's a huge difference in payers. And also in regards to the previous comment that right now they have like 10, 15 percent reduction of non-HEU Moly in the world. The U.S. could really only expect to see about half of that, so we're really dealing with 5 to 7 percent of our total moly now potentially non-HEU.

In regards to your analysis conclusions that in the -- I've heard this a few times and I don't understand where -- the concern seems to be that the hospital gets the patient. How is that additional money going to work its way back up the supply chain? And I can assure you right now in our current state with our -- it's still a fragile moly supply, as we all know, with the one big reactor down and actually they want to shut the Navy reactors over Duke -- being shut down for routine maintenance. So we're really in a very perilous situation right now. And everything the manufacturers have had to do to bring additional moly into the market has raised their cost already, and I can assure you they're not shy about raising our prices. I mean, because we've already experienced significant increases for our technetium generator at the hospital; already in the

past few years, despite our national price contracts that say, you know the price will stay the same for three or four years. That's just been blown away. So we're already getting substantial price increases now just for HEU moly because the supply is so unreliable. And so I do have a question for you, in regards to your model, when you look at -- and this goes back to the farmer analogy, that price increases for the farmer because of the efficiencies of the distribution. If it's a 50 percent increase in moly cost it's not a 50 percent increase at the consumer level or patient dose. So in your model if you look at a technetium generator, say for every curie that's in a generator, how many doses come from that curie?

DR. DUVALL: The answer to that one is that -- one clarification first, and that is we did not assume that the U.S. market was identical to the European market, rather our assumption -- or, not our assumption -- our conclusion was that the elements going into the model that OECD used as a world model were not significantly different when applied to the United States. So, yes, there are differences, but the fundamental assumptions and conclusions did not significantly change when we looked at the U.S. market.

Now with respect to the dosing, one of the differences between the U.S. market and European market is that we -- at least our evidence is that on the average we tend to have larger generators and a wider distribution for our regional radial pharmacies which actually creates some efficiencies. The range in generators, as you know, is

extremely wide, so for the purposes of a model we used a standardized 10-curie generator. However, the model that we used is actually a spreadsheet model with hundreds of cells in it and various distributions for each element so that the model can -- you can change any particular assumption within the model. And one of the things we can do is vary the generator size to see what happens if you assume five curies or 15 curies. In terms of doses per generator, that depends on the efficiency of the generator. On the order of, I think, several hundred doses, I believe on the order of about 300 doses from a 10 curie generator; however, the range is extremely broad and that actually shows the biggest problem that we have in the model is the -- not just the reliability of the data but the variability of the data. The first thing that we can measure, the one thing we can measure directly is the costs to a hospital by looking at the hospital charges, reducing it to cost on the basis of the cost reports that we have full access to. And what we find is that the costs for the tests, this basic -- let's say it's about a $600 to $700 for one of the particular versions of the test. Hospitals report that as costing them between $200 and $1,200. It's that much of a range depending on the accounting systems of the hospital. Well, clearly if they were all using the same accounting systems, their salaries and things like that don't create that much difference. So it's an accounting impact. That same variability hits at things like the doses per generator, and the only way there we're able to do it was to take the

model, look for midpoints, and then vary the model to see as we varied it what would be the impact on the final dose. And the main thing was that you could have wide variations at any individual step that tend to have the buffers by other steps.

CHAIRMAN MALMUD: Thank you. A follow-up, please.

MEMBER MATTMULLER: Yes. Just a comment, then -- I think at our hospital I think our financial system was approved by Congress so that may explain why you have these wide variations.

[laughter]

Because at times we don't even understand it. So I can appreciate the wide numbers that you get. And I guess I made this comment with a previous speaker. The problem as I see it is the transition because if every dose we were giving, coming into the hospital, was from a non-HEU source, that makes using this code so much easier. And even if we do have a relatively steady supply of non-HEU coming into the hospital, it's relatively easy -- once we go through all the work of setting it up the billing ought to be automatic, just about. Now then -- but you do have to take a step back which is going to make us reluctant participants, is not knowing what the cost -- as soon as we find out what the cost increase is -- because cost increase applies to all of our patient doses, not just the hospital outpatient patients who are then needing to take all the doses, hospital out-patient doses, Medicare-covered hospital out-patient doses. So this additional $10 per dose is going to be needed for

our perspective, the hospital, need to cover the cost -- the additional cost -- at all the other doses. So that's going to be a hurdle to jump over.

But if and when we do get past that and do try this -- as you know with our -- and it's just fragile, our whole supply, and even with the newer sources coming out it'll still be fragile. It's entirely possible that we'll be using non-HEU moly or technetium, but then there'll be some interruptions, and then that's when it really gets kind of scary. It's like, okay, we've been using non-HEU, we've been charging an extra $10, now we're not, so now we have to go into our system -- and basically it's like a manual system -- say, no, don't charge the extra $10. And in talking with several people from my department who are far more knowledgeable about this than I am, and they said, you know what, our lawyers -- we have lawyers in the hospital, too, say, it's not worth the risk of billing for something that we didn't actually incur the extra cost to because of the additional penalties that can be applied to the hospital that our legal staff, and accounting staff, and billing staff are very, very aware of; so that's the real risk we have at our level during the transition phase.

DR. DUVALL: One of the downsides, I think, of being a government employee now as opposed to one of my prior hats is that in response to issues like that I used to be able to go sit down with the individual financial managers of the hospitals, the CFOs and their staff, and actually work with them on how they could configure their

systems easily. My prior job at the -- before CMS was actually systems efficiency expert and so I did system configuration, things like that. I can say that it is not as difficult as some hospitals believe and sometimes it's knowing just the one or two facts that allow you to say, "Oh, that's how you can do it." But we didn't – in determining this, I mean we produced the thousands of codes every year that the hospitals have to put in their systems, so we try to stay pretty close in touch with how you have to use the codes. And it was our determination after looking into it and talking to people and things like that, that actually this is not that difficult to implement and to implement safely and absolutely in a way that you would not overbill the government because we definitely get very upset when you do that. So I would urge those of you that are in the industry that are hearing that to have hospitals that are having difficulties with this talk to other hospitals because there are hospitals that have found ways of implementing it fairly easily, and I think that as that knowledge spreads it's not a lot of discussion among CFOs for a $10 payment that they are not using that often. But again, as more LEU comes into the system the costs go up, then the pressure is going to be on the hospital that, oh, we really do need that payment, and I think they'll then find that it's actually not so difficult to implement.

CHAIRMAN MALMUD: Dr. Suleiman, did you want to comment?

MEMBER SULEIMAN: Yeah, just a quick one. I want

to compliment CMS for what they did. The whole purpose of this exercise was to encourage professional procurement of the LEU-produced moly. Not during a shortage, because during a shortage you should pocket the 10 and not give it to the community. But it's during the period of time when there's ample supply of moly that people start buying the cheaper HEU, and the infrastructure that's now in place for the non-HEU production is standing there not being used. And so that component of the supply chain has been complaining, we went to all this trouble and now there's a moly glut because right now the supply is not short, and so to encourage that I think the White House policies said we really want to preferentially procured guarantee that the LEU producers are not disenfranchised once we go through one of these surges where we actually have more moly. And so the whole purpose there was to give a little bit of encouragement to differentially repay the higher cost of the non-HEU moly.

This is so simple I've just been fascinated; I'll be honest with you, how difficult the community has reacted to this. I've talked to radiopharmacies where they've implemented it, and they said it's not a big deal. The people who have implemented it have been quiet, they've succeeded, and it's really pretty low at this time just because of the numbers. But if it's so complicated, and I've argued this before, don't use it. Just go ahead and pay your regular rate. This was not meant to be forced on the community. If you think this extra $10 is not worth it,

don't bother with it. And it's going to go away when the HEU production goes away. So it's just to help in translation over this period of time. I think you guys have done a phenomenal job and I wish people would try to take advantage of this.

CHAIRMAN MALMUD: Thank you. As a retired hospital CEO, I am impressed with the fact that you're introducing new billing code. Makes it easy to add it on as an add-on to the procedure and get reimbursed. I'm sure the hospitals that will enjoy this in the future are appreciative of it. And we very much appreciate your presentation here today. Thank you.

DR. DUVALL: Thank you very much.

CHAIRMAN MALMUD: We now have a schedule to take a break. We're running about a half-hour behind. What would you recommend for the length of the time for the break, Mr. Einberg?

MR. EINBERG: Should we take the half-hour break or run an abbreviated break of 15 minutes?

CHAIRMAN MALMUD: Is 15 minutes sufficient for the group?

MR. EINBERG: Before we go to break, I would suggest that maybe we change the agenda a little bit because there are some more interest in Ms. Weil's presentation from the members of the public, perhaps, so when we come back from the break if we could perhaps start with Ms. Weil's presentation.

MS. COCKERMAN: Actually, that was assuming we

were going to come back at 11:15, so if we're going to come back at 11:00 maybe we should proceed with Sophie and Dr. Gabriel's presentation on ViewRay. Use that 15 minutes, and then move onto Ms. Weil's presentation at 11:15 to keep that on schedule.

MR. EINBERG: That sounds like a good plan if it's acceptable to the Committee?

CHAIRMAN MALMUD: Yes. So that will allow Ms. Weil's presentation to be exactly on schedule. Thank you.

[break] [resume at 11:00AM]

MS. HOLIDAY: So, good morning, everybody. As you know, my name is Sophie Holiday, and Dr. Gabriel and I are listed to give this presentation because we were both part of the working group that worked to develop the licensing guidance document for the ViewRay. We are both members of medical radiation safety team, and we have the pleasure of presenting to you today the status of our licensing guidance document. Today, I just want to give you a brief description of the device, touch on with the sealed source and device registry, talk about the working group, give you our progress and current status, share with you our communications plan, and then wrap it up with a summary.

CHAIRMAN MALMUD: Thank you.

MS. HOLIDAY: You're welcome. The ViewRay device. This device -- is a unique device. It's a new device. It just hit the market not too long ago. The device in particular is very unique because of its a rotating gantry -- it has a rotating gantry with three Cobalt-60 radiation

therapy heads and three multi-leaf collimators. This device also has a MRI system that's integrated with it so you get real-time imaging while you're treating the patient. In addition to this, you also have an integrated treatment planning and delivery software so all of the dose calculations are merged, essentially, so there's no transferring of the parameters for treatment as the patient is being treated. This information -- basic information can be found on the ViewRay website at www.viewray.com. It was understanding that there may have been some representatives that were going to join us from ViewRay, but I believe since our presentation got switched around that perhaps they were unable to accommodate this change in agenda.

Also, I would like to share before I go further into my presentation that due to the nature of this work -- guidance document, in particular, and due to the proprietary nature of the device, we are strictly limited to how much information we can disclose with members of the public. And since the licensing guidance decision or how we want to license this device is considered pre-decisional information, so at this time, I'm afraid I will not be able to tell you which particular category we will be licensing this device.

Sealed source and device registry. This device -- the sealed source and device registry was created by Ohio and approved on August 17, 2012. On your screen if you're interested in looking up the sealed source device and registration -- if you have access to that database, you can

find it here.

The working group. This is the main component of my presentation. A working group was requested to the NRC from the state of Ohio; Ohio being the state that submitted the sealed source and device registration. And since they requested a working group to look at this licensing guidance document development, we had to send that solicitation through the OAS Board. Per NRC's management directive 8.3, Agreement State Participation in Working Groups, there's a whole process and procedure about how NRC has to go about developing a working group with agreement state participation. Among these procedures include things as a working group charter that outlines your tentative deadlines, your objectives, who is involved, and the roles that they play.

There were a total of six members on this working group evenly split between NRC and the agreement states. There were two individuals from headquarters. That's myself and Dr. Sandy Gabriel. The Region III representative was Ms. Frazier, who is one of the co-chairs on the working group. The other representatives were from agreement states; there was an individual from California, an individual from Ohio, and an individual from Wisconsin. The individual from Wisconsin was the OAS co-chair of the working group. As you will note that we have three individuals from agreement states, and the other individual from Region III. The reason why these individuals were chosen is because Ohio has an interest in that ViewRay is

based in Ohio, and they were the individuals who created the sealed source device registration. Region III is involved because they have a licensee who has the device. Wisconsin also has the device. For those of you who may not know, Dr. Langhorst and Dr. Thomadsen's facilities currently house those devices. And California is a expecting an application quite soon. So all of the individuals that were on the working group were familiar with the device and were the knowledgeable people to be involved in the development of this licensing guidance document.

Onto the progress and the current status. So, we formed the working group a couple months ago, and a charter was drafted and concurred upon -- concurred by both the NRC and the OAS Board. So both parties were aware of the procedures and objectives of the group and how the proceedings were supposed to go forward. The working group recently completed their initial draft of the licensing guidance document, and this is currently undergoing review. We just received comments from Regions I, III, and IV, and the OAS board; so the working group will be meeting later on this week to go over the comments to hopefully resolve the comments. After the document has gone under review, it will go through our management, and then it will also go through legal to make sure we're not doing anything we're not supposed to. And then that brings me to our next slide, communication.

There are several methods which NRC may use to communicate with members of the public and the agreements

state stakeholders on the licensing decision for particular devices. One of the methods is the medical listserver. I believe everyone here on the committee is a part of that. If you are not, you can simply send an email to the email address that's listed here and request that you be added to the medical listserver. Gretchen Rivera-Capella is actually the project manager over that medical listserver. An additional step that we would take is to issue a memo to the NRC regions and the OAS board to inform them of our decision of how we chosen to license this device. Another method that is available is the medical toolkit. The medical toolkit amongst other things has such things as 35.1000 guidance, FSME newsletters, other regulations, and references.

So, in summary, the working group completed its initial draft, and it is undergoing review. The working group will meet this week to hopefully resolve all the comments. And then upon approval, the guidance will be shared via multiple routes so that we can reach as many stakeholders as possible, as many agreement states, stakeholders, and members of the public that may be interested in this device licensing.

So, here are some acronyms. And that completes my presentation. Do you have any questions?

CHAIRMAN MALMUD: Thank you. Questions or comments for Ms. Holiday? Please.

MEMBER WELSH: Jim Welsh. So I heard you say, I believe, that you wouldn't be disclosing where in 10 CFR 35

this will be licensed, but from my perspective as a potential user, the radiation oncologist, I can't understand any reason for in not being in the clearly defined 690 teletherapy section. Is anybody aware of any reason why it wouldn't fit well in that section right now? To me, it seems like a teletherapy unit that has modernized image guidance.

CHAIRMAN MALMUD: Perhaps someone from NRC staff can answer.

MS. HOLIDAY: There's a limitation on how much we can share as far as our licensing decision without actually announcing what it is, but I do understand your concerns. When staff looks at devices, what we do is we evaluate it against our regulations, and that device has to meet all those regulations. If for some reason it can't, then we consider another category. I'm not saying of course that it would be 600, but this is how we evaluate every device that we get. So we evaluate it against the current regulations and see how it fits, and then if there are certain components that don't fit, then it gets moved to another category.

MEMBER WELSH: My question here might be just as last year with Dr. Zanzonico and we had our radium-223 dichloride subcommittee to ultimately provide some advice or recommendations about licensing. Why would there be no need for ACMUI input ahead of time for you to make this decision?

MS. HOLIDAY: Sure. One of the reasons why we didn't necessarily go through ACMUI this time is because we

didn't want to delay the use of the device. As I've been told, some licensees are trying to use this device as early as this summer. And duly noted, it may have not been sufficient time to form a subcommittee and get a report and get adequate feedback in order to make this licensing guidance document. However, I will say that a guidance document is simply a guidance document, and there's always opportunity for comments to be provided on licensing guidance documents.

CHAIRMAN MALMUD: Thank you. Dr. Langhorst.

MEMBER LANGHORST: As Ms. Holiday said, my institution, my organization does have a ViewRay device with sources at this point in time that the ViewRay Incorporated is still testing and getting to that point to where our medical physicists will then be doing acceptance measurements and testing. We have applied to Region III for medical use of the device last September and did make the argument of why it should be considered under 35.600. And I know that Region III is considering that, and that was probably one of the driving forces also to put together this group to review it. I do want to make mention, too, that at the May CRCPD meeting, the AAPM is sponsoring a training in ViewRay licensing and some of the challenges involved in that, too. So there's a lot of discussion going on on it and a lot of excitement about this new device, and we agree that it's teletherapy heads, and an MRI system is just an additional thing to help with giving effective teletherapy doses to patients.

CHAIRMAN MALMUD: Thank you. Other comments? If not, we'll move on to the next item on the agenda. It's Laura Weil, and we'll invite you to the front of the table.

MEMBER WEIL: Thank you, Dr. Malmud. Thank you for the opportunity to share with you my experiences at the 2012 Thyroid Cancer Survivors' Association annual meeting. I'd like to give you a little background history. Which one?

MS. HOLIDAY: The one on the right.

MEMBER WEIL: The one on the right. Really?

MS. HOLIDAY: Point it this way.

CHAIRMAN MALMUD: You did.

MS. WEIL: There we go. We'll see how it works next time. So, ThyCa is a non-profit organization, really grass-roots association that provides support and information for people with thyroid cancer. It has IRS 501(c)(3) status, and it's predominantly a volunteer organization. It has one full-time executive director.

So, the services that it provides. You can see here it's got 14,000 participants in email support groups. It's got a lot of local in-person support networks, free online newspapers. It does low-iodine cookbooks in several languages. They're working on the Chinese version. And it has periodic local workshops for informational purposes as well as this annual conference. Supports research, has -- here's a partial list of its grantees. So you can see these are prestigious institutions that receive funds from ThyCa. And the annual meeting has over 500 attendees on multiple

days. A thousand -- a hundred separate sessions, speakers, predominantly physicians from leading cancer centers including Cleveland Clinic, MD Anderson, Mayo, Memorial Sloan-Kettering, Yale, Johns Hopkins, and also other health care providers and attorneys are represented.

So ThyCa decided to survey its members in 2010. It had over 2,400 respondents, and this is some of the information that it captured. Sixty-seven percent of the patients who responded to the survey were released from the treating facility within 30 minutes, 17 percent within an hour, 8 percent within two hours. So you can see that the predominant majority of patients are released very, very quickly from the treating facility. Ninety-four percent went home or to a relative's home, and 5 percent reported going to a hotel or motel. Ninety-four percent said they received oral instructions. Only 87 percent stated they received written instructions on reducing radiation exposure to others. The treatment settings were 89 percent hospital and 11 percent out-patient, non-hospital settings.

So, I had the opportunity to attend the 2012 ThyCa conference. And I went with the intention of surveying attendees about which were family members of patients and patients, former patients mostly, to interview folks about their experience with outpatient iodine 131 therapy. I talked to more than 25 people. They are a highly motivated and highly activated patient population. These are folks who are very intelligent, very well informed about their disease, and very interested in becoming more informed.

My underlying concern, and this is the, you know, the soft counterpoint to Dr. Saba's presentation. My underlying concern is that patients who are given discharge instructions at the time of treatment have trouble understanding and following those instructions. And I backed that by comparing them to emergency department patients. It's been fairly well documented that emergency department patients don't understand discharge instructions, don't know they don't understand discharge instructions, and therefore don't reliably follow discharge instructions in large numbers. It's been postulated 75 to 78 percent of emergency department patients have problems following discharge instructions. Well, when release instructions are given to radioiodine therapy patients at the time of discharge, they are compromised the same way emergency department patients are compromised. They're frightened, they're not feeling well, they may be extremely hypothyroid. I think I get to this. Here we go, on the next slide. They are not at their best, and therefore, it's a difficult time to be giving instructions. Some centers provide them instruction well ahead of time, and some providers don't. And to assume that everybody gets their release instructions when they're feeling well and able to integrate them and with the person accompanying them perhaps who can assist them in understanding discharge instructions is a problematic assumption. Some of the barriers to understanding are fairly obvious. They may not have adequate time to integrate the information. The written

instructions are often, you know, in that stack of papers which, you know, can be this big with the important message from Medicare, and the bill, and information about not, you know, not bringing valuables with you to the institutions. It's a bunch of stuff that people get when they are receiving treatment, and those instructions are not always pointed out. And then a big problem that we really don't address well in any medical care is that the patient's primary language may not be used in providing this information to him.

So, I interviewed a lot of people, and I would like to share with you what I think is a representative sample of the stuff that people told me. So, I met a young woman who was treated at a small community hospital. She was given her final discharge instructions at the time of treatment stating she was completely hypothyroid. She felt cognitively compromised at the time. She remembers that she receives conflicting instructions from different members of the clinical team. She was feeling nauseated after treatment, but no antiemetics were offered. She wasn't offered instructions about travel home. She was not told to actively hydrate in the post-treatment period. And she learned about these concerns at the ThyCa conference. At a major university center, the interviewee told me that she received contradictory discharge information. She states she received no information about how to mitigate damage to salivary glands. She remained at the treatment site for 15 minutes post administration of her iodine 131. She traveled

home alone. She was totally unaware of any precautions that might relate to trash disposal, eating utensils. She learned this again at the conference, and she stated, "that stresses you out, not knowing what to do."

I met the mom of a 10-year-old who was treated at a university hospital. The mother was given no instructions for post treatment period other than she was told to bring the big car so that she could stay as far away from the patient as possible during the long drive home. She had another child at home, a 6-year-old, and she was given no instructions to isolate the patient from her sibling. She got no information about solitary sleeping or bathroom use, or eating utensils, laundry. She was suspicious about this and being that highly activated, typical ThyCa member, she accessed the ThyCa website for information. She called the hotline, and she got more information about what she ought to do, and she sent the younger child with -- to stay with relatives for three days.

Another conference attendee told me she was sent to a hotel. This is her word, after her therapy. She states she was given no other opportunities or recommendations. She's now a ThyCa volunteer who staffs the hotline, and she says she receives a lot of calls about hotel stays after treatment. Many patients tell her they get instructions only on the day of treatment, and she reports that many patients state that the instructions are included in a stack of discharge papers not specifically identified or verbally reviewed.

I met a young mom who has a 6-month-old. She's now two months status post breastfeeding cessation in anticipation of her iodine-131 treatment. She was expecting to get her treatment in the next month or month and a half. She thought she had excellent instructions from a major medical center. She showed me an email that she'd received from the center which was listed the specifics of her post-treatment period. She was very, very happy with the instructions that she received. I have to say that this is, among the 25, the only person I spoke to who was really, really happy with the way the instructions were presented ahead of time and with the access that she had for -- to people to ask questions. She said she'd gotten some conflicting information from other clinical presentations at the conference, but she was perfectly confident that she would be able to call her provider and get her questions answered. This was a happy thing.

So a summary of the concerns that I heard repeatedly expressed involved conflicting instructions from members of the team even at the same institution, cursory to minimal discussion of precautions, missing information, no effective contact information given for information after release. People told me that they went home and vomited on the shag rug and couldn't reach anybody at the institution to get information about what they should do to clean up a spill. A lack of information, uniform information in the medical community about appropriate precautions is another thing that was raised repeatedly. So my informal conclusion

based on very soft anecdotal data is that people at this conference felt that they had not received consistent, understandable discharge instructions that would enable them to maximize safety to themselves and minimize harms to others. Any questions?

CHAIRMAN MALMUD: Are there question for Ms. Weil? Or comments? Dr. Zanzonico.

MEMBER ZANZONICO: It's very interesting data.

MEMBER WEIL: Well --

MEMBER ZANZONICO: Information. It's very distressing.

MEMBER WEIL: Yes, I agree.

MEMBER ZANZONICO: It's -- I have to. It's nothing like what we do at --

MEMBER WEIL: Of course not.

MEMBER ZANZONICO: And I'll take this opportunity to again applaud NCRP Report number 155, which virtually states all of the issues that you address in terms of the immediate hopes in the period, hour so forth, people should remain under medical observation, report to discharge -- this is for out-patient -- instructions and information upon the trip home, written instructions, contact information, so forth and so on. All of these are included in detail in that report, and it's what we follow at Memorial and a number of other sites follow it as well. But I'd just like to take this opportunity to plug this report once again because I think it reinforces the problems that do occur obviously at a number of places where there's conflicting

information even among the medical and professional staff, and I think this provides a systematic comprehensive resolution to a lot of those issues. Thank you for that.

CHAIRMAN MALMUD: Dr. Suleiman.

MEMBER SULEIMAN: I want to compliment you on a nice presentation.

MEMBER WEIL: Thank you.

MEMBER SULEIMAN: There is nothing like real information. Maybe this is not a formal, large scale, random collection of data but it's always like the first step in maybe considering that. That's why I still would urge Mr. Saba and the NRC to collect some actual dosimetry data. I'm not a big fan of modeling when it's very easy to come up with an alternative, relatively inexpensive way to collect real data because no matter what model you select, I guarantee you, it's going to be challenged. And even real data will sometimes be challenged, but there's no substitute for it. And the dilemma I think we as a committee we have always got to consider, it's not what we do at our respective institutions with highly qualified individuals.

MEMBER WEIL: Right.

MEMBER SULEIMAN: The people that need to be -- whose safety has to be protected are nowhere near here. And so, what sort of safeguards are necessary to ensure that this situation doesn't exist out there. And again, if the magnitude is -- I've had some experience extrapolating from very tiny, little information to larger scale. And usually what you see here is probably much more representative that

we would like to admit. So, if this kind of superficial process exists out there, I would be concerned.

CHAIRMAN MALMUD: Mr. Einberg.

MR. EINBERG: Thank you, Ms. Weil, for this excellent presentation. It really does bring home, the personal nature of what we're dealing with, and emphasizes how these are real patients, real families that we're trying to protect.

One thing that comes to mind is that the ThyCa organization or the members of the ThyCa were surveyed by the Health Physics Society and basically to see whether the instructions were able to be followed. And there's a discrepancy in what you're reporting and what the -- what that survey indicated. And that survey indicated 97 percent of the members of ThyCa thought that the instructions were understandable. Now, however, having said that, I think that there is room for improvement. So, I just make that statement.

MEMBER WEIL: No, it's true, and I've discussed that discrepancy with Gary Bloom, who's the president of ThyCa. And he had some question about the accuracy of that 97 percent finding about the way the question was asked or about -- just about the way that information might have been presented.

MEMBER ZANZONICO: Can I just say something? How did you solicit interviews at the meetings?

MEMBER WEIL: I just walked around and said, "Hi, can I ask you about your iodine therapy -- acquisition

iodine therapy. Did you -- " I mean I tried to be as neutral as possible. Now one is never totally neutral. And my bias of course is that I believe there's a problem out there with the way patients are understanding and following their discharge instructions in this particular instance, because in the broader medical world, patients have trouble following discharge instructions or understanding them and following them. And I'm not using the word compliance because I don't think it's a question of choice. I think it's that we don't a good job in general in providing people with the information they need so they can protect themselves and others. But I tried to be as neutral as I could. And except for that one woman who had a very positive experience with her provider, the other people I spoke to all had concerns about their ability to understand the discrepancies in the information that they received, to make reasonable choices or that they learned later on at the conference of things that they should have done that they weren't aware that they were supposed to be doing. So, that's how I presented it. I just said I'd like to, you know, if I could, just ask you how you felt about your post-treatment experience and the instructions that you were given.

MEMBER ZANZONICO: I don't know. Maybe some of the physician members can comment on this but I'm struck by the relatively large portion of those patients who said they were nauseas and vomited, because when I speak to physicians at Memorial, and I think we treat more patients with

radioactive iodine for thyroid cancer than anyone in the world. To their knowledge, at least what they're willing to admit, they say it's almost undetectable proportion that they're aware of -- Dr. Malmud, what is your experience in terms of immediate, post-treatment nausea among the I-131 --

CHAIRMAN MALMUD: I've been doing -- I've been treating patients for 40 years. I've had two that have vomited. One vomited while in the department. We were able to handle that with radiation safety cleanup. Another one vomited on the street but only blocks from the hospital. And we sent a team out there from our own radiation safety to clean it up. Those are the only two that have reported to me that they vomited, because when I see them in follow-up, I ask them about what happened after I treated them. I don't doubt that the people that you interviewed said the things that they said. Some of the things, for example, frankly are illegal in our state. It's illegal to treat a patient who doesn't speak English without having a translator there; either a live translator, which slows down the process but we have them there. Or, in the absence of a translator, a telephone translation system. So, that's actually a breach of practice not to do that to someone who doesn't speak English. The other issues I can believe occurred. They would occur when we hospitalize the patient and then discharge the patient after several days or whether they were discharged from the laboratory. These are issues which are not related to the issue we discussed before, not directly related. And I don't doubt that; the patients are

very anxious when they're hyperthyroid and very slow when they're hypothyroid as any of us would be. And we give written instructions, and I go into detail with patients about situations that they may be facing or experiencing. And -- but I never -- we never at our institution direct the patient to go to a hotel. In fact, I tell them specifically not to go to a hotel or a motel.

MEMBER WEIL: That's unusual, I think, Dr. Malmud. I think it's an option that is broadly offered.

CHAIRMAN MALMUD: It may be unusual, and that's why I don't doubt what you said, because I've known the patients who have gone to hotels.

MEMBER WEIL: To comment on your statement about the use of interpreters, when a person speaks no English, it's usual that a medical provider, if not turning to a family member, which is a very questionable practice, will access either phone interpretation or call a staff interpreter or arrange for an independent interpreting service. It's when the patient speaks English, but it's not their primary language, and it's impossible to ascertain how much of that information is actually being understood because people want -- people will -- "Do you understand?" "Yes, of course, I understand." But it's difficult to assess what degree of the information is being absorbed when English is -- English proficiency is questionable.

CHAIRMAN MALMUD: You're absolutely correct, but the same thing is true for the patient who's fluent in English.

[laughter]

And doesn't absorb the information that the doctor transmitted.

MEMBER WEIL: True. It's just a double whammy for the person with limited English proficiency.

CHAIRMAN MALMUD: Just dealing with when they're on a medication, when the capsule should be taken. Is it before breakfast or after breakfast or in the evening? And you tell the patient, and it's written on the prescription bottle. And yet they don't follow the direction. So we find frequent non-compliance in that sense, not to mention the fact that in prescribing medications there are national figures for non-compliance for patients taking their medication, not radioactive, but medications in general. So I don't doubt that you gained that information from this number of patients. Though I think that it may be that you randomly had astute population of people who were more dissatisfied than usual, or more poorly informed than usual. But I don't doubt that there's a significant number of them, and we're concerned if there's only one. Dr. Guiberteau.

MEMBER GUIBERTEAU: I also want to compliment Laura Weil for her proactive and enthusiastic approach to her role as our public representative. I think it brings us back to what we're all here about, and that's for our patients and their providers. I have two questions. One, do you have any idea how recently these 25 people had been treated?

MEMBER WEIL: Oh, some of it goes back 20 years.

Some of these folks -- although the ones who had been treated a long time ago have been re-treated since. This would -- they would have been describing a secondary treatment, generally speaking, because they wouldn't have been discharged from the hospital long ago. So because this was all out-patient therapy that I was inquiring about, it's probably since '97.

MEMBER GUIBERTEAU: Well, I mean, I think that's important to consider. One, given the fact that about 90 percent of these people were treated in a hospital and the trend recently has been the reverse. And also, I think education and through the Society of Nuclear Medicine and other organizations where treating physicians is probably better, more recently than perhaps it was 20 years ago.

MEMBER WEIL: I hope you're right.

MEMBER GUIBERTEAU: Well, I'm just suggesting that we understand that this is anecdotal, but this is what makes it so interesting. But -- my second question is has any of this data from the surveys from ThyCa, has any of that -- have any of the data been published? And if so, can we get a reference because it would be interesting to read more about this.

MEMBER WEIL: I have a copy of the survey which was unpublished but perhaps you have accessed it from a -- in a published form.

MR. EINBERG: There's an abstract here and as such I believe it has been published by the Health Physics Society. We can get you that abstract.

MEMBER GUIBERTEAU: I think if you could send the references maybe to anyone here who is interested. Maybe I'll --

CHAIRMAN MALMUD: We'll send it to the whole committee.

MEMBER GUIBERTEAU: I think that would be interesting for us to read. Thank you.

CHAIRMAN MALMUD: Dr. Welsh.

MEMBER WELSH: Well, I too would like to compliment you on this effort.

MEMBER WEIL: Thank you.

MEMBER WELSH: I know it's a bit of a challenge, and it was outside the expected role. But nonetheless, I have to say that I'm skeptical. And I'm not skeptical about what you have here as far as what these people said, but I am skeptical about what might -- I have questions about what truly transpired. And to me, it's the three Cs of out-patient radio iodine therapy: comprehension question, conveyance question from the caregivers, and compliance concerns. We'll never know which one of those three Cs contributed to this -- these surprising anecdotes. But one explanation might be that, as Dr. Guiberteau explained, some of these patients were from a while back. Perhaps memory is failing. Perhaps standards were less stringent then than as they are compared to today. But for patients who were recently treated, one internal control might be to ask them. I don't know if you did. If you asked them, did you provide written consent, and I think that 100 percent should say

yes. If you got a number other than 100 percent, you would know that there is some human memory possible failure there. We'll never be able to know the true explanation for why these patients were not as happy as I would expect them to be, because these stories are deplorable and entirely unacceptable to my personal practice or any institution I've ever been with. And I believe that these responses would be unacceptable to any professional society that I'm aware of, namely the radiation oncology professional societies or the nuclear medicine societies. It raises the question in my mind that, is it possible that there is another group of practitioner authorized users, the endocrinologists who have standards that are slightly different from what I would expect the radiation oncology or nuclear medicine. I don't know if it's possible to ever tease out that data, but given the anecdotes, not true data, but the anecdotes that you presented, it raises this questioning in my mind because these are deplorable situations that I find so unacceptable that it makes me want to look into this further.

CHAIRMAN MALMUD: Dr. Suleiman.

MEMBER SULEIMAN: Did you collect information on where they had their procedures or the date? That would answer Dr. Welsh's one question.

MEMBER WEIL: Yeah, and frankly, I mean in the anecdotes that I've selected, I think I stated where they got their treatment. I think it was mostly hospital patients, but I can look back at my -- the other notes that I took. I don't remember the preponderance of whether it

was endocrinologists or others.

MEMBER SULEIMAN: I'm not questioning the credibility of what's been reported. I truly believe these people didn't dream this up, okay. And I fully expect that this occurs out there. My concern is how widespread is it. Could somehow we get a -- would there be some way to find out if there's a particular group or a particular circumstance or a -- you know, particular type of institution. I mean there are all sorts of hospitals. But, this sort of thing, having been a patient myself on several occasions, you know, when you sign those consent forms, who really has the time to read them, because you're about to undergo a procedure that's going to impact on your health; so maybe I'll look at them later after the fact. So, having been on both sides of the informed consent -- this consent issue, we really -- it's almost -- it's just a legal document. It's more to make sure the patient's been informed somehow, and we've got their signature but in terms of communicating across. Sometimes you almost need a lawyer to figure out what the informed consent means. So aside from that act, I just think this is worth some follow-up with some real data.

CHAIRMAN MALMUD: Dr. Guiberteau?

MEMBER GUIBERTEAU: I just want to make a distinction here between informed consent and the safety items that are instructions given to patients. They're usually distinct. At least in our state, they must be distinct. And so informed consent basically are the risks

and benefits of the treatment for the patient. The other is for the benefit of the caretakers of the patient, and we have to make that very clear so we don't like to confuse those items. We do, at our institution and many others, have the patients sign off that --

MEMBER WEIL: That they have received --

MEMBER GUIBERTEAU: -- they have read and have had a chance to ask questions and discussion. We give them our phone numbers. And that's pretty standard from the people that I know who treat these patients. Now of course I'm -- that's in itself is an anecdote. But I just want to make sure in the minutes here that we make a decision between informed consent and radiation safety instructions for the patients.

CHAIRMAN MALMUD: Dr. Palestro?

MEMBER PALESTRO: Yeah, a couple of comments. Number one in response to Pat Zanzonico's question about post-treatment vomiting, we treat about 200 thyroid carcinoma patients a year. And that's between North Shore University and Long Island Jewish Medical Centers. And I can only remember one instance of that happening, and that happens to be an in-patient some years ago. I do not recall it ever happening with any of the out-patients that we treat. In terms of language difficulties, as Leon noted, when we have someone who does not speak English or who we're concerned may not understand, we use the telephone translator. We don't have onsite translators. It was my assumption as it is yours that it was a law. I don't know

if it's a state law or federal law --

MEMBER WEIL: It is the office of civil rights.

MEMBER PALESTRO: -- but we do use that. A couple of other comments in terms of patients being hypothyroid and feeling quite poorly. While that's certainly true, I think the incidence of that happening is decreasing with the increasing use of recombinant human TSH, thyroid stimulating hormone --

MEMBER WEIL: Absolutely.

MEMBER PALESTRO: -- which is the vast majority of patients that we treat now. And I'm also not surprised that some of the information that they're given at the conference and by some of the medical speakers is conflicting, because the literature are conflicting. And the one thing that caught my eye is something that we grapple with all the time is what do you do about minimizing damage to the salivary glands. And over the years, we've told people to use sour candy, to chew gum, use lemon juice, but there's actually at least one -- excuse me, one paper published that says that's the worst thing you can do because the patients who've done that have actually had worse results in terms of increased salivary gland damage. So I think we're kind of at a loss now and are very -- from our own practice are reluctant to make any recommendations regarding how to protect the salivary glands.

MEMBER WEIL: Right, and you know, at the conference, there was conflicting information from speakers; some said use the lemon candy immediately. Some said wait a

day. Some said -- it was difficult for patients to understand what they should do given the lack of consistent recommendation out there from the medical community, and that's part of this dissatisfaction that patients have expressed about the instructions that they've been given. It's because they get conflicting information. That's nobody's fault, necessarily. That's that there isn't consensus in the medical community about what protects patients best.

CHAIRMAN MALMUD: So, very useful information. If you -- we also give our patients the ThyCa folder. ThyCa produces a folder --

MEMBER WEIL: It does.

CHAIRMAN MALMUD: -- and suggest to them that they can use that resource if they wish to, but that's separate from the behaviors that you described, and there is concern. Did I see a hand over here? Dr. Welsh?

MEMBER WELSH: Yes, just a quick comment. Although it seems appropriate to compare patient comprehension of directions in the emergency department to this population, it probably is not really a good analogy because this is an out-patient scheduled procedure, and there is consultation and there is a follow-up discussion, in most cases right before the treatment. So there would be ample opportunities for interpreters and for questions to be asked and answered under normal circumstances. So I don't think that the analogy to the emergency department is truly a valid one.

If it turns out that that is not happening and there is not a consultation and there is not a pre-administration follow-up visit for immediate questions and answers with the physician, it again raises my concerns that somewhere along the line our standards are not being met. And perhaps I might recommend that we revisit the question of whether or not physicians who are not nuclear medicine physicians or radiation oncologists should be allowed to administer this, because to my understanding and experience, I've never encountered a radiation oncologist or nuclear medicine physician or practice that doesn't vastly exceed these minimum standards from these anecdotes. So I don't have any reason to disbelieve what you've said, but it raises a question, that maybe there is a group of physicians out there that I'm not aware of that are not complying by our standards. So I might suggest that we revisit the question of who should be an authorized user.

CHAIRMAN MALMUD: Dr. Guiberteau.

MEMBER GUIBERTEAU: I'd just like to add, while we're putting patients who should or should not be doing certain procedures, which I do not think is the purpose of this committee, that most radioiodine 131 therapy in this country is performed by diagnostic radiologists with training in nuclear medicine. So I would not want that to leave here without putting that in our documents here. I think one -- I don't think that's the purview of this committee about who should and who should not be doing these, but also the fact that it's not just radiation

oncologists who actually perform the least number of the three groups we're talking about, and nuclear medicine physicians and diagnostic radiologists.

CHAIRMAN MALMUD: I think it might be useful just to give a brief description of how patients wind up being treated with radioiodine, because I don't think the committee is necessarily aware of it, all the members of the committee. A patient is diagnosed with thyroid cancer. Surgery is performed. Then, post-op, the patient is staged with iodine, usually I-123, a gamma emitter, in order to see if the residual thyroid tissue is considerable in the thyroid, in the neck, or elsewhere in the body. That requires whole body imaging. And the patient is prepared for that by withdrawal of the thyroid hormone which is autologous THA stimulation or with thyrogen stimulation. We use the thyroid withdrawal one. Then after the withdrawal of the hormone, then the patient is imaged with the I-123. A determination of the dose is then made. The dose is administered for the I-131, and there are three office visits associated with these three different -- well, at our institution. There are at least -- there are three office visits associated with this process, during which the patient is told what will be done, what the relevant risks are, and the patient is asked about their living arrangements, because it's essential that we understand those before we treat them. And once -- and then the patient's treated, obviously, and seen in follow-up after treatment. One week is the standard after treatment so that

we can image the patient after having received the I-131, which sometimes will disclose metasteses which were not evident previously.

So in all that process, there's more than one patient contact with the physician, and it's unlikely that the patient would be denied the information. In addition, we have handouts both in English and our second most frequent language at our institution is Spanish, so we have Spanish printouts as well. The -- it's disturbing to learn that this group of patients feels that they were not adequately informed, but that's very useful information to us, very useful. And I'm glad that you have collected it, because even if it doesn't represent a statistical, valid evaluation of these patients, the fact that it's happening at all is a concern. And probably is something that should be discussed either at the American College of Radiology or the Society of Nuclear Medicine with respect to reestablishing the guidelines of regular intervals for -- in our practitioner. What do you use at Sloan-Kettering? You say you have a regular handout?

MEMBER ZANZONICO: Yeah, basically, it's modeled on the NCRP -- it's the model you see here. It's pretty standard among most academic places.

CHAIRMAN MALMUD: And that's the same thing. Sure, anyway thank you. It's been a very useful presentation. If we may -- oh, excuse me, I'll get to you.

MEMBER MATTMULLER: I'm sorry, keep going. Yes, Steve Mattmuller. And, Laura, you talked -- you mention --

touched on this issue during Dr. Saba's presentation, but I'm not sure if he fully grasped -- and I think the issue is, maybe before the NRC goes and does research on how to do more effective guidelines, the issue -- to me what your presentation cites, how can we make the current guidelines implement it better? I mean, because if you look at that tug of rope I'm pretty much right in the middle. I'm leaning to the left now because it's like we've got good guidelines, appropriate guidelines. But from this data and this experience it's not being shared properly with patients who need to know it. So how do you solve that problem?

MEMBER WEIL: It's not -- you know, obviously, it's done very, very well in many institutions. Obviously it is. But what worries me is that if one looks at that best-case scenario and measures how well the guidelines are being followed, or how well they're being implemented, then you're missing this other shadowy world where it's not so well done.

CHAIRMAN MALMUD: Thank you. If I may, we have two more items on the agenda. The first one is that the representatives from ViewRay are here. They were not present for the earlier discussion because the schedule was changed. So may we invite them to first make any comments if they wish to? And that would be relating to the presentation that Sophie made. Sophie, would you just give us the intro?

MS. HOLIDAY: Sure.

CHAIRMAN MALMUD: Thank you.

MS. HOLIDAY: So the representatives that we have present here today from ViewRay are Mr. David Breuning, Dr. James Dempsey, and Mr. Paul Besette. So if you guys would like to present any comments on behalf of ViewRay, we will just ask that you come to the microphone and identify yourself.

DR. DEMPSEY: My name is Jim Dempsey -- is this on? My name is Jim Dempsey; I'm the inventor, founder, chief scientific officer, member of the board of directors of ViewRay Incorporated. I'm sorry we missed the presentation. You know, I guess we are keenly watching for the clinical guidance to come out for this product. The history of isotope use in external beam radiotherapy to the NRC is comprised mostly of teletherapy, which started back in the '50s. And in the mid-'70s to late '80s, developments in teletherapy sort of ground to a halt because the linear accelerator started demonstrating great efficacy in treating head and neck cancer and then breast cancer. And so, most companies that were producing teletherapy equipment stopped producing teletherapy equipment, started producing linear accelerators.

There's also the gamma knife, which is a device for treating disease in the brain. Dr. John Suh is an expert in this area of stereotactic radiosurgery. The ViewRay system is sort of a resurrection and modernization of the teletherapy device to the current standards of the linear accelerator. In fact, for the FDA our predicate device was not a cobalt machine, and it was not a gamma

knife, it was the CT guided linear accelerator. And so it represents a very broad spectrum of indications and use, all the way from palliative therapy, which may not need image guidance, simple therapies, to image-guided stereotactic body radiotherapy, and stereotactic use. And so we just, I guess, are keenly watching our clinical guidance to make sure that the broad spectrum of indications and uses are covered by the considerations of the clinical guidance. So I think our concern, as a company, is that that's appreciated as the guidance is produced.

And I guess we missed the presentation. There was a nice set of slides, they were a little terse. I don't know what transpired or was discussed. We'd be happy to answer any questions about it, and I think that's just the statement we'd like to say is that, "The clinical guidance considers the broad spectrum of indications and uses of the device and its practice. And just to be aware that there is this spectrum of treatment being performed in radiation oncology departments with devices like the Varian map and CT guidance, and that's really, sort of, the work flow we use -- that our device is entering into.

CHAIRMAN MALMUD: Thank you. Are there questions for Mr. Dempsey? Mr. Einberg.

MR. EINBERG: Yeah, Chris Einberg with the NRC. I don't have any questions; however, I just wanted to kind of summarize what was discussed at the meeting. We didn't indicate which way that our licensing decision was going to be going because that information right now is pre-

decisional and it will be inappropriate. So, the focus of the discussion was more process than status as to where we are, and I think you probably could get that from the presentation -- from the slide packet. So, from that standpoint I don't think you've really missed anything.

I would also point out that afterwards, this meeting is being transcribed so there will meeting minutes and transcription. So, and that will be posted on our website and you can see, word for word, what was said.

CHAIRMAN MALMUD: Thank you. Does either of the other two gentlemen accompanying you wish to make a statement? They're invited to do so. Please introduce yourself first.

MR. BESETTE: Good afternoon, my name is Paul Doucette; I'm with Morgan Lewis Law Firm here in D.C. And, I guess I would be interested, obviously, the process for the public having input on the clinical guidance. I understand it's pre-decisional, but I also understand the guidance is supposed to take into account the practicalities of the users. So we're just trying to understand how folks could have in input to the guidance before it's finalized.

CHAIRMAN MALMUD: That question should go to --

MR. EINBERG: Dr. Howe.

CHAIRMAN MALMUD: Dr. Howe. Dr. Howe.

DR. HOWE: Depending on how the final determination comes out, I think I can answer best for a case in which guidance status was 35.1000 because that guidance was different than the guidance that's currently in

the NUREGs 1556 series. So if you're talking about guidance for a 35.1000 device, the guidance is published on our public website at our medical toolkit for everyone to look at.

The guidance is always considered to be draft. In other words, anyone can make a comment on the guidance at any time; it's not the same as a regulatory position that's in our regulations where you can make a comment but you got to wait for NRC to go into rulemaking to make a change. So the 35.1000's very flexible in how -- and when we develop the guides, we develop them, generally, fairly quickly and it's very flexible in that we will take comments at any time on the guidance and then we will make a decision if we need to change it. And I think you can use the example of the yttrium-90 microspheres to show that the guidance has evolved over time with additional use and that we have been pretty responsive to requests for changes to it. So, the guidance is always considered draft and not final and you can also comment, if we were to decide to go 35.1000.

MR. BESETTE: Just one final question, Is there an opportunity to provide written comments on ViewRay currently before you publish that guidance?

DR. HOWE: Sophie, answer that.

MR. EINBERG: This is Chris Einberg, NRC. Your office proceeds right to the NRC, and I think Sophie laid out -- we're moving with our licensing decision right now. So if you are going to be providing any comments please provide them to the staff or -- as soon as possible.

MR. BESSETTE: I appreciate that.

CHAIRMAN MALMUD: Ashley.

MS. COCKERHAM: Just to follow up on what Donna-Beth was talking about, a decision with basically, something like 35.1000 as another example, radium-223 dichloride is another product that came before us, and we made the same type of considerations. We didn't publish guidance because we decided it was not 1000. And so we just issued a memo to our regional offices, and we did mailings on our medical listservers, and as much kind of public outreach as we could to convey what our licensing decision was and that it fit within the existing regulations. So those are kind of the two pathways that we've used as models before it goes to 1000 to be on the website, and follows guidance, and it goes in the regulations, we would use communications -- just to communicate that decision with the public.

MR. MCDERMOTT: Dr. Malmud. I'd just like to point out for clarification --

CHAIRMAN MALMUD: Mr. McDermott.

MR. MCDERMOTT: Thank you. The gentlemen mentioned clinical guidance, and I don't know if it's just the terminology of if you're actually looking for something different, but NRC would issue licensing guidance, okay. So in terms of the use the material, as the founder of the device brought up the wide variety of uses, NRC is focused on how the product is licensed in NRC space and not necessarily the different clinical uses.

CHAIRMAN MALMUD: Dr. Suleiman.

DR. SULEIMAN: Yes, I have some questions, also clarification. Radium- 223 has not yet been approved by the FDA, but it is under investigational research right now. So clearly, there's a licensing requirement as well.
You got cleared by FDA. What about your label, your instruction manual? That's already out there?

DR. DEMPSEY: So we have --

CHAIRMAN MALMUD: Please come to the microphone and reintroduce yourself.

DR. DEMPSEY: So yes, labeling was part of the submission to the 510(k) for the FDA. So all of that was complete. We also did complete IEC testing for the FDA before they granted us the 510(k).

MEMBER SULEIMAN: So your instruction manual is available.

DR. DEMPSEY: Yes.

MR. EINBERG: Excuse me, can you please restate your name.

DR. DEMPSEY: My name is James F. Dempsey PhD, DABR, formerly medical physicist, now purveyor of fine medical instruments.

MEMBER SULEIMAN: He answered my question.

CHAIRMAN MALMUD: Dr. Welsh.

MEMBER WELSH: Yesterday, during one of our discussions, Dr. Suh and I addressed the concern or issues surrounding the fact that cobalt must be -- cobalt-using units must be thoroughly evaluated, investigated every certain number of years, and perhaps for the older

teletherapy units, these inspections can be done without complete dismantling and replacement to the sources. But for the gamma knife, it appears that for these inspections to be done, it must be accompanied by the very costly exchange of sources. So, I'm just wondering, in your particular unit, where will that fall, just so we can get an understanding ahead of time whether inspections are going to cost maybe a million dollars.

DR. DEMPSEY: Okay, so the pricing model and the cost is one thing, I can tell you on the servicing, on the source exchange. So for us, we can change the sources in about a weekend. It does use the old source drawer and source technology. It's in a shuttle that doesn't have any friction or touch any parts, so everything in our system that has moving parts are newly designed. We do capture the old source drawer. The source mechanism and the pneumatics are all external and accessible. And so you can completely do inspections, preventive maintenance, service on the system without having to remove the sources. So the source exchange is quite efficient. You know, the cost of cobalt is quite high these days so there's not a lot of use cobalt teletherapy, so I can't promise you that it won't cost a million dollars. But the answer is, in terms of preventive maintenance and servicing, it's all quite accessible without any exposure. And our heads are very thick. So you very quickly get the outside of the head even with a 15,000 curie source or down to about 2 mR an hour or less.

CHAIRMAN MALMUD: Any other questions for the

representatives from ViewRay? If not -- Mr. McDermott.

MR. MCDERMOTT: Just one question, is that -- your about the serviceability without removing the source, does that include that variable collimator?

DR. DEMPSEY: No so too -- you can service -- the motors are accessible. If there's a problem with the mechanics or the linkage, you will have to remove that. And so -- but we do have toolings and mechanisms where a head can have its source mechanism removed, it's bolted and locked. We do have a locking mechanism on the source drawer. And so that can be bolted and locked, removed from the machine, and then the MLC can be extracted. And again, it's a procedure that just takes on the order of six to eight hours.

CHAIRMAN MALMUD: Does that answer your question?

MR. MCDERMOTT: Yes, thank you.

CHAIRMAN MALMUD: It's Dr. Dempsey, right? You're a PhD.

DR. DEMPSEY: Yes, technically.

CHAIRMAN MALMUD: Do you have any other statements that you want to make to us?

DR. DEMPSEY: Just thank you for allowing us the time.

CHAIRMAN MALMUD: Thank you for being here.

DR. DEMPSEY: Thank you.

CHAIRMAN MALMUD: Thank you all. If we may, we'll move on to the next item on the agenda, which is Mr. Mattmuller.

MEMBER WEIL: Dr. Malmud?

CHAIRMAN MALMUD: Yes.

MEMBER WEIL: Can I offer a clarification on my presentation? There was a question about nausea and vomiting.

CHAIRMAN MALMUD: Yes.

MEMBER WEIL: According to the Annals of Nuclear Medicine, June 2004, the incidence of nausea is 40.2 percent and vomiting is 7.6 percent for those that tried that therapy of I-131, iodine 131.

MEMBER MATTMULLER: Good morning. Ms. Holiday, how much time do I have?

CHAIRMAN MALMUD: Thirty minutes.

MEMBER MATTMULLER: Thirty minutes, really? I was warned beforehand that some people are on a tight flight schedule. So, I'll try to abbreviate some of my slides in the interest of time. Let's get this guy to work here. Here we -- all right.

So today I'd like to talk about gallium-68 and the germanium generator that comes from. And in regards to this, four areas I need to cover are receptor imaging and why this this is such an important strategy for rating pharmaceuticals for diagnosis and therapy. Why gallium-68 is such an important radionuclide, it's available via a generator, so sites do not need to have an expensive, complicated cyclotron on-site. And personally, I tell you because it has a half-life of 68 minutes, so it's one of the few that's easy to remember.

I'd also like to talk a little bit about the different radiopharmaceuticals that are being developed in the U.S right now. And of course, since this is an ACMUI meeting, we've got some regulatory issues to discuss. And as a side note, to avoid getting tongue tied with all the long names, whenever I refer to gallium, it'll be gallium-68, indium, indium-111. The slides will have the right radionuclide.

This is a schematic representation of the somatostatin receptor in a cell wall. And then the yellow insert is the actual pathological somatostatin peptide hormone. And you can see the four dark critical amino acids that interact with this receptor that gives this molecule, this peptide hormone, its great specificity. And it's important for the regulation in the endocrine system, it affects neurotransmission, and for cell proliferation in certain tissues.

The issues -- or the problems when the SSJR at the somatostatin receptor go awry is that it's expressed in neuroendocrine tumors, excuse me, such as those that would include carcinoma, growth hormones creating pituitary tumors, paraganglioma tumors, fetal proctomas, and neuroblastoma.

We're actually doing receptor imaging right now, in nuclear medicine, with Altria scan which is an indium radiopharmaceutical, it's a SPECT imaging agent. And at the top you can see the somatostatin peptide hormone; at the bottom is the Altria scan molecule. And if you can read it,

it has the exact same four important amino acids in a critical order so it interacts with the receptor. In the middle of the Altria scan is a DTPA molecule which is a chelator, derived from Greek, which means like a crab claw. So the chelator is like a crab claw that can hole the metal atom. And in this case, it's indium.

Now this is a gallium version of the same molecule. In this case, the amino acids are expanded out in their complete chemical structure, so -- but it is the exact same four amino acids.

Instead of using DTPA because the chemistry is a little bit different between gallium and indium, this is called -- instead of DTPA, we're using DODA. And in the literature you may see there's like three versions of DODA that's in use, DODATOT, DODANOT and DODATATE. But essentially, they all have the crab claw aspect going to hold the metal atom.

So if we already have a good receptor imaging agent, why change? And I think this image clearly demonstrates -- this is the same patient image with the indium SPECT agent versus gallium-68 DODATOT version. And so, it's quite apparent with the greater resolution and clarity. There's also advantages for the patient in that indium version takes three visits to the clinic in two days, whereas the gallium because of its - to back up. The indium has a half-life of 68 hours versus the gallium that has 68 minutes. So it's imaging -- the injection imaging is all much faster so it takes one visit in one day.

So to have gallium-68, you've got to have germanium-68 for the generator. And I'm going to skip over most of this. This is about the chart tree and how they produce germanium. But it is done here in the U.S. at the two national laboratories. It takes a much bigger machine than what we typically have at commercial grade pharmacies that produce F-18. But this is the generator. Here's the schematic of our -- of the germanium generator -- gallium generator. It looks a lot like a moly generator with technetium. You have your -- where you're eluent goes in, your column, your shielded column. As it passes through it goes through a sterilizing filter, your 0.22-micrometer filter, into your collection vial.

There are differences, of course: the technetium, it's an aluminum column. There's actually three different gallium generators available right now and they use different column materials: titanium dioxide, tin dioxide, one actually has an organic material in its column. The LE1 is different: technetium, of course is 0.9 percent sodium chloride. The gallium generator uses dilute hydrochloric acid to loop the generator. Lifespan: Technetium generator is good for 14 days. The gallium generator can be used for about nine months, so another big advantage for this radionuclide.

The sizes: Technetium generators can range in size from one to 20 curies. And there's a wide range of gallium generates, but those used for human use typically range from 40 to 100 millicuries. Or a way of looking at it, the

largest gallium generator is about one-tenth the size of the smallest technetium generator.

I'm going too fast, sorry. Shielding, with the technetium generator up to about 10 curies, they'll use lead. And they get larger, they'll use depleted uranium versus the gallium generators; lead is sufficient. And disposal's an important difference. Technetium generator, you can hold on to and let the moly decay, and you can disassemble the generator yourself, and dispose of it yourself safely. Whereas, with the gallium generator because the germanium -- apparent half-life of 270 days, it's rather impractical to do that. Plus, most manufacturers, I can't say all, but one's I contacted, do require that if they sell you a gallium generator, they expect you to send it back to them. So the site has no disposal issues, in a sense, for germanium.

This is one example of one of the commercially available generators. And this is from Eckert & Ziegler. I picked it to make our FDA representative the most comfortable. Because it is -- it has recently received pharmaceutical grade approval from the German regulatory there --

MEMBER SULEIMAN: It's not approved by -- it has not been approved by --

MEMBER MATTMULLER: It's not approved by FDA, but it's the closest one getting to that status.

So since we have a generator, we have to be concerned about breakthrough. And breakthrough testing with

this type generator requires some outside of the box thinking. Especially since the germanium decays 100 percent by electron capture, so there's no measureable gamma or x-ray emissions to measure. So you have to do it as we do it now with a strontium rubidium generator, in that you elute the generator, you assay for the rubidium generator -- rubidium activity so then you hold it for decay to let the rubidium decay away, and with its 75 second half-life, it does that pretty quickly and typically you do it for one hour. So that's about 48 half-lives of your rubidium. So then you assay it again. So then your -- any activity you measure is -- you'll be measuring rubidium, but you'll be measuring strontium indirectly because, at that point, if there's any rubidium activity it has to be there only because there's strontium activity. So you measure the strontium indirectly.

Likewise, you have to do it the same way for the gallium generator. With the difference -- the big difference, and this will be unusual for anything else we've used, is that you have to hold it for two days because of the long half -- because of the relatively longer half-life of gallium-68, we have to let it decay away sufficiently so that you have high confidence that any activity that you're measuring at that point is due to germanium breakthrough.

Again, it's not approved in the U.S. but there is -- it hasn't got official approval in Europe either but they -- Europe is ahead of us with use of this radionuclide. They have a proposed limit in the European Pharmacopoeia

that the activity needs to be 99.9 percent pure.

Another important difference with this generator versus current generators we're using now is that the eluent from a technetium generator or a rubidium generator can be used directly into a patient, that as it comes out of the generator, it's safe and good to use on a patient for various studies. With this generator, you can't. It's in a dilute hydrochloric solution, so it's not useful for any imaging procedure at that point. You have to do some chemistry with it. And the best way to do chemistry with a 68-minute half-life radionuclide is quickly. And the best way to do something quickly is with a radiochemical synthesis module.

Here's an example of three different versions that are commercially available and they're computer control pumps to elute the generator so you never have to touch the gallium-68; it goes right to the generator to the reaction vessel. Different reagents come in for repairing your radiopharmaceutical. You can then push it through purification columns, and then finally into your final collection vial.

These are actually very, very similar to what we use in PET now for FDG synthesis. So they're constructed and operated very much the same way. And these mark the images such that you'll never see one like this sitting on a bench some place in a lab. It'll be in a hot cell, behind a lot of lead.

The other important difference from technetium,

but similar to FDG, is that the quality control testing would be a lot more extensive. I have to test the pH, for pyrogens, for sterility. And chemical and radiochemical purity testing would be a lot more involved for a gallium radiopharmaceutical versus the relatively simple radiochemist -- radiochromatography that we do for a technetium rated pharmaceuticals.

Here's another example of gallium imaging. This is with DODATOT, and this also shows where they're at with this imaging modality now, in that there's a fused MR image with the patient. And again, it was acquired quickly, one hour after administration. And they're able to fuse the anatomical information from the MR with the physiological information from the DODATOT.

Dosimetry -- there's another important advantage with gallium versus indium because dosimetry roughly is about one half of the indium radiopharmaceutical.

So gallium-68 is also being used for other receptors besides the somatostatin receptor, although that's the biggest class that's being looked at right now. Here are three other examples of -- for melanoma, patients for angiogenesis, patients with the RGB version, and for prostate for the bombesin.

Now another important advantage, or let me -- advantages for this agent, it's PET, so you have the advantages of coincidence imaging from PET, the convenience of a generator; so you have a long source for your gallium-68, one that can last up to nine months. Plus another

reason these agents have a lot of interest right now is that the chemistry is relatively simple to convert it from a diagnostic agent to a therapeutic agent, and that's what we have here. Here we have the same DOTO type agent, only the only difference is now you have a therapeutic radionuclide, the beta emitter, yttrium-90 in place instead of the gallium-68. So it's the same receptor agent, same amino acid sequence, so it's going to the same receptor, same bifunctional chelator, just a different radionuclide. In fact, this strategy's been in use now in Europe for well over 10 years, so currently U.S. patients who can take advantage of this, if they have the means, are going to Europe for this diagnosis and therapy. It'd be nice to treat those patients here. So, I tell you it's hard to read, it's better up here.

So, this is our issue with our gallium generator, with its parent germanium, is that a DFP -- or excuse me, a decommissioning financial plan gets triggered. And the DFP gets triggered because of the germanium unsealed, has half-life greater than 120 days, and then you have to go to Appendix B to figure it out, your limit, which is this: Appendix B when the limits are in the first column, your microcuries, for some commonly used radionuclides that we use now, and then if you do the math in the appendix, you take that limit, multiply it by 10^5, and then I've converted that to curies so it's a little bit easier to read; so that's the next column, that's the quantity to limit in Appendix B, for the top four radionuclides in curies.

Now the problem with germanium is that it's not listed in Appendix B, and when a radionuclide's not listed in appendix B you go to a default value of 0.1 microcuries, so after you do the math, convert to curies, your limit is 10 millicuries if you want to avoid a DFP; and that's a problem in a lab because our generators need to be from, you know, anywhere from 40 to 100 millicuries, so we can't -- we can't escape that.

Here's another slide that I never intended you to read, but it just gets into the difficulty and complexity of a DFP. And the highlights are they're not cheap, you have to have an independent contractor, that's mandated, and from sites I talked to can run $15,000 to $20,000, you have to revise it, renew it every time you resubmit your license, and the cost for germanium. People were saying you have to have a bond up to $1.1 million.

So the DFPs are costly and burdensome and a real barrier right now. I'll skip through this one pretty quick. Except that to point out they've got some wiggle room to try to make it more palatable, but these tests are difficult for a lot of places to meet; in this case a centralized radio pharmacy would be an ideal place to have this, but then they have to have a net tangible worth of $21million. And that's just to get them away from part of the expense. Hospitals, nonprofit colleges can get a little relief if their bonds are sufficiently high grade, in the A's, but then this is a Moody evaluation of their ratings versus all other public health care finance rating, and it's probably hard to read,

but basically if you draw a line behind where the A's stop, just a little more than one half of all health care facilities have bonds that meet this test.

So the current regulatory status of germanium is hampering its use. I think it's unintentional. I think germanium fell through the regulatory cracks in 2005 when byproduct material was redefined; it's missing from appendix B part 30. DFP is a very onerous and expensive process. It is being used in the states now though, but there's a wide range of experiences by licenses. And most who have had success are at large institutions who have already had a DFP in place. So it was a seamless addition to their program. But for those who don't have a DFP or can't meet the financial test, this is a real barrier to being licensed for germanium. And this is the really tragic part in my mind.

I talked to two licenses that were using the gallium generator before 2005 and then when the new rules and the DFP requirements came into place they had to stop using them, because they couldn't afford to use them anymore.

So my interpretation of how it got lost, how we got into this predicament, and I would suggest perhaps it got lost in translation. I think the scene from Tokyo works well. It's a nice metaphor for the regulatory process. There are a lot of people jostling you around on the streets, bright lights vying for your attention, it's easy to get distracted, with even an occasional dinosaur walking around. For the record, I'm not suggesting anyone here is a

dinosaur, but I have heard comments that late at night in this building you can hear heavy footsteps, but --

[laughter]

We'll move on. So this is collection of three schedules appendices from the regs, and I think we have to dig into this a little bit to try and figure out how or where this went awry. I've said before, starting in 2005 when byproduct material was redefined to basically include everything that's radioactive including, and at that time, you know, an important category was added that of, in essence, material made radioactive by a particle accelerator, which then incorporated the PET radionuclides and germanium. And it was a good change, because prior to that there was a big dichotomy of how the different radioactive material in different labs was handled or regulated. So it was a good change. And it brought all of our material under the purview of the NRC, and so now they're covering everything from U238 with a half-life of 4.4 billion years to rubidium-82 with a half-life of 75 seconds. So they're pretty versatile.

So that was 2005. The first column 30.71 Schedule B to Part 30, this is for exempt quantities of byproduct material. Basically stay under these limits in microcuries and you don't need an NRC license. The next column, Appendix C to Part 20, quantities of licensed material requiring labeling. Again this is in microcuries. Stay under these limits if you've got a 100-microcurie source of -- in a test tube in your lab, if it's 95 microcuries, I

don't have to label it. And then, let's see, let me back up a little bit, Schedule B 30.71, it was last -- if you dig into its history, last amended October 2007, Appendix C last amended April of '95, our problem child, Appendix B -- and again, it has the same title as Appendix C, Quantities of Licensed Material Requiring Labeling; same title, but they are of course referring to different sections of the regulations. And you can look into its history. It was last re-designated in 1993, but last amended in 1980. And I don't want to quibble over re-designation versus amendments, but still, even with 1993, that was a good 12 years before byproduct material was redefined in 2005. I think what's really interesting from this chart is that regardless of the schedule or appendix, you've got the same limits for all the radionuclides, and in fact, if that had just continued into the last one I wouldn't be here, but.

So, I think from a regulatory perspective, I would suggest that maybe it got lost in the translation. So hopefully I've been able to demonstrate quickly the three important points here: vast potential receptor radionuclides; gallium in particular, in that it can create smooth transition from diagnostic radio pharmaceutical, and if you get a diagnostic pharmaceutical to work well, you're going to have a high probability that a therapeutic radio pharmaceutical is going to work, be very effective because of the specificity of the receptor aspect of it.

But we're kind of stuck now; the nuclear medicine community needs relief in the DFP requirements so its use

can grow throughout the U.S. So I'd like to indulge on the committee and put forth a recommendation for the committee to consider regardless of how germanium was or wasn't considered in these appendices. I don't think the NRC ever intended to create such a barrier for this important PET radionuclide. So I'd like to recommend that -- ACMUI recommends that the NRC provide regulatory relief for the DFP requirements for the use of germanium-68/gallium-68 generator, given that there's a good possibility that all this was unintentional, given that the licensees return their generators back to the manufacturer if they're not dispensing any germanium, and given that the burden of the DFP is stifling the use of the radionuclide in nuclear medicine. So what type of relief could this come in the form of? There's the regulatory process, but we all know that that takes many, many years. But would it not be possible for quicker relief through something like an RIS, a regulatory issue summary; and it could contain, you know, restrictive statements such as a site gets a generator, they have to send it back to the manufacturer. If they comply with that the DFP requirement would be waived. Thank you.

CHAIRMAN MALMUD: Thank you. Are their questions for Mr. Mattmuller? Dr. Langhorst.

MEMBER LANGHORST: I have a question first for NRC staff. And are you able to grant an exemption in this case for licensees that would put forth this is the number we think for the germanium-68 generator? Is that a possibility or is that not a possibility in licensing?

MR. EINBERG: I'm going to ask Dr. Howe to address that and see what our options are for regulatory relief.

DR. HOWE: The NRC can grant exemptions. However, the Commission set a policy a number of years ago that we can't regulate by exemptions. So it's easy to grant one -- two exemptions, but if you're talking about a whole industry, then you've got to go through rulemaking. With regards to -- Mr. Mattmuller suggested perhaps a RIS regulatory issue summary would be -- a RIS cannot be used to change policy. It can only be used to explain the regulations. So I don't think that's a viable route. I would think that you would need rulemaking to address the issue permanently. And the question that I have is how common is this right now in the U.S.?

MEMBER MATTMULLER: In the U.S. it's, I believe there's about four or five sites who are using the gallium generator.

DR. HOWE: Under investigational --

MEMBER MATTMULLER: Yes. All under INDs. Yes. But there're -- I do know, my institution and others at this table are also interested in using it. So -- and I breezed over one of the other -- as far as the expense of this, these two sites that I talked to, one's in an NRC state, one's in an agreement state. They both -- their cost estimates were remarkably close. Fifteen to 24 that -- consultant, and then another 20 to 25 for the surety bond to verify that they had the financial assurance, to cover the DFP. So, very expensive for these sites.

MEMBER LANGHORST: Dr. Malmud, I had a second question.

CHAIRMAN MALMUD: Please, Dr. Langhorst.

MEMBER LANGHORST: Thank you. And I don't know if NRC staff can answer, maybe Ms. Bailey can answer. Are there -- do agreement states maybe have this isotope identified in their comparable tables, given that this was always state regulated --

MEMBER BAILEY: They had known before.

MEMBER LANGHORST: Yeah

MEMBER BAILEY: It's possible, but I don't know the compatibility of the chart once NRC -- if it's a compatibility A or B now, that would have --

DR. HOWE: I can answer that, I believe. When we were involved in the rulemaking, we went through and looked very carefully at the state-proposed regulations, especially for the norm side of things, to see if it was something we needed bring into the NRC regulations that it was already over in the agreement state, suggested regulations. And it was nothing identified here.

MEMBER LANGHORST: Okay, thank you.

MEMBER MATTMULLER: I can tell you the Ohio experience is that when you look at that last -- or look at the schedule, instead of multiplying your limit by 10^{5}, in Ohio it gets multiplied by 10^{4}. So actually our limit in Ohio is 10 times more restrictive right now.

CHAIRMAN MALMUD: Dr. Suleiman.

MEMBER SULEIMAN: Clarification. So, if the NRC

or anybody would go back and recalculate, that would involve rulemaking, to see if it fell under this category?

DR. HOWE: Right now NRC considers it's covered in this other category.

MEMBER SULEIMAN: Under the default.

DR. HOWE: And so in order to bring it out of the other category, you would probably have to go through rulemaking, and you'd need a regulatory basis and a lot of information to support it. So it's not -- this is a nice thing to do, you need some more information to support it.

MEMBER SULEIMAN: Another quick question just for Steve. Has anybody labeled it with gallium-67? Which is not as heavy as --

MEMBER MATTMULLER: I'm not aware of, although I don't know if that would give you any more advantages over indium-111, since they're both PET agents.

MEMBER SULEIMAN: I was curious because it's the same, I mean, the same isotope, so...

CHAIRMAN MALMUD: Any questions for Mr. Mattmuller? What would you -- what are you proposing as a result of your presentation, other than --

MEMBER MATTMULLER: I would still like a put forward this recommendation to the NRC staff that --

CHAIRMAN MALMUD: And what is the recommendation precisely?

MEMBER MATTMULLER: That as stated on the screen, ACMUI recommends that the NRC provide regulatory relief for the DFP requirements for the use of the -- excuse me,

germanium-68, gallium-68 generator.

CHAIRMAN MALMUD: That's a motion. Is there a second to that motion?

MEMBER ZANZONICO: Second.

CHAIRMAN MALMUD: Seconded by Dr. Zanzonico. Further comment or discussion? Dr. Suleiman.

MEMBER SULEIMAN: Would it -- rather than provide regulatory relief just address about getting this incorporated into the existing regulatory mechanism. I mean --

MEMBER MATTMULLER: I mean add it into the current 35 revision?

MEMBER LANGHORST: So it's not 35. It's not that.

CHAIRMAN MALMUD: Yeah, yeah.

MEMBER LANGHORST: Separate rule making.

CHAIRMAN MALMUD: Dr. Thomadsen.

VICE CHAIRMAN THOMADSEN: I think that Mr. Mattmuller has made a very good case for this, although I don't feel that just at the end of this presentation that I understand the issues well enough to vote on this, so...

CHAIRMAN MALMUD: Other comments? Mr. McDermott.

MR. MCDERMOTT: As for clarification, when you're interested in regulatory relief and the decommissioning funding plan requirements, are you speaking licensees who would use the unit and would return it to the manufacturer -- the manufacturer would still have their decommissioning requirements. You're just talking about people through licensing or other mechanisms won't actually have to

decommission.

MR. EINBERG: Right.

MEMBER MATTMULLER: Right, and I'd like to think that further research given how the original index was set up, that they had no idea this even existed or would be used in this manner. But there could be a way to find relief.

CHAIRMAN MALMUD: Dr. Suleiman.

MEMBER SULEIMAN: I agree with Dr. Thomadsen's first comment. I think I don't have enough information for myself, but number two, could they lease it? You know, you get the lawyers and the economists. Could they lease it -- would than mean, if a site is leasing it from the manufacturer, does that relieve some of the responsibility for meeting that?

MEMBER BAILEY: It's authorization requirements. If it's authorized on their license then they have the go through the decommissioning.

MEMBER SULEIMAN: So they're still licensed.

MEMBER BAILEY: Yes.

DR. HOWE: NRC and the agreement states regulate the possessions, but we don't get into who owns it.

CHAIRMAN MALMUD: That was Dr. Howe answering Dr. Suleiman's question. Any further discussion? There's a motion on the floor. All in favor?

MULTIPLE SPEAKERS: Aye.

CHAIRMAN MALMUD: One, two, four, six, seven, eight. Any abstentions?

MEMBER SULEIMAN: I abstain.

CHAIRMAN MALMUD: Two, three, four abstentions. And any opposed? It's eight for, four abstentions, no opposition. Thank you, Dr. Mattmuller -- I'm sorry, Mr. Mattmuller. The next item on the agenda was already covered by Sophie. You may have a few other points that you may want to make to us.

MS. HOLIDAY: Yes, sir. I'd like to go over changes to the recommendation chart.

CHAIRMAN MALMUD: Okay, please do.

MS. HOLIDAY: Okay, so I didn't have time to print this just yet, since I just got a final recommendation from Mr. Mattmuller. But I will start with item number 15, from our closed session, we recommended to table the discussion of the amendments to the bylaws the fall 2013 ACMUI meeting, when there's adequate time to review the changes.

The next recommendation was Dr. Langhorst requested NRC staff could add the draft guidance for the draft expanded Part 35 rulemaking into the same docket number as the rule making document, and that if this is not possible she requests that the location or the docket number of the draft guidance be clearly identified in the draft that is the Part 35 rulemaking docket. Ms. Bhalla, of course, did indicate that she's going to check if that's an option for us.

MEMBER LANGHORST: May I add, and you can say vice versa. So if you know the guidance, you want to be able to be pointed to the docket number through the rulemaking too.

MS. HOLIDAY: Certainly. Okay, item 17, ACMUI

plans to hold a summer teleconference to discuss the medical subcommittee analysis of the yttrium-90 microspheres medical events. The dates proposed are June 18th, 2013, from 2:00 to 4:00 p.m. Eastern or backup date of June 20th, 2013 from 2:00 to 4:00 Eastern. Yes, Dr. Welsh.

MEMBER WELSH: Well, for clarification can you who remind us who is on this subcommittee?

MS. HOLIDAY: I believe the members of the subcommittee are yourself, Dr. Langhorst, Dr. Thomadsen, Dr. Suh, I believe is on the medical event subcommittee. We're going to pull up that list for you.

So moving on to item 18, that ACMUI endorsed the Abnormal Occurrence Subcommittee report that was up for approval. Item 19, that ACMUI had planned to hold the fall 2013 ACMUI meeting here at headquarters on September 9th and 10th, 2013, or backup date of the 16th and 17th -- [coughs] -- excuse me. Item 20, and I may not have gotten this right because I was coming in between. I believe Dr. Guiberteau requested that NRC staff provide a link to the abstract that was cited in Ms. Weil's presentation, and so it's --

MR. EINBERG: We will provide that.

MS. HOLIDAY: We will provide that to the full ACMUI. And our last recommendation is that the ACMUI recommended that NRC provide regulatory relief from the decommissioning funding plan requirements for the use of the germanium-68 gallium-68 generator. That was approved on an eight approval basis and four abstentions. Are there any comments?

CHAIRMAN MALMUD: Are there any comments? There are none.

MS. HOLIDAY: Okay. I'd also like to add one clarification. During my presentation for the ViewRay, one of my communication resources I mentioned was the medical listserver. I had the incorrect email address on there. So for the record, if you would like to subscribe to the medical listserver you can send an email to medical, M-E-D-I-C-A-L, dash G-C dot resource at NRC.gov. Dr. Thomadsen.

VICE CHAIRMAN THOMADSEN: In any -- in just some future email to us, would you just include that?

MS. HOLIDAY: Sure. Dr. Malmud, at this time I would like to turn this over to Mr. McDermott.

CHAIRMAN MALMUD: Mr. McDermott.

MR. MCDERMOTT: And one final thing for Dr. Malmud on his departure from the committee as chair, I have a certificate of appreciation here for Dr. Malmud. In recognition of 11 years of service and leadership, the Advisory Committee on the Medical Uses of Isotopes, which resulted in significant contributions to the work of the U.S. Nuclear Regulatory Commission, we greatly appreciate your service and advice.

CHAIRMAN MALMUD: Thank you Mr. McDermott --

[applause]

CHAIRMAN MALMUD: Thank you all. I will be very brief and just say that I've been practicing for 40 years, and this has been one of the most enjoyable experiences that I've had in working with such a diverse group of talented

individuals, both those who have been on the committee and rotated through and those who are here today. It's unusual to be able to exchange information with other disciplines in a collegial fashion. I also want to thank the individuals who served as the communicator between the NRC and this committee, and that dates back Angela McIntosh, Mohammad Saba, and then of course Ashley Cockerham and Sophie Holiday; they have all been a tremendous asset to us. And I want to thank the NRC staff who really are most helpful, most knowledgeable, and really have worked to try to assist us in working within the regulations in order to effect the changes that we think are necessary with implementations for optimal patient care and the public safety. And sometimes it's very frustrating working within the framework, but the staff here has been very, very helpful. And even legal, which usually is a roadblock --

[laughter]

-- has offered constructive advice to us. And we thank NRC legal as well for being most collaborative in circumstances which are always almost confrontational and yet we manage to resolve them between the NRC staff, the legal advice, and the desire of this committee with respect to the patient and public welfare. So it's just been a wonderful experience for me, and I appreciate very much and I thank all of you.

[applause]

And I will turn the leadership over to Dr. Thomadsen, who has graciously accepted the chairmanship, and

complementing him will be Dr. Guiberteau as the vice chair. And you're in good hands. Thank you all. Have a safe trip home.

[applause]

[whereupon, the proceedings were concluded at 12:30pm]