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NUCLEAR REGULATORY COMMISSION

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ADVISORY COMMITTEE ON THE MEDICAL USES OF ISOTOPES

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TELECONFERENCE

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MONDAY,

MARCH 30, 2020

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The meeting was convened by teleconference, at 9:30 a.m., Dr. Darlene F. Metter, ACMUI Chairman, presiding.

MEMBERS PRESENT:

DARLENE F. METTER, M.D., Chairman

A. ROBERT SCHLEIPMAN, Ph.D., Vice Chairman

GARY BLOOM, Member

VASKEN DILSIZIAN, M.D., Member

RONALD D. ENNIS, M.D., Member

RICHARD L. GREEN, Member

HOSSEIN JADVAR, Member

MELISSA C. MARTIN, Member

MICHAEL D. O'HARA, Ph.D., Member

ZOUBIR OUHIB, Member

MICHAEL SHEETZ, Member

MEGAN L. SHOBER, Member

HARVEY B. WOLKOV, M.D., Member

DESIGNATED FEDERAL OFFICERS:

CHRISTIAN EINBERG, Chief, Medical Safety and Events Assessment Branch (MSEB)

LISA DIMMICK, Medical Radiation Safety Team Leader, NMSS/MSST/MSEB

KELLEE JAMERSON, ACMUI Coordinator

NRC STAFF PRESENT:

KEVIN WILLIAMS, Deputy Director, Division of Materials Safety, Security, State, and Tribal Programs (MSST)

MARYANN AYOADE, NMSS/MSST/MSEB

SAID DAIBES, Ph.D., NMSS/MSST/MSEB

DANIEL DIMARCO, NMSS/MSST/MSEB

JASON DRAPER, NMSS/MSST/MSEB

ROBIN ELLIOTT, NMSS/MSST/MSEB

JENNIFER FISHER, NMSS/MSST/MSEB

SARA FORSTER, NMSS/MSST/MSEB

ROBERT GALLAGHAR, R-I/DNMS/MLAB

ANITA GRAY, Ph.D., NMSS/MSST/SMPB

VINCENT HOLAHAN, NMSS/MSST

ESTHER HOUSEMAN, OGC/GCLR/RMR

DONNA-BETH HOWE, Ph.D., NMSS/MSST/MSEB

IAN IRVIN, OGC/GCLR/RMR

JANELLE JESSIE, COMM/OCMJB

PENNY LANZISERA, R-I/DNMS/MLAB

SARAH LOPAS, NMSS/MSST/MSEB

KATHY MODES, NMSS/MSST/SLPB

JANICE NGUYEN, R-I/DNMS/MLAB

DENNIS O'DOWD, R-III/DNMS/MIB

SHAWN SEELEY, R-I/DNMS/MLAB

VERED SHAFFER, RES/DSA/RPB

ZAHID SULAIMAN, R-III/DNMS/MIB

ROBERT SUN, NMSS/MSST/MSEB

KATIE TAPP, Ph.D., NMSS/MSST/MSEB

IRENE WU, NMSS/MSST/MSEB

MEMBERS OF THE PUBLIC:

JENNA ABBOTT, Illinois Emergency Management Agency

SUKHJEET AHUJA, Society of Nuclear Medicine and Molecular Imaging

REX AYERS, Northwest Medical Physics Center

JAMIE BARNES, Cook Children's Medical Center

AMY BOLAR, Illinois Emergency Management Agency

KEITH BROWN, University of Pennsylvania

MARY BURKHART, Illinois Emergency Management Agency

ASHLEY COCKERHAM, Mercurie Consulting

LELAND COGLIANI, Unaffiliated

SUSAN COREY, Cook Children's Medical Center

ELAINE CRESCENZI, Pennsylvania Department of Environmental Protection

DAVID CROWLEY, North Carolina Department of Health and Human Services, Radiation Protection Section

MATT DENNIS, CRD Associates, LLC

TERRI DODSON, Illinois Emergency Management Agency

ARIEL DOUCET, Virtua Health

ADAM EKSTEDT, Illinois Emergency Management Agency

BRIAN ERASMUS, Boston Scientific

KELSEY EVERETT, University of Pennsylvania

LYNN FAIROBENT, Unaffiliated

LISA FORNEY, Pennsylvania Department of Environmental Protection

JORDAN FRENGUT, Unaffiliated

MIKE FULLER, Virginia Department of Health

SANDY GABRIEL, Unaffiliated

DEBBIE GILLEY, International Atomic Energy

Agency

MIGUEL de la GUARDIA, Cooks Children's Medical Center

GARY HALL, Fort Bragg Department of Public Health

MATTHEW HALL, Sirtex

STANLEY HAMPTON, Eli Lilly

MEG HARKINS, University of Pennsylvania

JAMES HARVEY, NorthStar Medical Radioisotopes

DANIEL HILL, Cardinal Health

JAMES HIRN, Illinois Emergency Management Agency

MARY ELLEN JAFARI, Gundersen Health

JANELLE JESIKIEWICZ, University of Pennsylvania

JOSH KNOWLAND, Lucerno Dynamics

TODD LAFRENZE, Illinois Emergency Management Agency

RON LATTANZE, Lucerno Dynamics

GEORGIA LAWRENCE, American Society of Nuclear Cardiology

RALPH LIETO, St. Joseph Mercy Health System

WILLIAM LORENZEN, Boston Children's Hospital

CAROL MARCUS, Ph.D., M.D., University of California at Los Angeles

RICHARD MARTIN, American Association of Physicists in Medicine

JEFFREY MASON, Department of Veterans Affairs

CANDI MCDOWELL, University of Pennsylvania

THOMAS MOHAUPT, NorthStar Medical Radioisotopes

VANESSA MONGEON, Boston Scientific

TOM NAMSA, BWX Technologies

JON NEUHOFF, U.S. Department of Energy, Isotope Program

RICHARD PEROS, New Jersey Department of Environmental Protection

MICHAEL PETERS, American College of Radiology

DERON ROBBINS, Illinois Emergency Management Agency

GRACE SCHOENIGER, Pennsylvania Department of Environmental Protection

KATIE SCOTT, Pennsylvania Department of Environmental Protection

DIANA THOMPSON, Sirtex

CINDY TOMLINSON, American Society for Radiation Oncology

GIBB VINSON, Illinois Emergency Management Agency

KARAMDEEP VIRK, Illinois Emergency Management Agency

JOSEPH WISSING, St. Joseph Mercy Health System

MELONIE WISSING, Department of Veterans Affairs

C-O-N-T-E-N-T-S

P R O C E E D I N G S

9:30 a.m.

OPERATOR: Welcome and thank you for standing by. For today's call, I'd like to inform all parties that your line has been placed in listen-only mode until the question-answer session of today's conference. It is now my pleasure to turn the call over to Dr. Metter. Thank you, and you may begin.

CHAIR METTER: Thank you very much. Good morning, and welcome to the Spring 2020 ACMUI meeting. At this time, I would like to thank the NRC and ACMUI for their flexibility during these very challenging times and for your commitment to continue the Committee's work for our patients and for the public.

At this time, I would also like to acknowledge all the dedicated workers in our country and our health care professionals in taking care of patients, even at the risk of their own health. So please join me in taking a moment of silence for those lost and those currently dealing with the COVID-19 disease. Thank you.

Since we are on a conference call, please remember to state your name before speaking. And at this time, I would like to turn the meeting over to Mr. Chris Einberg who will now open the meeting,

followed by Mr. Kevin Williams with some other opening remarks. Mr. Einberg.

MR. EINBERG: Thank you, Dr. Metter. As the Designated Federal Officer for this meeting, I'm pleased to welcome you to this public meeting of the Advisory Committee on the Medical Uses of Isotopes.

My name is Chris Einberg. I'm the Branch Chief of the Medical Safety and Events Assessment Branch and I have been designated as the federal officer for this Advisory Committee in accordance with 10 CFR Part 7.11.

Present today we have Lisa Dimmick, our Medical Radiation Safety Team Leader, and Kellee Jamerson, our ACMUI Coordinator, as Designated Federal Officers for the ACMUI.

This is an announced meeting of the Committee. It is being held in accordance with the rules and regulations of the Federal Advisory Committee Act and the Nuclear Regulatory Commission. This meeting is being transcribed by the NRC and may also be transcribed or recorded by others. The meeting was initially announced in the February 19th, 2020 edition of the Federal Register, Volume 85, page 9484.

The function of the Committee is to advise

the staff on issues and questions that arise under medical use of byproduct material. The Committee provides counsel to many staff but does not determine nor direct the actual decisions of the staff or the Commission. The NRC solicits the views of the Committee and values their opinions.

I request that whenever possible, we try to reach a consensus on the various issues that will be discussed today but I also recognize there may be minority or dissenting views. If you have such opinions, please allow them to be read into the record.

At this point, I would like to perform a roll call of the ACMUI members participating today. Dr. Darlene Metter, Chairman, Diagnostic Radiologist.

CHAIR METTER: Present.

MR. EINBERG: Dr. Robert Schleipman, Vice Chairman, Health Care Administrator.

VICE CHAIR SCHLEIPMAN: Present.

CHAIR METTER: Mr. Gary Bloom, Patients' Rights Advocate.

MEMBER BLOOM: Present.

MR. EINBERG: Dr. Vasken Dilsizian, Nuclear Cardiologist.

MEMBER DILSIZIAN: Present.

MR. EINBERG: Dr. Ronald Ennis, Radiation Oncologist.

MEMBER ENNIS: Present.

MR. EINBERG: Mr. Richard Green, Nuclear Pharmacist.

MEMBER GREEN: Present.

MR. EINBERG: Dr. Hossein Jadvar, Nuclear Medicine Physician.

MEMBER JADVAR: Present.

MR. EINBERG: Ms. Melissa Martin, Nuclear Medicine Physicist.

MEMBER MARTIN: Present.

MR. EINBERG: Dr. Michael O'Hara, FDA Representative.

MEMBER O'HARA: Present.

MR. EINBERG: Mr. Zoubir Ouhib, Radiation Therapy Physicist.

MEMBER OUHIB: Present.

MR. EINBERG: Mr. Michael Sheetz, Radiation Safety Officer.

MEMBER SHEETZ: Present.

MR. EINBERG: Ms. Megan Shober, State Government Representative.

MEMBER SHOBER: Present.

MR. EINBERG: Dr. Harvey Wolkov, Radiation

Oncologist.

MEMBER WOLKOV: Present.

MR. EINBERG: I confirm that there is a quorum. All members are in attendance. All members of the ACMUI are subject to federal ethics laws and regulations. They must receive annual training on these requirements.

If a member believes that he or she may have a conflict of interest, as that term is broadly used within 5 CFR Part 2635 regarding an agenda item to be addressed by the ACMUI, this member should divulge it to the Chair and the DFO as soon as possible before the ACMUI discusses it as an agenda item.

ACMUI members must recuse themselves from participating in any agenda item for which they have a conflict of interest unless they received a waiver of prior authorization from the appropriate NRC official.

I now ask that NRC staff members who are participating to identify themselves. So, who do we have on the line from the NRC?

DR. HOWE: Dr. Donna-Beth Howe.

MR. DAIBES: Dr. Said Daibes.

MR. EINBERG: And Dr. Daibes. Who else?

MS. TAPP: Dr. Katie Tapp.

MR. WILLIAMS: Kevin Williams.

(Simultaneous speaking.)

MR. EINBERG: Kellee Jamerson and Lisa Dimmick.

(Simultaneous speaking.)

MS. HOUSEMAN: Esther Houseman -- from the Office of General Counsel.

MR. EINBERG: Very good. Thank you. Members of the public who notified Ms. Jamerson that they would be participating on the teleconference or registered for WebEx will be captured in the transcript.

For those of you who did not provide prior notification, please contact Ms. Jamerson at kellee.jamerson@nrc.gov -- that's K-E-L-L-E-E, dot, J-A-M-E-R-S-O-N, at NRC dot gov -- at the conclusion of this meeting.

We are utilizing a bridge line for today's meeting. And the phone number that participants use is 888-790-2022. The passcode to access this bridge line for members of the public is 1893028#.

This meeting is also using the WebEx application to view presentation handouts in real time. And you can access this by going to https://usnrc.webex.com and joining the event which is

#901274268, 901274268. The handouts and agenda for this meeting are available on the NRC's ACMUI Meetings and Other Related Documents Public Web page.

For the purpose of this meeting, the chat feature in WebEx has been disabled. Dr. Metter, at her option, may entertain comments or questions from members of the public who are participating with us today.

Individuals who would like to ask a question or make a comment regarding a specific topic the Committee has discussed should dial *1 to signal the operator that you wish to speak. Comments and questions are typically addressed by the Committee at the end of the presentation after the Committee has fully discussed the topic.

We ask that you please clearly state your first and last name for the record. We will notify the operator when we are ready for the public comment period of the meeting. At this time, I'd ask everyone on the call who is not speaking to place their phones on mute. If you do not have the capability to mute your phone, please press *6 to utilize the conference line mute and unmute functions.

I would also ask everyone to exercise extreme care to ensure that the background noise is

kept at a minimum as any stray background sounds can be very disruptive on a conference call this large. At this point, I would like to turn the meeting over to Mr. Kevin Williams, Deputy Director of the Division of Materials Safety, Security, State, and Tribal Programs for some opening remarks. Mr. Williams.

MR. WILLIAMS: Thank you, Chris. First of all, I'd like to welcome everyone to the ACMUI Spring 2020 meeting. As Chris stated, my name is Kevin Williams. I am the Deputy Division Director of the Division of Materials Safety, Security, State, and Tribal Programs.

I'd like to thank ACMUI for all the hard work and support to the NRC. We truly value your contribution, knowledge, and expertise. Considering the continuously evolving situation regarding COVID-19, and following directives to minimize face-to-face interaction, we had to adjust this meeting to a teleconference and WebEx format. I want to thank the ACMUI for being receptive to the idea and accommodating on such a short notice.

Additionally, the ACMUI meeting with the Commission initially scheduled for March 31st has been postponed. The staff is currently working to schedule a new date in the summer. More information will be

provided once this date is confirmed.

I would now like to highlight a few items that may be of interest to ACMUI and the meeting attendants. In regard to Commission-related activities, on January 13th of this year, the staff submitted a notation vote paper to the Commission providing a rulemaking plan to revise the training and experience, also referred to as T&E, requirements for the use of unsealed byproduct material in 10 CFR Part 35. The Commission is still deliberating on this topic.

To address a few NRC staff activities, the emergency -- emerging technology rulemaking, the staff is developing a rulemaking plan which will consist of a SECY paper with assistance from a working group that includes a representative from the Agreement States, NRC Region I, and the NRC rulemaking staff.

The plan will discuss rulemaking options that would codify licensing requirements for some or all of the 10 CFR Part 35.1000, emerging medical technologies into existing or new subparts of Part 35. The ACMUI will receive a courtesy copy of the rulemaking plan in May, and the staff expects to deliver the plan to the Commission this summer.

Evaluating extravasation. The ACMUI

subcommittee provided a recommendation on extravasations and infiltrations at the September 2019 meeting. Currently the NRC staff is conducting an independent evaluation and providing a status report to Congress -- and provided, sorry, a status report to Congress on March 17th, 2020.

Phase 2 revision of Regulatory Guide 8.39. The process for the Phase 2 revision to Regulatory Guide 8.39, which is the Release of Patients Administered Radioactive Material, began in October of 2019. Phase 2 will update the dosimetric equations, methodology, and tables used to calculate those to members of the public from released patients.

Activity since the ACMUI Fall 2019 meeting. The ACMUI recently held a public teleconference meeting on March 11th, 2020 to discuss the subcommittee's final recommendations on the final draft of Phase 1, a revision to Regulatory Guide 8.39.

The subcommittee provided for consideration a number of specific comments and recommendations for patient instruction and emphasized the important precautions to reduce or avoid external radiation exposure from the patient. I'd like to thank the subcommittee for their efforts, the staff expect to issue, Regulatory Guide 8.39, Revision 1

which incorporates Phase 1 in April of 2020.

Some organizational changes, this has been deferred. But I will be going to -- on a rotational assignment to NRC's Region I after we -- I think we get to a point where we have resolved or we're on a path to resolve the COVID-19 issues. And we're working to find a backfill for my position.

Meeting items of high interest. The ACMUI subcommittee has been working hard, and there are several subcommittee reports of interest that will be discussed today.

Mr. Sheetz will discuss the subcommittee's thoughts and recommendations regarding the definition of patient intervention and other actions exclusive of medical events. Ms. Shober will discuss the subcommittee's thoughts and recommendations on the need for an interventional radiologist representative on the ACMUI. Dr. Wolkov will discuss the subcommittee's recommendations for changes to the ACMUI bylaws.

That concludes my opening remarks, and I'll turn the meeting back to Dr. Metter.

CHAIR METTER: Thank you, Mr. Einberg and Mr. Williams. Now on the agenda I have old business. And Ms. Kellee Jamerson will be presenting this

session.

MS. JAMERSON: Thank you, Dr. Metter. Give me one second and I will switch screens. So, for old business, as of our fall meeting and even going back to the spring, the staff has made a significant effort in resolving some of the ACMUI recommendations and action items dating back to 2007.

So now we are at a point to where we have gotten to 2017. And I just want to state for the record what you see on the screen, there is a difference from what was provided in the meeting material. I inadvertently omitted Item No. 14 from the 2017 chart.

So, we will begin with Item 14. And so, this recommendation of the ACMUI relates to reported medical events as required. There were four conditions that were proposed as part of the recommendation.

And this was discussed in the December 2nd, 2019 staff response memo. And from the fall meeting, staff did not agree with the recommendations for the licensees to use a patient safety organization as a substitute or supplement for the current medical event reporting process. And so, at that time, the staff did not accept Conditions 2, 3 and 4 of this

recommendation.

The staff determined after exploring other -- whether information could be redacted from event notifications. The staff determined that existing event redaction processes only applied to personally identifiable information and security-related information. So as presented in the December 2nd response memo, this recommendation was not accepted, and the staff, for this reason, recommends closing this item.

For Item No. 20, this was regarding the ACMUI's endorsement of the Medical Event Reporting and Impact on Medical Licensee Patient Safety Culture Draft Report. As discussed during the fall meeting, Dr. Palestro formed a subcommittee to clarify patient intervention and other actions and circumstances exclusive of medical events.

And so the subcommittee -- that subcommittee, the Patient Intervention Subcommittee, is expected to present a report today. And so for this reason, the NRC staff recommends that this item be closed.

I will move to 2018. For Item No. 1, the ACMUI recommended that there be no breastfeeding cessation for these particular values. And this was

captured in the Phase 1 Regulatory Guide 8.39 update.

And as noted in the August 23rd response memo, it was noted there that this would be captured in the update and that the staff was proposing to close this item with the anticipated completion of the update, which is scheduled for April 2020. So you'll see here is that we have accepted this and propose to close with a target completion date of April when the Regulatory Guide is issued.

For Item No. 20, the Committee recommended for the NRC to draft an information notice on the best practices that could prevent medical events. And as noted in the December 2nd response memo, IN-19-07, Methods to Prevent Medical Events, was published on August 26th. And for this reason, the NRC recommends that this item be closed.

For items -- so this begins our 2019 list of recommendations and action items. Some you will see some as open, and there's some notations at the bottom. But these items are open pending your approval and decision to close these items at this meeting, so after our discussion of this.

For number one, the ACMUI recommended -- for Items 1 and 2, the ACMUI -- this is related to the Training and Experience Requirements for All

Modalities. The subcommittee report regarding the Committee's desire to work with the staff to develop a curriculum for limited-scope Authorized User and the recommendations included in that report. And so those items were addressed in a February 27th memo related to Training and Experience.

And these items, the staff did partially accept some of the items notated in the report. And some were partially accepted per the notation paper, the SECY paper that was issued. And so for this, the staff recommends that these items be closed.

For Item No. 3, the ACMUI endorsed the Yttrium-90 Microspheres Brachytherapy Licensing Guidance, Rev. 10 Subcommittee Report, and the recommendations provided therein. This was also -- this licensing guidance has been issued as of December 16th. And so with this, the NRC staff also recommends that this item be closed.

For Item No. 4, Dr. Palestro formed a subcommittee to reevaluate the 1980 infiltration decision and report to the Committee at the fall 2019 meeting. So we know that that Committee did provide the report at the fall meeting.

And so the staff has accepted this and proposed to close this. As Mr. Williams noted, the

staff is conducting its own independent evaluation. And we expect to have more information regarding this.

For Item No. 5, the ACMUI endorsed the Germanium/Gallium Generator Licensing Guidance Subcommittee Report. And this was also one of the items that we discussed at our fall meeting. But it was accepted and closed with the germanium guidance that was issued in August of 2019.

So Nos. 6, 7, 8, 9 are items that were previously discussed, accepted, and closed; those items related to the bylaws, changes to the bylaws regarding the Chair's role on subcommittees, the presentation from NNSA, amending the opening remarks, and recommending the column be added to the action chart. So those items have been incorporated since our spring 2019 meeting.

For Item No. 10, Dr. Palestro formed a subcommittee to improve the ACMUI's institutional memory. So, this has been accepted and closed, and we heard from the subcommittee in September at the fall meeting. And also Item 11, the meeting occurred in September. For Item No. 12, 13, and 14, those items as wells occurred at the fall meeting.

Beginning with No. 15, the ACMUI amended the membership of the Training and Experience

Requirements Subcommittee. And this has been accepted. And the NRC recommends that this item be closed. This was also captured on the NRC's subcommittee, ACMUI subcommittee website.

No. 16, the ACMUI endorsed the Medical Events Subcommittee Report as presented. And this was also captured. The final report was captured and finalized on the ACMUI Subcommittee Report's website. So the NRC recommends that this item be closed as well.

The ACMUI endorsed the Appropriateness of Medical Event Reporting Subcommittee report and the recommendations. For this item, this has been accepted and you will hear Mr. Robert Sun on what the staff is doing to address the recommendations.

For No. 18, the ACMUI endorsed the Evaluation of Extravasations Subcommittee Report as amended. And as noted, this one has been accepted and the staff is currently conducting an independent evaluation.

No. 19, the ACMUI endorsed the Xcision GammaPod Licensing Guidance Report, as amended, to include these rationales. And this was also the subject of a response memo dated February 26th. This GammaPod licensing guidance has been issued. And for

this, the NRC staff recommends that we close this item.

For Item No. 20, the ACMUI endorsed the Institutional Memory Subcommittee Report, as amended, to include the recommendation that a complete list of ACMUI members be updated and added to the Web page. This item was accepted, and after some research on the page, it was determined that the listing dated back to I believe the late '80s. It's up to date. Members are added to the list as they are rotated off of the Committee.

The list was recently updated to include Dr. Chris Palestro and Ms. Laura Weil as they were the most recent Committee members to rotate off. And so this -- with this, the NRC recommends that this item be closed as well.

For Item 21, Dr. Palestro formed a subcommittee to evaluate the definition of patient intervention. So, for 21 and 22, the patient intervention and the bylaws subcommittee, we will hear from them today regarding their subcommittee's proposed comments and recommendations. And so for this, the NRC recommends that these items be closed.

And also for Item 23, the Interventional Radiologist Subcommittee, we will hear from this

subcommittee today. The NRC accepted this, and it remains open pending the formal closure by the ACMUI today.

Also for Item No. 24, we are conducting this meeting today. So we propose to close this item as well. And for Item 25, the ACMUI endorsed the Training and Experience Requirements Subcommittee Report and the recommendations. This was from the October 17th, 2019 teleconference. And the staff's responses to the recommendations were provided in a February 27th memo.

And lastly 2020 for the ACMUI chart, this one is our most recent addition. So it will remain open pending the issuance of the Reg Guide 8.39, Revision 1, Phase 1 update. And this concludes the old business chart.

CHAIR METTER: Thank you, Kellee, for the review of all the business back to 2017 to the current time. Are there any comments from the Committee regarding any of these items or questions?

MEMBER OUHIB: This is Zoubir. Just for the record, on the Yttrium-90, I thought I had heard the date as being December 2016. Just to check the record to make sure that that's December 16th, 2019. It's stated correctly on the slide. But I just want

to make sure the record is correct also.

CHAIR METTER: Yes. You are correct. I believe that's what happened and thank you for the correction. Any other comments or questions from the Committee? Okay. Hearing none, the next section deals with the open forum.

MS. JAMERSON: One thing, Dr. Metter. So, do we have a motion from the Committee to close the items?

CHAIR METTER: Thank you, Kellee. Do I have a motion from the Committee to close the items that were suggested for closure by the NRC staff?

MEMBER WOLKOV: This is Harvey Wolkov. Move for closure.

CHAIR METTER: Do I have a second?

MEMBER MARTIN: This is Melissa Martin. Second.

CHAIR METTER: Thank you. Any discussion?

(No audible response.)

CHAIR METTER: All in favor?

(Chorus of aye.)

CHAIR METTER: And any opposed?

(No audible response.)

CHAIR METTER: Any abstained?

(No audible response.)

CHAIR METTER: And Ms. Jamerson, it looks like it's unanimous approval of the closure for your report. Thank you very much.

MS. JAMERSON: Thank you.

CHAIR METTER: So, our next item on the agenda is our open forum. And does anybody on ACMUI have any topics, some medical topics of interest for further discussion?

(No audible response.)

CHAIR METTER: I do have an item that I would like to discuss. I would like to form a new subcommittee with the charge. Because of the current COVID-19 pandemic occurring, the staff and I would like to have a charge for a new subcommittee to review the impact on the medical community of the COVID-19 pandemic to prepare the NRC for any potential future regulatory impacts affecting the regulation of the medical uses of radioactive material while protecting the public's health and safety.

And for this new subcommittee, I would like Dr. Hossein Jadvar to be the Chair as the nuclear medicine physician. Members of the subcommittee, I'd like to include Dr. Vasken Dilsizian as a nuclear cardiologist, Dr. Harvey Wolkov as radiation oncologist, Ms. Melissa Martin as the nuclear medicine

physicist, Mr. Richard Green as the nuclear pharmacist, and Ms. Megan Shober as the Agreement State Representative. And I'd like to also have a subcommittee consultant to be Mr. Gary Bloom as the patient advocate.

Do I have any questions or comments on this new subcommittee?

MEMBER JADVAR: Darlene, I still have not completely gone through my security clearance. I just wanted to let you know that.

CHAIR METTER: Okay. Thank you. Mr. Einberg, can you kind of help clarify that position for Dr. Jadvar? And if that is still --

(Simultaneous speaking.)

MR. EINBERG: Yeah, go ahead, Kellee.

MS. JAMERSON: Dr. Metter, this is Kellee. So, Dr. Jadvar has been granted his 145(b)-employment waiver. So, he is cleared to perform work for the ACMUI.

MEMBER JADVAR: Oh, okay. I didn't know that. Thank you.

CHAIR METTER: Thank you, Kellee, and thank you, Mr. Einberg. Okay, good. Dr. Jadvar, if you don't mind being Chair of this new subcommittee, I'd really appreciate that.

MEMBER JADVAR: Sure. No problem.

CHAIR METTER: Thank you.

MEMBER OUHIB: Dr. Metter, this is Zoubir.

CHAIR METTER: Yes.

MEMBER OUHIB: As the Chair of the Brachytherapy Subcommittee within the AAPM, we are having a heavy discussion on all this. And unless the subcommittee is completely full, I would love to serve on that because there are several items that have been raised. That would present the therapy component which I think is essential.

MEMBER JADVAR: Excellent.

CHAIR METTER: Okay. Mr. Einberg, is that -- can they add another member to the Committee?

MR. EINBERG: So historically, the committees we've kept to six, less than half of the full committee. So I would recommend that -- Mr. Ouhib, that perhaps serve as a consultant. He can participate, but we limit the voting members to six on the subcommittee. That's acceptable.

CHAIR METTER: Mr. Ouhib, would that be acceptable? You'd still be participating.

MEMBER OUHIB: That would be fine. I just want to make sure there's a good representation from the radiation therapy physics side.

CHAIR METTER: Yes, yes. Thank you for your comments. And yes, we'd love to have you as a consultant on the Committee. Do I have any other comments regarding this new subcommittee?

(No audible response.)

CHAIR METTER: Okay. So --

MEMBER GREEN: Dr. Metter, this is Richard --

(Simultaneous speaking.)

MEMBER GREEN: Was there an identified NRC resource?

CHAIR METTER: Oh, I'm sorry. Thank you, Mr. Green. Mr. Einberg, may I have a resource person from the NRC?

MR. EINBERG: For this subcommittee, the resource will be -- we'll put down Lisa Dimmick as the resource for the time being.

CHAIR METTER: Okay. Thank you very much. And thank you, Mr. Green, for that suggestion. I have another person that had a question?

(No audible response.)

CHAIR METTER: Okay. Hearing none, any other comments before we start Dr. Jadvar's presentation?

VICE CHAIR SCHLEIPMAN: Hello. It's

Robert Schleipman.

CHAIR METTER: Yes.

VICE CHAIR SCHLEIPMAN: I'm not sure if it's now or later that we should do this. But since we're speaking of subcommittee membership revisions, as part of the T&E Subcommittee, I would also invite Dr. Jadvar to share his nuclear medicine and didactic training experience. I think it would be a very valuable resource to that subcommittee as well.

CHAIR METTER: Yes. Would that be -- how many members do you have on your Committee right now?

VICE CHAIR SCHLEIPMAN: That would, again, push us over six. And so possibly because we're principally focused on clinical and didactic training and practice and so forth, perhaps if he wouldn't mind, Mr. Gary Bloom could become, as well again, a patient safety consultant and that the full-time members would be those who are actually involved in clinical training.

CHAIR METTER: That sounds reasonable, and it makes sense. Would that be all right with you, Mr. Bloom?

MEMBER BLOOM: Yes, that makes sense to me as well. Thank you.

CHAIR METTER: Thank you, Mr. Bloom.

MR. EINBERG: And this is Chris Einberg. I just want to make it clear. If any of the consultants do have any dissenting opinions, I would expect from an NRC staff perspective that any dissenting opinions would be incorporated into the subcommittee reports as well.

So just because the person is not a full subcommittee member, but if they do have any dissenting views, we would certainly want to capture those and understand those from the NRC staff perspective.

CHAIR METTER: Thank you. Do I have any other comments or suggestions about subcommittees, either current or future?

(No audible response.)

CHAIR METTER: Okay. Hearing none, let's go onto the next item which is Dr. Hossein Jadvar will be presenting a presentation on trends in radiopharmaceuticals. Dr. Jadvar.

MEMBER JADVAR: Thank you, Dr. Metter. So good morning, everyone. I was asked to give a brief presentation on what we may expect as far as novel radiopharmaceuticals over the next few years. So can I have Slide No. 2, please?

So this is the outline of my presentation.

I will go over some of the recent approvals over the past decade to kind of get a feeling what the trend is. And then for the emerging tracers, I divided them up into various clinical scenarios including neuropsychiatric, cardiac, and then of course oncologic and theranostics. And then I close with a summary slide. Can I have the next slide, please?

So here is the recent approvals over the almost past decade that we can see. Back in 2012, the florbetapir which is marketed as Amyvid was the first amyloid-based tracer -- PET tracer that was approved by the FDA.

Essentially, and then, of course, that was followed in 2013 and '14 by two more relatively similar amyloid-based PET agents. These are basically imaging-based bioassays of the presence or absence of amyloids in the brain, which is relevant in a number of different neurologic and neurodegenerative diseases including Alzheimer's disease.

In 2012, under oncology, C-11 choline was approved for imaging of patients, the biochemical recurrence of prostate cancer. And then later on in 2013, we saw the very first alpha emitter-based treatment which was Radium-223. It's the calcium mimetic marketed as Xofigo for use in a patient with

metastatic cancer and prostate cancer who have no visceral metastasis but could have some nodal metastasis. But basically, these are for patients with extensive metastatic disease in the group of prostate cancer.

In 2016, we saw the second tracer that was designed for looking at imaging patients with biochemical recurrence of prostate cancer, 18-F fluciclovine marketed as Axumin. Fluciclovine is a synthetic amino acid. It's a leucine analog.

And basically, with fluciclovine, you're able to look at the amino acid metabolism of the various cancers. In this case, prostate cancer. But there is also research being conducted to extend that indication to other disease processes including glioblastoma multiforme in basically brain cancer.

In the same year, Gallium-68 Dotatate was FDA approved. It's marketed as Netspot. This is for, again, an imaging-based bioassay for somatostatin receptors in patients with neuroendocrine tumors.

And soon after that in 2018, there was an FDA approval for Lutetium-177 Dotatate which is the theranostic pair to the Gallium-68 Dotatate. So the Lutathera is used if the patient is shown to have relatively robust somatostatin receptor expression in

the tumors and are not surgical candidates. So in that case, the Lutetium-177 for the beta-emitter could be used for radionuclide -- targeted radionuclide therapy of this patient.

So this Lutetium-177 Gallium-68 Dotatate basically forms the second major theranostic in the history of nuclear medicine. As you know, the first one was, of course, radioiodine for treatment of thyroid diseases which goes with the history that goes back almost 75 years now.

The next tracer that was applicable in 2018 was Azedra which is the l-lobenguane which is basically a neural epinephrine amyloid. And this is being used for treatment -- beta particle treatment of patients with pheochromocytoma or paragangliomas.

And again, it is also in a sense theranostic there because you can use the diagnostic tools to make sure that the target is available before the patients are treated with Azedra.

And finally, last year, we had fluorodopa. That was approved again for neuroendocrine tumors and other tumors. And then Gallium-68 Dotatoc which is very similar to Dotatate again for bioassay of somatostatin receptor. And may I have the next slide please?

So, what I'm going to do is just relatively quickly go over some of the novel tracers that we may expect over the next few years. Under cardiovascular, there's a lot of interest and excitement regarding Flurpiridaz. The biological target for this is Mitochondrial complex 1, MC-1, which is, of course, in abundance in mitochondrial cells.

There was a Phase 3 clinical trial back in 2015 that included almost 800 patients. The Flurpiridaz PET CT at that time was being compared to myocardial perfusion imaging and coronary angiography as the standard of reference.

And although the clinical trials showed that the Flurpiridaz had a higher sensitivity than SPECT, myocardial perfusion imaging, especially in patients who are females or obese. But it did not meet the non-inferiority threshold for specificity in comparison to typical SPECT MPI. Therefore, it was not approved at that time.

Because of that, a second Phase 3 international multicenter clinical trial with the name of AURORA was revised. And that's actually ongoing right now involving 650 patients. In fact, where I work at University of Southern California, we are one

of the sites for this particular investigation.

And the last follow up for this clinical trial -- ongoing clinical trial is expected to be in August 2020. And the findings on the Flurpiridaz PET CT is basically compared to the standard reference, coronary angiography.

So this is something to look forward to, and I think it will be very useful in use of PET in the area of myocardial perfusion imaging. As you know, we do have Rubidium-82 -- Rubidium-82 Chloride for myocardial perfusion imaging which is based on a generator, and then also ammonium.

But one of them requires a generator. One of them requires a cyclotron. If you had a Fluorine-18 enabled tracer, that would be quite useful from point of view of duplicity and distribution just like FDG. Can I have the next slide please?

So, under the category of neuropsychiatric, I mentioned before that there are now three tracers that have been approved for amyloid imaging. Now there's a lot of interest in looking at tau, what's called the Taupathies, which are these hyperphosphorylated proteins which accumulate within the neurons in a number of different neurodegenerative diseases, including Alzheimer's.

And the idea here is to again develop an imaging-based bioassay for presence or absence of taus in the neural tissue. And of course, such ability would be very helpful if there are anti-tau immunotherapies that were developed and make sure that the target is there, and how this treatment change the extent of the taus that are accumulating in the brain.

It is a very active area of research. There are some issues with some of these tracers because some of them have non-specific binding to off target areas. For example, the image that you see on your right-hand side, you can see a patient. It is denoted as HC. That's healthy control. And then you look at the healthy control patient.

There is something, not much. There's some minor signal in the basal ganglia and mid brain and the choroid plexus, which is not exactly understood why that is. But in any case, overall, the signal is pretty low. But in patients with Alzheimer's disease which is next to the -- the image next to the healthy control, you can see there's a relatively high amount of signal in the patients with Alzheimer's disease that do have a tau accumulation. Next slide please.

Now we move on to very active areas within

the oncology and theranostic. One of them that I chose to present here is the fluoroestradiol, which is basically again another imaging-based bioassay for presence or absence of estrogen receptors. It's very relevant in patients with breast cancer.

This is approved actually in France right now, and the company's name is Zionexa. They filed a new drug application with the FDA back in May of 2019. And the idea here is, of course, to be able to determine the presence or absence or the heterogeneity of the estrogen receptor expression in patients with breast cancer who may benefit from monotherapy.

So for example, if you look at the slide on the right, on the top, you see a patient with breast cancer that had an FES, fluoroestradiol imaging plus FDG scan. And you can see there's a concordance between the tumor on both of these images. And therefore, there was a robust expression of estrogen receptor.

This patient did receive hormonal therapy, and you can see the signal on FDG is going down. In other words, there was a good, favorable response to estrogen hormonal treatment. This is -- as opposed to that, you can see on the bottom this is another patient who has breast cancer. FDG, of course, is

positive. You see a number of metastasis in the spine. But the fluoroestradiol shows no major activity at those known sites of disease.

Therefore, this patient will not be really a candidate for anti-hormonal therapy. And in fact, she's received the hormonal therapy and you see there was no change in the metabolism of this lesion. Therefore, I think this will be another important step in stratifying who may benefit -- patients with breast cancer who may benefit from this type of treatment. Can I have the next slide please?

This is another one which is being actively pursued right now, Zirconium-89 trastuzumab. Similar to estrogen receptors, now the target here is HER-2 which is expressed in a number of cancers, most commonly, of course, breast cancer. And again, there are anti-HER2 drugs that can be used. And therefore, it would be good to know what the extent and heterogeneity of this type of target -- availability of this target is in these patients with, for example, breast cancer.

You can see an image of a patient with breast cancer with multiple sites of disease that are HER-2 positive. Now interestingly, of course, we can have a patient who has a HER-2 negative primary tumor

as I showed in this case. But the metastasis are HER-2 positive.

So just because a patient may have a HER-2 negative primary tumor, that doesn't mean that the patient is not going to be a candidate for anti-HER2 targeted therapy. And this type of imaging can be very helpful to stratify who may benefit with this type of targeted treatment. Can I have the next slide please?

This is Zirconium-89 anti-CD8 Minibody. This is being used in the era of immunotherapy. Basically the idea is to try to predict which of the patient's solid tumor can benefit from this new recently approved immunotherapy drug like the ones which are anti-PD1.

The program has one drug such as trastuzumab or PDL-1 which is programmed death-ligand 1. Those are also drugs against that target. These drugs have been very helpful and have shown good responses in a number of patients.

For example, with melanoma, lung cancer. But they are costly, and some of the patients do not respond very well. And in fact, they may get hyperprogression. So it is very helpful if you know before these patients undergo this type of treatment

who is going to actually benefit from this type of treatment.

And it turns out that if a tumor is populated by T-cells, to a large extent, those tumors do better with this type of treatment. So this is one of those attempts to develop a PET tracer that can stratify these patients who may best benefit from this immunotherapy.

It is ongoing right now, a clinical trial, a Phase 2 trial. In fact, again, our university, University of Southern California, is involved as one of the sites for this particular tracer evaluation. Can I have the next slide please?

Okay. So this is Gallium-68 FAPI, which stands for fibroblast activation protein inhibitor. Very, very exciting. This was published just several months ago from the Heidelberg in Germany. This is a tracer that doesn't look at the tumor directly like FDG, when we do it with FDG, but looks at the fibroblast activation in the micro-environment of the tumor.

And this -- basically this image that I showed you on this slide has been showcased all over the world many, many, many times just to show you how versatile this type of PET tracer is. And basically

it's showing the tumor involvement of many different types of tumors.

You can see here we have pancreatic cancer, esophageal cancer, lung cancer. And in fact, in some tumors which may not be very FDG-avid per se, those tumors may be imaged by this type of tracer, the FAPI.

And of course, the FAPI is not specific for cancer. Basically, anything that develops kind of a fibroblastic reaction like a wound, an inflammation can also be imaged with it.

But the idea here is that we can expand our understanding of the micro-environment of the tumor with this type of tracer. And then, of course, that will open up a completely new area of FAP targeted diagnostics which when we attack the cancer by attacking the micro-environment where the tumor is residing.

And of course, we can -- on top of that, can have also other treatments that attack the tumor itself. So very exciting. I think we're going to see a lot of activity in this particular area. Next slide, please.

Now on the last few slides, I want to talk about prostate cancer because it has shown there has

been a lot of activity in this area. This is just a slide to show you the three major phases of prostate cancer, the initial staging.

And of course, imaging is very important in that stage to try to find out if the disease is local or not local, what the extent of disease is because that will determine the subsequent management.

Then in patients who have local disease and are treated with the intent to cure with a radical prostatectomy or radiation, about 30, 40 percent of these patients usually develop biochemical recurrence which is basically a rise of PSA per the definition of rising PSA. And the question is: is this a recurrence -- local recurrence or is it a metastatic disease, or both?

The determination of that actually makes a big difference in the type of treatment. Typically, these patients are imaged with contrast-enhanced CT of abdomen, pelvis, and hips if necessary. And also bone scans.

But it has been shown that many of -- these what we call traditional or conventional imaging is really inadequate to image patients at very low PSA levels when in fact it could be useful at that time if the patient undergoes salvage therapy.

So we want to be able to detect disease if it's present and know where the location of that disease is in the very low PSA range if possible. And C11 choline, and then as I mentioned before, fluciclovine has appeared in this clinical state.

But there is a lot of activity on other tracers based on prostate specific membrane antigens, which I will talk about after this slide.

And then finally the advanced metastases, there's a lot of activity also going on in that area with regards to post diagnostics. And but particularly with regard to targeted radionuclide therapy, which I will talk about in a minute. May I have the next slide?

So here's the PSMA, which is a complete misnomer. It's not specific to prostate. It's not specific to cancer.

It's actually in a transmembrane enzyme. And you can -- to some low degree of expression you can see it in a number or organs. And also you can see it in other cancers, because the neovascularity of other tumors also express PSMA.

So it is not specific to prostate cancer imaging. But it can be useful in other cancers too. And people are looking into that.

Because it internalizes constitutively, it's actually, they're very useful for -- as a targeted treatment, which is that's why there has been a lot of activity in PSMA-based theranostics.

We know that in prostate cancers, especially aggressive prostate cancers, there is a very high expression, over-expression of PSMA as you see here. About 1,000 times more than a normal prostate tissue. Can I have the next slide, please?

So here is the same schematic of the PSMA transmembrane enzyme. Long ago there was an FDA-approved tracer, which was Indium-111 capromab pendetide marketed as ProstaScint.

It was not very useful. It was never really used very much, because basically the target to background ratio was low. And because it was targeting the internal moiety of this transmembrane, you have to have the cell either dying or dead to be able to image it.

But now, as you can see with the novel PSMA-based tracers, we are really targeting the external moiety of this PSMA molecule. And that's good, because that means that first of all it's much better accessible, but also we are imaging the live and viable tumor cells, not the dead or dying cells.

Can I have next slide, please?

So here are just three tracers based on PSMA. The first one on the left, gallium-68 PSMA-11 is the granddaddy of them all.

This was developed several years ago in Heidelberg, Germany. And it still is being used in -- across Europe and many other places, also in the United States at some sites under specific conditions.

But you can see the biodistribution is basically relatively high uptake in the salivary glands and the cortex of the kidneys. But overall the amount of activity in the rest of the body is not very much, which is good for looking at PSMA expression.

The F-18 PSMA 1007, which is on the right-hand side, that is also another tracer which is currently being pursued and was synthesized first in Heidelberg, in Germany. With an interest to have an F-18 type of label rather than a gallium-68. Again, for wider distribution and ease of use.

And another good thing about the F-18 PSMA 1007 is that it does not excrete into the urine very much. So you can see that there is not much bladder activity there. That improves the target to background ratio for looking at the local prostate cancer.

The one in the middle is 18-F DCFPyl. People just call it Pyl. Again, F-18 label, which is an advantage. But it does have excretion into the urine as you can see in this case. But generally the bio-distribution of these tracers are very similar. Can I have the next slide, please?

So just to show you a lot of, the fact that there has been a lot of activity in this area. This is a comparison of gallium-68 PSMA-11 PET/CT to fluciclovine, which is FDA-approved, the amino acid-based tracer.

This was a head-to-head comparison, prospective comparison spearheaded by the folks at UCLA. And I had a chance to participate also in this trial.

This was published just last year, several months ago in Lancet Oncology. And you can see in the bar graph that essentially gallium-68 PSMA does a much better job in detecting disease.

This was done in 50 patients with a very low PSA level, as you can see the range was somewhere between 0.2 to less than 2, where conventional imaging is essentially not very useful. There was 15 days between the two scans. And one thing to notice is that none of the patients had any bone disease or

metastatic disease detected by fluciclovine, where in fact they were detected by PSMA. Can I have next slide, please?

This is a systematic review and meta-analysis that was done with the -- on the literature with PSMA-based diagnostics. This involved 16 studies and more than 1,300 patients.

And again, on the top, if you look at the triangle with the -- in a very low PSA range, 0 to 0.19 nanograms per milliliter, the detection rate, the gallium PSMA test is somewhere around 30 to 40 percent, which is quite impressive. Can I have next slide please?

And this just shows you the comparison between what -- the PSMA with what we have available as FDA-approved agents. Basically choline and FACBC is the same as fluciclovine.

So the green bars are fluciclovine. PSMA is the red bars. And choline is the orange bars. And you can see across all PSA levels, especially in the very low PSA level of less than 1.0, you can see the diagnostic performance of PSMA-based tracers is better than the other two currently FDA-approved tracers. Can I have next slide, please?

This also shows again the potential power

of the PSMA-based imaging. This was, again, spearheaded by the folks at UCLA across town from me in Los Angeles.

They looked at these patients who were being considered for salvage radiotherapy. All of them had a PSA less than, a biochemical recurrence with PSA less than 1.0, very low PSA level.

And when PSMA was done in these patients, you can see on the image on this slide that those tiny yellow dots are the sites of disease that were detected in these 270 patients, kind of overlaid all of them onto one skeleton here.

The green area that you can see on -- at the bottom in the pelvis is the area that would have been typically radiated by the radiation oncologist. And just this image was trying to show how much disease would have been missed in these patients with very low PSA levels, if they were just going to have salvage radiotherapy based on what you see in the green area down there. Can I have next slide please?

And because of that, very encouraging results, the UCLA colleagues have developed this clinical trial, which is ongoing. It's a randomized prospective phase III trial of gallium-68 PSMA-11 for prostate cancer salvage radiotherapy. They call it

PSMA-SRT.

These patients will all have radical prostatetectomy, will have biochemical recurrence. PSA should be at least 0.1.

And the primary outcome here is greater than 20 percent decline in salvage radiotherapy failure at five years. And of course, patients will be randomized to either have their salvage radiotherapy as conventional, like before, and then the other half, almost other half, will have the PSMA first done. And based on the PSMA, they will be either boost in radiation therapy, or involvement or inclusion of those other areas in the pelvis which would have been missed on conventional therapy.

And then of course, again, we look at it at five years, what the outcome is in these two are. Can I have next slide, please?

So now then the last couple of slides I just want to talk about the theranostics with PSMA. This is a very exciting area. This is a lutetium-177 PSMA-617 study from Germany, where most of these studies have been performed.

This just shows you the power of targeted radionuclide therapy. This is a patient, for example, in this slide, who had extensive metastatic disease,

especially in the bone, with prostate cancer.

This is a metastatic castrate-resistant prostate cancer who basically failed all other conventional therapies. So in the -- and studies have shown that in these even very previously heavily pre-treated patients, these types of treatments can be very useful.

So this patient, for example, in this case, started with a PSA level of 1,000, as you can see, and received four cycles of lutetium-177 PSMA. And the PSA went down below 1 after four cycles.

And you can see the difference in the scan appearance on PSMA after this type of treatment. Here -- that's fine. Can I have next slide?

And here is a very recent paper that was published by Mike Hofman from Melbourne, Australia. It was a phase two study, single-arm.

They looked at 30 men with metastatic castrate-resistant prostate cancer. All of them received lutetium-177 PSMA.

And these patients, they're of course first -- it was made sure that the patients did have PSMA expression on PSMA PET.

But they also excluded patients who had FDG positive disease. In other words, they wanted to

make sure that this was a homogeneous group of patients with PSMA positivity.

And they received four cycles of treatment. And they had really favorable response in this group of patients, with 60 percent of patients demonstrating PSA declines more than half.

There was objective response on other types of imaging, including with these criteria, and also decline in bone pain and quality of life. Can I have next slide?

This is, again, a systematic review and meta-analysis across a number of articles and more than 700 patients. Again, showing that these types of treatments with PSMA lutetium-177, you can expect almost 50 percent of patients demonstrating more than 50 percent of PSA decline. So that's kind of a number to remember.

There are some side adverse effects. But they tend to be all manageable and mild. Can I have next slide?

But not only lutetium-177, the beta emitters, people have been starting to look into alpha particles. The image on the left from Kratochwil, again, this is back in Heidelberg.

This is a patient with very extensive

metastatic disease from prostate cancer. Did receive the lutetium-177 PSMA twice. Unfortunately, did not do very well, and the disease actually got worse.

But when the patient received three more -- three -- subsequently received three doses of actinium-225, this is a alpha emitter, the patient did really well.

You can see the site of disease essentially gone on the PSMA scan. This also has been shown by the group from South Africa, Mike Sathekge, who used bismuth-213 as a type of treatment.

Of course, these are all very single kind of case reports. And there's a lot of clinical trials that need to be done.

But there's a lot of excitement that these types of treatments may be coming in the future. Can I have next slide, please?

So, very quickly, I just want to tell you the landscape of the trials that are going on. This is a therapy trial, which basically compares cabazitaxel, which is a taxel chemotherapy approved by the FDA for use in metastatic castrate-resistant prostate cancer. And this will be simply compared to lutetium-177 PSMA in this particular trial.

This is being spearheaded by Mike Hofman

from Melbourne, Australia. Next slide, please?

This is the VISION trial. There's a lot of anticipation and excitement with the VISION trial, which my understanding is that has already been completed, but the results have not been published yet.

This is very much tailored after what was done with radium-223 XOFIGO, comparing the active arm, in this case, lutetium-177 PSMA, versus best supportive care. And, again, we all look forward to the results of this VISION trial. Next, please?

The PRINCE trial is looking at PSMA, again, lutetium-177 radionuclide therapy. This time in addition to pembrolizumab, which is, as I mentioned, is a PD-1 inhibitor. It's a programed death 1 protein inhibitor.

And the question in here is can immunotherapy and radioligan therapy be combined for the benefit of the patient? And this is being spearheaded by colleagues from UCSF. Can I have next slide, please?

The LuPARP trial is combining lutetium -- 177 PSMA with Olaparib, which is a DNA repair inhibitor. Again, Olaparib is FDA-approved.

And, again, the question is does this

combination benefit the patient with metastatic castrate-resistant prostate cancer? Can I have next slide?

This is another study from Australia, the UpFrontPSMA. So this is a -- in this particular study, patients did receive either the typical docetaxel with ADT, androgen deprivation therapy, or they will receive first lutetium-177 PSMA for a few cycles, and then get the typical treatment with ADT and docetaxel. And to see if the addition of lutetium PSMA makes a difference. Next slide, please?

This is a LuTectomy trial. This is use of lutetium-177 PSMA prior to surgery. These are patients who have high-risk localized prostate cancer and may have a small amount of nodal disease in the pelvis. And of course, should have the high PSMA expression.

They first get a couple of cycles of the PSMA treatment and then undergo prostatectomy. Next slide, please?

And finally, what's going on in this country. A lot of these things that I showed you are actually happening not in the USA. It's happening outside of the USA, mostly in Europe, particularly in Germany and Australia.

But there are -- there is hope that we start seeing some of this soon in the USA market. There are a number of companies that are in trials right now, or in NDA phase with gallium-68 PSMA based tracers, including illumet and GalliProst, as I mention there.

The industry has recognized the potential of these type of theranostics. As you can see on top, I mentioned that Novartis invested a large amount of money, $6 billion, to acquire Endocyte, which actually is -- spearheaded the VISION trial with lutetium-177 PSMA.

And the AAA company, which was behind approval of the Lutathera, lutetium-177 dotatate. And right now at some academic centers also folks are trying to provide PSMA type imaging or treatment, mostly imaging.

UCSF and UCLA have joined forces to send an NDA to FDA, which I believe has already been done as of last month. And at Stanford there's an early access program for PyL that F-18 label type tracer that I already mentioned before. Can I have next slide?

So, in summary, we should expect new PET tracers in various clinical domains that I mentioned,

especially in oncology and theranostics. And I think PSMA specifically will be one of the early ones that will be introduced both for treatment -- or, I'm sorry, both for imaging diagnostics and for treatment.

And I think these are really exciting times. And I'm particularly happy to see this amount of activity in nuclear medicine, and which is basically spearheaded by our better understanding of cancer biology and also availability of these types of radiotracers in PET and for treatment.

And thank you very much for your time.

CHAIR METTER: Well, thank you very much, Dr. Jadvar, for that very extensive and really excellent and complete review of the current and especially our emerging radiopharmaceuticals and therapy.

And it's very exciting, it sounds like, for our future in regards to patient care and for the therapy. Are there any questions for Dr. Jadvar?

MEMBER DILSIZIAN: Yeah, Vasken here.

CHAIR METTER: Yes, Dr. Dilsizian?

MEMBER DILSIZIAN: Yeah, Hossein, that was a fantastic presentation.

MEMBER JADVAR: Thank you.

MEMBER DILSIZIAN: This is really an

exciting area within nuclear medicine, the growth that we're seeing both in diagnostics and therapeutics.

I wanted to just say a couple of things. One is from the cardiology perspective, the Flurpiridaz, you highlighted the F-18 label dose being an advantage so that you can have a unit dose ordering rather than have a generator or cyclotron onsite.

MEMBER JADVAR: Uh-huh.

MEMBER DILSIZIAN: The other main advantage, I think you know but you just didn't mention, I just want to highlight for our colleagues, is that currently with PET, you can only do pharmacologic stress study.

And with F-18 Flurpiridaz, you will have the advantage of doing exercise treadmill studies, which is huge.

MEMBER JADVAR: Sure. Yeah.

MEMBER DILSIZIAN: For laboratories like ours, I would like to move completely from a SPECT-based cardiac imaging to a PET-based cardiac imaging. It has all the advantages that we can talk about at some point, including measurement of absolute blood flow.

So I think it is an exciting area. And I'm hoping that beyond Flurpiridaz, other companies

also will get into the F-18 label perfusion tracers.

And the next question, which is a tough one, as you know, we've been talking about T&E. And now you throw at us all of these complicated oncology radiotracers that not only you're just going to be administrating, you really have to understand the biology. How it's incorporated into the cells. And clearly the therapeutic aspects vary dramatically.

I just wanted to not put you on the spot, but to kind of emphasize that T&E for the future development of the therapeutic agents may not be as simple as giving radium-223.

MEMBER JADVAR: Yes. I completely agree. So in fact perhaps one of the reasons that I was asked initially to talk about trends in radiopharmaceuticals was to exactly point out what you are saying.

That, you know, these are things that we expect in the future. And it has many ramifications with regard to training and being able to -- it's not as simple as just, you know, injecting radium.

You have to really understand the biology. You have to really understand all the things that go around it with regard to training. And I think this is -- these can be very useful in that discussion too.

MEMBER DILSIZIAN: Thank you, Hossein.

CHAIR METTER: Thank you, Dr. Jadvar, again. Are there any other questions from the Committee regarding Dr. Jadvar's presentation?

MEMBER OUHIB: Yes. Hi, this is Zoubir.

CHAIR METTER: Yes?

MEMBER OUHIB: Excellent presentation. Thank you so much. I just want to add, just in case, because I had to step out for a patient, in the event that this was not brought up by Ms. Melissa Martin. She and I are part of this ad hoc committee within the AAPM actually.

And it's the -- it's looking specifically at these items. This is an ad hoc on recommendation for better integrating radionuclide therapy within the structure of the AAPM.

And there are several items that this ad hoc is looking at. And that's the clinical perspective, isotope production and supply, metrology, radiation safety, the imaging and dosimetry component, the radiation biology, the regulatory aspects.

And then some clinical perspectives that's like for the future. So there's a strong interest within the AAPM.

And this includes the, you know, the

imaging people, the radiation therapy people, the dosimetry people. All those to really make sure that when people jump on these procedures, they know exactly what they're supposed to be doing, and they're doing it safely.

MEMBER JADVAR: Yes. Absolutely. I agree.

MEMBER MARTIN: This is Melissa. I would -- Martin. I would just like to add to that. Yes, one of the other big points of question is the necessity and appropriateness of requiring individual patient dosimetry for these radionuclides.

That's a big project of this AAPM work group.

MEMBER OUHIB: Yeah. That's right.

CHAIR METTER: Okay. Well, thank you very much for all that. And, yes, it looks like we're getting more complex treatments for our patients, more specified for them specifically, which I think is amazing.

And thank you very much, Dr. Jadvar, for that very excellent presentation. I do have a question regarding the issue that you brought up about low PSMA detected. And that would be less than 1.0, I believe you said, that you had that study.

What happened to that group of patients that were detected with that very low PSMA, with less than 1.0? Did they just get followed?

Or, I think it's going to be a challenge now that when you have these very early detections. When do you treat? When do you follow up?

MEMBER JADVAR: Well, the PSA in a sense is a gauge of their -- the burden of disease. So the idea is that, you know, if you are able to detect disease, especially local -- locally recurrent disease in those very low PSAs, that the chances and the success of salvage radiotherapy, for example, would be much higher than when the PSA is already on a higher amount.

So the idea here again is that in those very low PSA levels to be able to see if there is disease in the prostate, the treated prostate bed. Is there disease outside of the bed so that you can include it in the radiation field if it's one or two here and there?

So it basically opens up your eyes of what is actually going on. The current imaging modalities that we have, that also includes even MRI, multiparametric MRI, is not really that accurate at very low PSA levels when the chances of favorable

response to treatment is much higher.

So we want to be able to really treat what we see and see what we treat. That's the idea.

CHAIR METTER: Great. Well, thank you very much. And that is just a very exciting area for our patients.

Any other questions from the Committee? Or any comments?

Okay. Well, thank you very much.

MEMBER JADVAR: Thank you.

CHAIR METTER: And right now -- was there someone with another question?

MR. EINBERG: This is Chris.

CHAIR METTER: Yes?

MR. EINBERG: Yeah, Dr. Metter, this is Chris Einberg. Do you want to open it up to members of the public to see if there's any comments from members of the public?

CHAIR METTER: Yes. Thank you, Mr. Einberg. Yes, operator, could you unmute the phones for any comments or questions from the public?

OPERATOR: Thank you. To ask a question or make a comment over the phone, please press star one.

Please ensure your phone is unmuted and

record your name so your question can be introduced.

Again, --

DR. HOWE: Dr. Metter, this is Dr. Howe. Just a quick comment while we're waiting for the public.

I note that FDA -- not FDA, but DEA, last week took away the barriers for using DaTscan, which is a nuclear medicine scanning agent that had an opioid in it that required DEA registration.

And they've taken that requirement away. I have no idea whether that's going to increase its use or not. I believe it's used for Parkinson's.

MEMBER JADVAR: Yes. That's correct. Yeah, that's an FDA-approved tracer. It's a single photon-based tracer for SPECT.

And I -- but that would help, of course, what you mentioned. But I think that the expense is, the cost is a factor, if I'm correct.

I'm not into business of what's going on with the hospital based, you know, type of management of how they decide on these things. But hopefully that will help.

I don't think that was a major barrier. But I think the cost is another one.

CHAIR METTER: Okay. Well, thank you very

much. It looks like, Mr. Einberg, did they open up the line, operator, for any comments from the public?

OPERATOR: Yes. I did.

MR. EINBERG: Open a line.

OPERATOR: Thank you.

MR. EINBERG: Any questions?

OPERATOR: If you'd like to ask a question over the phone, please press star one. Please ensure your phone is unmuted and record your name so your question can be introduced.

Again, that is star one to ask a question. One moment while we wait for any questions to come in.

There are currently no questions over the phone.

CHAIR METTER: Okay. Well, thank you. Mr. Einberg, let me ask. It is now 11:00, and we went through our break. Would it be all right for the Committee to continue on so that we are on schedule?

MR. EINBERG: That or we can shorten our lunch by a few minutes. I'll leave it up to you and the Committee to make that decision. But it's fine either way by me.

CHAIR METTER: Does anybody on the Committee have any preference? Or what we can do is

we can take a short break for maybe about ten minutes. Or would that be too long, Mr. Einberg?

Let's go ahead and take a ten-minute break and reconvene at 11 -- oh, let me see, 10 -- I'm at Central Time. So how about 11:10 your time?

MR. EINBERG: Okay.

MEMBER SHEETZ: So we're all going to be calling back in, right?

CHAIR METTER: Yes. Can we go on -- operator, can you put us on mute? And that would --

MR. EINBERG: I recommend everybody stay on line.

CHAIR METTER: Okay.

MR. EINBERG: Yeah, I'm sorry. Yes, this is Chris Einberg. I would recommend that everybody keep their line open and just go mute.

MEMBER SHEETZ: Okay. Thanks.

MR. EINBERG: Okay. Thank you.

(Whereupon, the above-entitled matter went off the record at 11:03 a.m. and resumed at 11:10 a.m.)

CHAIR METTER: Okay. This is Darlene Metter. And we're back online now. It's 11:10.

So just before the break there was a question for Dr. Jadvar by Mr. Dan Hill regarding Dr.

Jadvar's presentation. And it is regarding if Dr. Jadvar was familiar with scandium-49 for clinical trials. Dr. Jadvar?

MEMBER JADVAR: Yes. So scandium-44 has been used in -- for imaging with PSMA because of its longer half-life, it's almost four hours half-life, which is considered to be more advantageous compared to 68 minute half-life for gallium-68, where the original study was done.

So this has been, you know, being studied. Especially, again, by the group from Heidelberg in Germany. I just did a quick search on that. There was a paper published back in 2017 in the Journal of Theranostics comparing first-in-human use of the scandium-44 PSMA-617 in comparison to gallium-68 PSMA-617.

And so this is -- I don't think there is a specific clinical trial going on. But this is -- this particular radionuclide is also being looked at as possibly a useful radionuclide for use in PSMA type imaging.

CHAIR METTER: Okay. Thank you, Dr. Jadvar. And thank you, Mr. Hill, for your question.

Okay. Next on the agenda is Mr. Michael Sheetz, who is our Radiation Safety Officer, who will

be giving a presentation on the Patient Intervention Subcommittee Report.

Mr. Sheetz?

MEMBER SHEETZ: Okay. Thank you, Dr. Metter. Can I have the first slide, please?

CHAIR METTER: Can we have -- Kellee, can we have the first slide?

MS. JAMERSON: This is -- yes, this is Kellee, one second. It's opening.

CHAIR METTER: Okay. Thank you. Sorry.

MEMBER SHEETZ: Hello?

MS. JAMERSON: Sorry for the delay. The program is not responding.

CHAIR METTER: So, Kellee, do you think you'll be able to get those slides up?

MS. JAMERSON: I'm working on it.

CHAIR METTER: Would it be possible, Mr. Einberg, if we could go ahead, and Mr. Sheetz can start his presentation. And when the slides get up, we can get to the appropriate slide?

MR. EINBERG: Yeah. That would be a -- very appropriate. And we can do that.

And then just the ACMUI members were also provided with the background material. And the slides should be in the background material if the ACMUI

members want to follow along.

And then when Kellee gets the slides up there, we can switch back to WebEx.

CHAIR METTER: Okay.

MEMBER SHEETZ: Okay. This is Mike Sheetz. If you like, I will proceed with the presentation.

CHAIR METTER: Yes. Thank you.

MEMBER SHEETZ: Sure. And so this presentation is on the Patient Intervention Subcommittee Report.

The other subcommittee members were Mr. Gary Bloom, Dr. Vasken Dilsizian, Dr. Ronald Ennis, and our NRC staff resource is Dr. Said Daibes Figueroa.

The subcommittee charge originated during the September 2019 ACMUI meeting. ACMUI Chair, Dr. Christopher Palestro established a subcommittee to evaluate the definition of patient intervention and other actions and circumstances that are exclusive of medical events.

The purpose for this stemmed from varying views and interpretations from regulators, licensees, and previous ACMUI subcommittee recommendations of the term patient intervention.

Our objective is to determine what types of events were intended to be captured by the term patient intervention and what should or should not be reported as a medical event.

This presentation will explore the history of medical event reporting, and look into the different aspects of patient intervention.

Regarding the history of -- misadministration, or medical event reporting, a medical misadministration reporting rule was first proposed by the Atomic Energy Commission in 1973 in response to a Government Accounting Office report which identified 20 cases of wrong doses or overdoses between the years of 1961 and 1972, all which involved human error.

In 1980 the NRC issued a final rule on medical use regulations, which included criteria for the misadministration reporting at 10 CFR 35.41.

For this part, a misadministration was defined as the administration of a radiopharmaceutical or radiation involving the wrong radionuclide, the wrong patient, the wrong route of administration, a diagnostic dose or dosage different by more than plus or minus 50 percent, or a therapeutic dose or dosage differing by more than plus or minus 10 percent. May

I have the next slide, please?

So the purpose of misadministration or medical event reporting, it was stated at that time to allow the NRC to investigate the incident to evaluate the corrective action taken by the licensee to minimize the chance for recurrence, and if other licensees can make the same errors, begin generic corrective action which would, as a minimum, inform other licensees of the potential problem. May I have the next slide, please?

At that time, NRC did however specifically exclude extravasation or the infiltration of injected fluid into the tissue surrounding a vein or artery as a misadministration. It stated extravasation frequently occurs in otherwise normal intravenous or intra-arterial injections. It is virtually impossible to avoid. And therefore, the Commission does not consider extravasation to be a misadministration. May I have the next slide, please?

In August of 2000 the NRC issued a revised Medical Use Policy Statement to focus its regulatory emphasis on those medical procedures that posed the highest risk. The policy statement outlined the intent of the NRC to regulate the medical use of radioisotopes based on the following four guiding

principles.

One, the NRC will continue to regulate the medical use of radioisotopes as necessary to provide for the radiation safety of workers and the general public.

Two, the NRC will not intrude into medical judgments affecting patients except as necessary to provide for the radiation safety of workers and the general public.

Three, NRC will, when justified by risk to patients, regulate the radiation safety of patients primarily to assure the use of radionuclides is in accordance with the physician's direction.

And four, NRC in developing a specific regulatory approach, will consider industry and professional standards that define acceptable approaches of achieving radiation safety. May I have the next slide, please?

In 2002 the regulations in 10 CFR 35 were revised to be more risk-informed and performance-based and in alignment with the revised Medical Use Policy Statement. The term misadministration was changed to medical event.

And the reporting criteria was revised to include both a type of deviation from that which was

prescribed, such as wrong dose or dosage, wrong radioactive drug, wrong route of administration, wrong patient, wrong mode of treatment, wrong treatment site, or implanted a leaking sealed source.

And it also included a dose threshold that must be exceeded, which is 50 millisieverts effective dose equivalent or 500 millisieverts to an organ or tissue.

It was stated again that the purpose of reporting medical events was for the NRC to evaluate if there was a breakdown in the licensee's program for ensuring that byproduct material or radiation from byproduct material was administered as directed by the Authorized User.

Or if there was a generic issue that should be reported to other licensees, thereby reducing the likelihood of other medical events. May I have the next slide, please?

It should be noted that there were two specific exclusions to medical event reporting in the 2002 rule. One was for permanent implant brachytherapy for sources that were implanted in the correct site but migrated outside the treatment site.

The other was for an event that resulted from patient intervention where patient intervention

is defined as actions by the patient, whether intentional or unintentional, such as dislodging or removing treatment devices or prematurely terminating the administration.

However, the licensee must still report any event resulting from patient intervention of a patient which will result in unintended permanent functional damage to an organ or a physiological system as determined by a physician.

It should also be noted that in the 2018 amended 10 CFR 35 regulations for reporting and notification requirements for medical event, no changes were made to the patient intervention exclusion. May I have the next slide, please?

There are two previous ACMUI subcommittee recommendations related to the topic of patient intervention. A 2017 Patient Intervention Subcommittee looking into unintentional treatment outcomes of Y-90 microsphere therapy introduced the concept of passive rather then active patient intervention.

It stated unintentional treatment outcomes due to anatomic or physiological anomaly and/or imaging uncertainty falls into the category the Art of Medical Practice, provided that the standards of

medical practice are met.

Reporting such unpredictable and unavoidable patient specific medical events will not help to prevent such events in the future and therefore cannot be regulated.

This type of passive patient intervention was intended to address situations where there was a stasis of arterial flow or shunting of microspheres through aberrant vessels, resulting in a medical event for the Y-90 microsphere therapy.

The subcommittee also recommended that such unintentional treatment outcome exceptions should apply to all current and future treatments and not be limited to Y-90 microspheres.

A 2019 Extravasation Subcommittee reviewed the 1980 NRC decision to exclude extravasation from being considered a misadministration or medical event. The subcommittee agreed with the 1980 assessment that extravasation frequently occurs in otherwise normal intravenous or inter-arterial injections and is virtually impossible to avoid, and concluded that extravasation is a practice of medicine issue, and not an item that needs to be regulated by the NRC.

The subcommittee reconfirmed that the exclusion of extravasation from medical event

reporting was appropriate for both diagnostic and therapeutic procedures. However, one of its recommendations was for extravasation to be considered a type of passive patient intervention and that extravasation that leads to unintended, permanent functional damage should be reported as a medical event under 10 CFR 35.3045(b). The next slide, please.

So at issue is what types of events are intended to be captured by the term patient intervention, and what should or should not be considered a medical event.

As noted by the definition of patient intervention, it was intended to address physical action taken by the patient, intentional or unintentional, which cause a deviation in the administration of byproduct material from that which was directed by the Authorized User.

It is also assumed that the licensee did everything it could to prevent patient intervention during the treatment and that the actions taken by the patient were practically out of the licensee's control. For example, the patient pulls out an applicator during an HDR treatment and then refuses completion of the treatment.

However, there could also be a situation where physiological changes in the patient's medical condition causes a deviation in the administration of byproduct material from that which was directed by the Authorized User. For example, a patient experiences cardiac arrhythmia halfway through a gamma knife treatment, requiring urgent medical care, thus preventing completion of the treatment.

In both cases, the patient caused the deviation from the prescribed treatment, which would meet the medical event reporting criteria. And in both cases, the event could not have been reasonably prevented by the licensee.

Therefore, it would seem reasonable for both of these examples to be considered a type of patient intervention.

A reportable medical event is meant to be an event that occurred due to treatment errors on the part of the licensee.

The medical event criteria are met due to patient death, patient choice, or because of changing medical conditions, that it's out of the control of the licensee, it should not be reportable as a medical event.

The value of reporting such unavoidable

patient specific medical events is questionable since it will not help to prevent such events in the future.

It should be noted that medical events may also be due to a device failure or equipment malfunction with no error on the part of the licensee. These events still need to be reported as a medical event as it may indicate a generic defect or problem that would be of benefit to other licensees to know. May I have the next slide, please?

There are several patient-specific events incorporated in Part 35.1000 licensing guidance which are exempt from the medical event reporting requirement. Each of these events or situations involves an anatomical, physiological, or changing medical condition which could cause a deviation in administration of the radioactive material from that prescribed by the Authorized User, resulting in a medical event.

In the radioactive seed localization licensing guidance, there was an exemption for medical event reporting for cases involving either, one, a patient failing to return for the scheduled explant surgery, and, two, a physician determination not to explant the seed due to various patient conditions where doing so would jeopardize the patient's well-

being.

Here various patient conditions is intended to address situations where either the implanted seed may have migrated close to sensitive nerves or vessels where surgical removal may cause significant patient harm, or the patient's medical condition has changed such that the patient may be at a high risk to physically tolerate the surgical procedure.

In the Y90 microsphere licensing guidance, there's an exemption from medical event reporting that the procedure must be modified to emergent patient conditions that prevent administration in accordance with the written directive, such as arterial spasm or sudden changes in blood pressure.

There's also an exemption if the total activity administered was less than that prescribed due to stasis or if a dose to the wrong treatment site is due to shunting, when shunting was evaluated prior to the treatment in accordance with the manufacturer's procedures.

All of these exemptions are intended to address an anatomical or physiological condition of a patient that may affect the administration of a therapy in accordance with the written directive, and

are out of control of the AU or the licensee.

The events are purposely excluded from the medical event reporting requirement because they cannot be controlled by the licensee and they fall into the category of the practice of medicine. May I have the next slide, please?

I think it is important to note that there have been several specific situations that have been determined to be not due to patient intervention. There were two medical events that were discovered by the NRC during routine inspections where the licensee initially determined it to be the result of patient intervention, and therefore did not report the event.

These are described in NRC Information Notice 2006-11. And in both cases, which involved gamma knife, the patient's head frame had moved during treatment, resulting in a dose to the wrong treatment site.

In both cases, the licensee attributed the movement as a result of patient intervention. And since it did not result in permanent functional damage, the licensee concluded that it did not meet the reporting criteria for a medical event.

However, the NRC concluded that neither licensee provided sufficient evidence to exclude

equipment set-up error as the cause of the medical event rather than patient movement. And so the licensees were required to report these as medical events.

There have also been multiple cases involving Y-90 microsphere treatments where the microcatheter becomes occluded and prevents complete administration of the prescribed dosage from the delivery device. This has created confusion among some licensees as to whether this type of event is reportable as a medical event, or it constitutes a type of stasis or patient intervention.

However, in the most recent Y-90 Microsphere Licensing Guidance document, it states that the inability to complete administration due to clogging or kinking of a catheter is not considered stasis. And therefore this would need to be reported as a medical event. May I have the next slide, please?

The following are the subcommittee position on medical events and patient intervention. The purpose of the medical event reporting rule is to evaluate if there was an error or problem in the licensee's program for ensuring that byproduct material or radiation from byproduct material was

administered as directed by the AU, or if there was a generic issue that should be reported to other licensees, thereby reducing the likelihood of other medical events.

If unanticipated events occur during a properly performed clinical procedure, and results from actions taken by the patient which could not have been reasonably prevented by the licensee, or from an anatomic or physiological condition of the patient, which falls into the realm of the practice of medicine, then it should not need to be reported as a medical event.

Reporting such unavoidable patient-specific medical events will not help to prevent such events in the future. And doing so would potentially infringe on the practice of medicine. May I have the next slide, please?

The term patient intervention should be interpreted to include intentional or voluntary actions, would include physical actions taken by the patient, such as removing an implanted brachytherapy source or applicator, or refusing to continue with a prescribed course of treatment.

And unintentional or involuntary actions, which would include medical outcomes resulting from

the anatomical or physiological conditions of the patient, such as extravasation, migration of implanted radioactive seeds, arterial spasms, the onset of other underlying medical diseases and disorders which interfere with the prescribed treatment.

The expansion of the term patient intervention -- or this expansion of the term patient intervention is consistent with the original objective which was developed in 2002.

It is recognized however that there will always be differences in the interpretation of what is captured by the term patient intervention and that some determinations will need to be made on a case-by-case basis. May I have the next slide, please?

Medical events resulting from patient intervention in which the administration of byproduct material results or will result in unintended permanent functional damage to an organ or physiological system as determined by a physician, should be reported as required by 10 CFR 35.3045(b).

This will allow for those events resulting in serious patient harm to be evaluated for any program deficiencies and identify any potential generic issues or concerns that may be of benefit to other licensees.

A medical event resulting from patient intervention, whether it causes permanent functional damage or not, should still be internally reported to the institution's patient safety committee in accordance with the institutional patient safety reporting and review process.

This review is both appropriate and important in ensuring a strong patient safety culture. May I have the next slide, please?

Any medical event that is due to a device failure or equipment malfunction, even though there is no error on the part of the licensee, still needs to be reported as a medical event as it may indicate a generic defect or problem that would be of benefit for other licensees to know. May I have the next slide, please?

The following are the subcommittee recommendations. One, the current definition of patient intervention, in 10 CFR 35.2, should be interpreted to include both intentional or voluntary actions taken by the patient, such as removing an implanted brachytherapy source or applicator, or refusing to continue with a prescribed course of treatment.

And unintentional or involuntary actions,

which would include medical outcomes resulting from the anatomical or physiological conditions of the patient, such as extravasation, migration of implanted radioactive seeds, arterial spasm, and the onset of other underlying medical diseases and disorders which interfere with the prescribed patient treatment.

Two, the subcommittee agrees that medical events resulting from patient intervention should not need to be reported as it would potentially infringe on the practice of medicine. And it will not help to prevent such events in the future.

And three, medical events resulting from patient intervention in which the administration of byproduct material or radiation from byproduct material results or will result in unintended permanent functional damage to an organ or physiological system as determined by a physician, should be reported as required by 10 CFR 35.3045(b).

And that concludes my presentation. Thank you.

CHAIR METTER: Thank you, Mr. Sheetz. That was a very nice and thorough presentation. I congratulate you and the subcommittee for this report.

Are there any comments or questions from members of the subcommittee?

MEMBER ENNIS: This is Ron Ennis.

That was a great presentation, and I am very happy that we are confronting or addressing this explicitly. It's been hovering around my entire time on the ACMUI. And I was really stimulated by our colleague the late Frank Costello. And so, I am really pleased that we are finally addressing it specifically. And Mr. Sheetz did a perfect presentation of our feelings.

CHAIR METTER: Thank you, Dr. Ennis.

Any other comments or suggestions from the Subcommittee members?

(No response.)

Okay. Hearing none, are there any comments or questions from the ACMUI Committee members?

MEMBER OUHIB: This is Zoubir.

Could we go to slide No. 14? Okay.

It's the second item that sort of caught my attention, and specifically, that last part of that where it says, "should not need to be reported as a medical event". And perhaps I was hoping to see something like -- it could be like a non-medical event, sort of like an FYI. In other words, capture that information for other people to actually see

that, learn from it, hopefully -- maybe; maybe not -- but not as a medical event. How can we actually accomplish that?

MEMBER SHEETZ: This is Mike Sheetz. I can address that.

We did recognize that any incidents due to patient intervention, whether it causes physiological damage or not, should be reported to the institution's patient safety committee, as it looks for other unanticipated events. And so, it can be addressed there and can be expanded out from that. But I don't think there's any advantage to reporting these unanticipated events within the regulatory arena as a medical event.

MEMBER OUHIB: Right, but I'm not referring to it as being a medical event, no, not at all. It will be a non-medical event. But I think let's just say something happened at your institution and something occurred. I'd like to learn from it. Even though that was not a medical event, we should like to capture that information and learn from it. That's really where I'm coming from.

VICE CHAIR SCHLEIPMAN: Hello. It's Robert Schleipman. I have a comment.

Perhaps, Zoubir, the place for that would

be through your professional organizations, either a regional chapter of AAPM or periodicals, where you could report on it either in a case report or as several incidents occurring. That would help disseminate that, but, yet, keep it clear from institutional reporting and official medical events.

CHAIR METTER: This Darlene.

And I think I do like Dr. Schleipman's comment. And again, remember that we are regulators and we're not in the practice of medicine.

MEMBER OUHIB: Well, this is not a practice of medicine. This is really for people who ought to not participate in any one of those organizations -- and it's like royals, or whatnot -- would love to probably learn from it. And just maybe that could come from the manufacturer, if that's reported to the manufacturers, to take "We're seeing this and this," and maybe other users would like to learn from this and be aware of it. That's all.

MEMBER DILSIZIAN: Vasken Dilsizian here.

I would like to echo what every clinician has said so far. You want to learn; you go to a scientific session and you present abstracts. This is not a place for the NRC to be intervening with medical care. This level of curiosity is not necessarily a

burden on clinicians to be recording because some members of the community would like to know. Though that kind of information is not part of the NRC, that curiosity itself is part of abstract papers/scientific sessions.

MEMBER SHOBER: This is Megan Shober. I have a comment as well.

My comment is just that a lot of times there are events that happen where it's like patient intervention isn't a binary choice. Like it's not quite clear whether it's patient intervention or not. And so, one thing that we're struggling with right now is what if the facility had an opportunity to identify it prior to starting treatment but did not. So, in that case, there's something that may or may not be something that's patient-specific, but the licensee may or may not have identified -- they may have had a chance to identify it in advance and did not. So, is that patient intervention; is it not patient intervention? I just want to highlight that there still remains a lot of gray space.

CHAIR METTER: Okay. Thank you for your comments, Megan.

Do you have any comments to say on that, Mike Sheetz, regarding Megan's comments?

MEMBER SHEETZ: I'm not sure if I understand the particular situation. I do recognize the Subcommittee recognizes there will be gray areas on interpretation of what constitutes patient intervention. And I guess I would hope that in those situations the licensee would feel open to contact the regulator and to discuss it and get their opinion, so it's not second-guessed later in an inspection.

But, as far as seeing something upfront before it happens, I'm not sure of the particular situation you're referring to. I'm not sure.

MEMBER SHOBER: Yes, I mean, we just had a medical event that was recently reported, and the patient intervention question did come up from our end, not necessarily from the licensee's end. And it was just it's been difficult to parse that out. So, I mean, maybe at the end of the day, the way to look at it more globally is just to kind of highlight that continuing communication. There may be lessons learned from it, whether or not you call it a medical event.

CHAIR METTER: Thank you.

Any other comments or questions from the Committee?

MEMBER MARTIN: Yes, this is Melissa

Martin.

I would just really like to support the presentation that Mike Sheetz has just given. Having had about 30 years of experience in these procedures of different brachytherapy procedures and nuclear medicine procedures, there's times that it is patient intervention and it is not going to be obvious. And it is hard to determine that.

I understand what Megan is saying. Sometimes after the fact, when you're, quote, "getting investigated," it's very much of a punitive approach as opposed to a documentation approach that, yes, this happened. And I think we should encourage the reporting of these instances within our institution and maybe within our professional associations, but when it is basically a patient intervention, it should not be punitive to the facility.

CHAIR METTER: Thank you, Ms. Martin.

Any other comments or questions from the Committee?

(No response.)

Any comments or questions from the NRC staff?

DR. HOWE: This is Dr. Howe. Just a quick comment on the professional societies.

Isn't it quite difficult now to get a talk accepted in the professional societies or a poster accepted in the professional societies? So, it seems to me this type of thing probably wouldn't make the grade.

CHAIR METTER: Dr. Dilsizian, do you have a comment on that?

MEMBER DILSIZIAN: Well, I mean, you know, again, we're making judgments without really basis of any scientific knowledge. I think that it depends on the field. For example, if you're submitting an abstract to the inappropriate society, then it will get rejected. But if you submit it to the group of, let's say, radiation safety officers, physicists, nuclear medicine physicians who are interested in this, I think we would be interested. So, it all depends on where you submit it. I mean, if you submit it in the wrong society, obviously, there will be no interest; it will be low priority. But, again, if you submit it to the proper group of scientists and scientific discussions, I think there will be an interest.

CHAIR METTER: Thank you, Dr. Dilsizian.

Any others?

MEMBER OUHIB: Yes. This is Zoubir.

Just a comment on that point. I think what will be desirable, not always possible, is to have a standard sort of session year after year regarding this topic, which could be medical events update, or something like that, just like the ABS has actually adopted, where there is a session on medical events where people can come in and learn about what has occurred, and so on and so forth. So, I'd like to see other organizations basically adopt the same thing, and I think that would be beneficial for everybody.

CHAIR METTER: Thank you, Zoubir.

Any other comments or questions from the NRC staff?

(No response.)

Okay. Operator, can you unmute the lines for any public -- oh, I'm sorry. Was there a person --

MS. HOUSEMAN: Yes, this is Esther Houseman in OGC.

And I just wanted to request, if the ACMUI could, moving forward to help folks like me understand your meaning, perhaps define what you mean by "the practice of medicine". Because, both in this context and your patient intervention report and, also, in

your reviews of training experience requirements, and in various other contexts, I have heard the ACMUI and individual members use that term "practice of medicine" to help you figure out where you think the line should be for NRC regulation. And without a definition of that term "practice of medicine," and without understanding what your working definition of it is, I am having a difficult time understanding what you mean by that term and how it should inform, how you think it should inform the NRC's policy on regulating the practice of medicine -- or excuse me -- regulating medical use of nuclear material.

And the other comment I would like to make on the patient intervention issue is that, of course, as you know, this term is defined in the regulations in Part 35. And if we're going to interpret that definition, as a legal matter, the agency would have to be careful about how it interprets that definition and ensure that its interpretation of the regulatory definition is reasonable, and to define that term to include some of the unintentional actions and anatomical anomalies of patients might not be tenable from a legal standpoint.

Nevertheless, the NRC staff can take all of the advice and recommendations from the ACMUI and

perhaps consider a different regulatory tool to accomplish the same thing. So, I just wanted you to keep that in mind because, you know, we have heard recommendations for an interpretation of that regulatory definition, and perhaps that might not be the regulatory tool that the NRC could use, but the NRC staff could use a different regulatory tool.

CHAIR METTER: Okay. Thank you.

So, if I can restate this, it's that you would like, the NRC staff and the OGC would like to have an explanation on what the ACMUI considers the practice of medicine?

MS. HOUSEMAN: That would be helpful. And I'm not formally requesting that the ACMUI as a committee come up with a definition. That's certainly not what I'm asking. But I just wanted to comment that I have a bit of a difficult time fully understanding the ACMUI's discussions and the basis of its recommendation when I don't have a clear understanding of how you're using that term "practice of medicine" and how you're defining it.

CHAIR METTER: Okay.

MS. HOUSEMAN: Again, I'm not asking for a formal definition, but I'm asking for perhaps a bit more explanation, as you've used that term, what do

you mean by that term when you're using it.

CHAIR METTER: Okay.

MS. HOUSEMAN: That would help me to understand your recommendations a bit better.

CHAIR METTER: Okay. Thank you.

Do I have any other suggestions or questions from the NRC staff?

MR. EINBERG: Yes. This is Chris Einberg.

So, I echo Ms. Houseman's comment regarding the clarifications required for the "practice of medicine". We do rely on that line of "practice of medicine" versus NRC's role. And so, if there are thoughts, or if there's a way for the ACMUI to clarify that, that would be useful. I'm not sure whether a subcommittee could be formed for this or if one of the existing subcommittees could further look into this.

CHAIR METTER: Yes. I was planning on having a subcommittee. I was going to put together a list of the members. But I'll probably put it later on in the meeting, later on in the next open forum and suggest a subcommittee look at this.

MEMBER DILSIZIAN: Vasken Dilsizian here.

I mean, this is, obviously, a term that's been used for decades. If you simply Google and look

at The New England Journal of Medicine, you'll find nice editorials and definitions of what the term is. If you'd like to have a subcommittee to kind of reproduce that literature for you, you can do that, but it's not a new term. As you know, it's part of the history of medicine for decades and it's all over the literature.

CHAIR METTER: Thank you.

MEMBER OUHIB: This is Zoubir.

I think the issue here, in my opinion, is not necessarily the definition, but the interpretation of that definition. And I think this would be a good, healthy discussion to make sure that both the NRC staff and the ACMUI members are going by the same interpretation. In that way, when this term is being referred to, everybody understands what is meant by it.

CHAIR METTER: Thank you.

Okay. Do I have any other comments from the NRC staff?

(No response.)

Okay. Operator, can you unmute the lines for any public comments or concerns or questions?

MEMBER SHEETZ: Dr. Metter?

CHAIR METTER: Yes?

MEMBER SHEETZ: Dr. Metter, this is Mike Sheetz. I have one response to the one NRC question --

CHAIR METTER: Yes?

MEMBER SHEETZ: -- with respect to the definition and how that would be expanded. And I guess to try to clarify one, our first recommendation, it would be to the current definition in 10 CFR 35.2, on patient intervention, that what we propose on these passive or involuntary actions could actually be captured in the current definition and with the statements of considerations of the 2002 rule. Because there's very little said. And while I believe that the initial intent of patient intervention was a patient pulling out a manual brachytherapy source, it did include involuntary actions -- I'm sorry -- it included intentional actions which can be synonymous with involuntary actions, which would cover all of the other items that we are addressing. And I think, logically, it flows that way.

And I guess our hope is that, through a regulatory issues summary or some other mechanism, this current definition in 10 CFR 35.2 would include these other types of patient intervention actions.

Thank you.

CHAIR METTER: Okay. Thank you. Thank you for that clarification.

Any other comments or suggestions from the ACMUI Committee or the NRC staff?

MEMBER ENNIS: Hi. This is Ron Ennis.

A question for the OGC representative. So, the NRC's Revised Medical Use Policy of 2000 seems to define, to me, kind of where that line is. There's always going to be ambiguity, though. I'm just not sure we'll get more refinement than this. It basically says, "not to intrude on medical judgments affecting patients except as necessary to provide radiation safety workers and the general public...."

MS. HOUSEMAN: This is Esther Houseman again.

Yes, I do understand that the current Medical Use Policy does speak indirectly to what is the "practice of medicine". I still have a bit of a difficult time understanding what the ACMUI and individual members think the bounds of that term are, particularly in contexts such as the training & experience requirements. I know this came up in the training & experience requirements recommendations and report, when patient treatment is not involved and, yet, even at the training & experience point, somehow

this is an issue of the practice of medicine. So, there are certain contexts in which the bounds of that term are not entirely clear to me.

So, that was sort of the basis of my question and my request for a bit more specificity about where exactly you're going with this.

VICE CHAIR SCHLEIPMAN: This is Robert Schleipman. May I comment?

CHAIR METTER: Yes, Dr. Schleipman.

VICE CHAIR SCHLEIPMAN: Regarding the T&E reports, I think we were referring historically to the Medical Policy Statement of NRC. But I would recommend at this point perhaps we would consider that, if a subcommittee or an ACMUI Committee report did include that, there could be some minor comment distinguishing how and where that was apropos; and that we would not necessarily have to form a separate subcommittee to redefine this.

CHAIR METTER: Okay. Would your Committee like to take that on?

VICE CHAIR SCHLEIPMAN: Well, what I was saying is that, for each subcommittee that's referring to it, it could say, "And this is how we are interpreting this," or provide more context, more or less.

CHAIR METTER: Okay. Okay. I understand now. Thank you.

MEMBER OUHIB: This is Zoubir. May I comment on that?

What if there are some differences from each subcommittee? What would you do with that? In the way they define it per se?

MEMBER JADVAR: We will challenge it, Zoubir.

(Laughter.)

No, seriously, that's why we're here, right? We listen to presentations and we say, "Well, that's not our understanding. That's not consistent." And we will challenge you.

MEMBER OUHIB: I think that makes sense. Thank you. Yes.

CHAIR METTER: Okay. Thank you.

Okay. Do I have any other comments or questions from the Committee or NRC staff?

(No response.)

Okay. Operator, can you unmute the lines for any public comments?

OPERATOR: Yes. To ask a question over the phone, please press *1. Please ensure your phone is unmuted and record your name, so you can be

introduced. Again, that is *1 to ask a question. To withdraw your request, please press *2.

One moment, please, while I wait for questions to come in.

Our first question comes from Ron Lattanze.

You may go ahead.

MR. LATTANZE: Hi. This is Ron Lattanze.

Mr. Sheetz, thank you for your presentation. I have a question and, then, I have some comments related to the Subcommittee's suggestion to classify extravasations as passive patient interventions.

My first question is related to the ACMUI institutional memory. I'd like to know how did the Subcommittee reconcile their conclusion that extravasations should be classified as passive patient interventions with the ACMUI's past conclusions from 2008 and 2009 meeting transcripts that included the following:

First, in both of these meetings that were exclusively focused on extravasations, it appears that no ACMUI member mentioned that extravasations are the result of any patient passive or active intervention, but they did mention the following:

First, they mentioned that extravasations happen more frequently when you have a very young technologist staff;

That extravasations can be avoided when special care is taken in the administration of the radiopharmaceutical;

That extravasation rates can be improved by using IV access versus other forms attaining access;

And that the quality of the needle catheter makes a great deal of difference in the quality of the line and the likelihood of an extravasation;

And that there is general consensus that the quality of technique was a contributing factor to extravasation.

CHAIR METTER: Mr. Sheetz, do you have any comments?

MEMBER SHEETZ: Yes. This is Mike Sheetz.

Well, we were merely supporting the 2019 ACMUI Extravasation Subcommittee's recommendation that extravasation be considered a type of passive patient intervention. That Subcommittee looked at all the aspects of extravasation and, again, concluded and supported the 1980 NRC position to exclude it from

medical events reporting.

What is slightly different is that the 2019 Extravasation Subcommittee supported medical event reporting of extravasation if it resulted in permanent functional damage. And again, this Subcommittee supported that same thing. So, those events that result in permanent functional damage from extravasation, or from any other patient intervention, event should still be reported.

So, to try to define as far as this would be a good example of the practice of medicine, I would say it is the practice of medicine to determine, you know, what types, size needle or catheter or mode of administration the individual should use for the administrations of internal or implanting of seeds. That is a medical decision. If that event results in extravasation, then that is the result of the art of medical practice. It's very difficult to control or regulate that.

Thank you.

MEMBER DILSIZIAN: Vasken Dilsizian. Can I comment as well?

CHAIR METTER: Yes, please.

MEMBER DILSIZIAN: You used two words, "technique" and "training". None of those are under

the auspices of the NRC.

When I was an intern, a young intern, my technique of IV insertion probably was not as good as my senior chief resident, but my training during my residency got me to be better. None of those are under the NRC regulations and it should not even be mentioned as part of the NRC regulation.

CHAIR METTER: Thank you, Dr. Dilsizian.

Any other comments or questions from the public?

MR. LATTANZE: This is Ron Lattanze again with my second topic.

I'd like to share evidence with the ACMUI that does not support the Subcommittee's recommendation to classify extravasations as passive patient intervention. The evidence suggests that extravasations can be reasonably prevented and possibly addresses Ms. Shober's comments about licensees wanting to know the factors to prevent unintentional radiation exposure.

There was a multi-center study published in June of 2019 in The Society of Nuclear Medicine Molecular Imaging Journal of Nuclear Medicine Technology. It was a quality improvement initiative in multiple centers. And the conclusion was that

there was statistically-significant center and technologist infiltration rate variation. Furthermore, secondary endpoints included associative factors that likely lead to infiltration and whether or not centers could improve their infiltration rates. Some of those factors included: choice of injection site; flush volume. Patient weight was actually an associative factor.

But centers could actually statistically improve their infiltration rate, indicating that the patient population remained constant, and by addressing techniques, centers could improve infiltration rates.

From this same quality improvement project, we see similar centers with similar patient populations having vastly different infiltration rates, which supports that this is an issue, a technique issue, and is not patient intervention.

There is further evidence that extravasations should not be classified as passive patient intervention. One center that was tracking their infiltration rate put a quality improvement plan in place and dropped rate from 16 percent to 6 percent as soon as they implemented their plan, which included the following:

Repositioning an uptake chair to provide more access to the technologist to perform left side injection;

Switching from butterfly access to IV access;

Standardizing and slowing the flush process,

And retraining technologists on the best techniques.

One other example is that the ownership of that center changed 18 months later, and new technologists replaced the technologists that had improved their rates. The center's infiltration rate changed from 6 percent to 19 percent overnight, the same patient population, different technique.

So, I'd like to address Dr. Dilsizian's comment about medical practice and training. This particular topic that we're discussing today is whether extravasations should be considered a passive patient intervention. And the evidence is that it is not a passive patient intervention. It's, in fact, a technique-related issue.

So, Dr. Dilsizian's comment about the extravasation being a medical practice issue is related to the extravasation issue which the NRC is

looking into at this point in time. But I think, for this topic, there is evidence that, when you know information about what's driving your extravasation rate, it is reasonably prevented.

My final comment is that Dr. Jadvar just gave a really nice talk this morning about trends in radiopharmaceuticals. And many of the new therapeutic administrations use hundreds of millicuries during administration. And infiltration of beads or an extravasation of bead therapies can result in immediate patient harm and a lack of delivery of therapy. Additionally, as the NRC knows, we have provided 22 cases of moderate to severe diagnostic infiltrations of FDG and MDP that have far exceeded medical event reporting limits.

The Subcommittee recommendation to exclude extravasations from medical event reporting by creating a new passive category of patient intervention I believe will result in a complete lack of transparency to the NRC and to the patients and their physicians of medical events that exceed reporting limits and are harmful to patients.

While there are centers in the U.S. that may not have an extravasation issue, as Mr. Sheetz noted in his presentation, and as the 2008 and 2009

ACMUI transcripts state clearly, extravasations frequently occur in nuclear medicine. Since the evidence is clear that extravasations are a technique-related issue, I would urge the ACMUI to remove the extravasation topic from the patient intervention discussion and consider it on its own.

Thank you for giving me the opportunity to provide my thoughts.

CHAIR METTER: Thank you for your comments and your suggestions.

Any other member from the public who would like to make any comments or ask questions?

OPERATOR: Yes. The next one is from Dr. Carol Marcus.

You may go ahead.

DR. MARCUS: Thank you.

This is Carol Marcus. I have a few comments.

No. 1, if a medical device malfunctions, that is really not the NRC's regulatory purview. That is regulated by the FDA Center for Devices and Radiological Health. And I think they do a very good job of it. There was a lot of bad behavior by the NRC with the Indiana-Pennsylvania brachytherapy device failure, but the FDA behaved, I think, extremely well.

My second point is that I don't see what NRC could possibly do with reporting of permanent damage. It's not going to fix it. There are times in all specialties of medicine where permanent damage does occur because of some diagnostic or therapeutic attempt. And I just think that the NRC has no business here and it doesn't do anything about it anyway, except harass people.

Having gone through 40 years of nuclear medicine with, first, it was the misadministration rules, and now it's called medical events, and endless, endless arguments and ACMUI meetings all over the place, I'll tell you this: NRC has never had anything intelligent to do with all of this reporting. It has not taught anybody any lessons. All we have ever learned is that, occasionally, human error happens, and you can't stamp out 100 percent of it. But there are no lessons learned. Assuming the physicians are competent, they know these things happen. They're not learning anything from the NRC.

And I think that this whole adventure of the NRC's with, whether it's called misadministrations or medical events, has no functional value to the United States and that they ought to just get rid of all this reporting. We have other mechanisms in

medicine that cover this, but the NRC has really behaved quite badly on occasions, such as the Indiana-Pennsylvania event and the Tripler event of past years. And it's not doing any favors to the United States with this program.

Thank you.

CHAIR METTER: Thank you, Dr. Marcus.

Are there any other public comments?

OPERATOR: Yes. Our next one comes from Richard Green.

You may go ahead.

MR. GREEN: Thank you. I got kicked off the call and came back in.

I just want to point out that, when we discuss what the definition of "practice of medicine," we also have to discuss the corollary "practice of pharmacy". Both are activities conducted by Authorized User physicians or Authorized User pharmacists, and both should be discussed in tandem.

CHAIR METTER: Thank you, Mr. Green.

Any other comments from the Committee, the NRC staff, or the public?

MEMBER OUHIB: Yes. Hi. This is Zoubir.

I would just like to comment on Dr. Marcus' comments. I think, as far as the FDA, yes,

you'll learn from that, assuming users are actually reporting their issues with the medical devices, and so on and so forth. And I think there ought to be a reminder that, if something would happen with your device, you are obligated to report that to the FDA, so they can act on it.

I think the other point that I would have to totally disagree with you is that I certainly can learn from reading a medical event report on what actually happened. The process itself, when I can actually identify something that perhaps we need to be aware of it and be prepared for that, I think that's valuable information in my opinion.

And I'm saying this because I have looked at 12 years, literally 12 years, of medical events on the NRC website one-by-one in brachytherapy. And I can tell you I learned quite a bit from that.

Thank you.

CHAIR METTER: Okay. Thank you.

We are running a little behind.

Are there any other comments from the public?

OPERATOR: Yes. The next question comes from David Crowley.

You may go ahead.

MR. CROWLEY: Okay. Good afternoon to the ACMUI and the members of the public who have commented so far.

First, I'd like to support Mr. Lattanze's comments regarding the evidence that has shown before and, then also offered in the future to the ACMUI on extravasations. And I hope that the issue can be looked at as a separate matter from passive patient interventions that was presented here today.

And I also wanted to bring up, on the "practice of medicine" definition and how that needs to be more clearly defined from the NRC's comments, and then, Mr. Einberg as well. Just to echo that, you know, I have seen physicians from the ACMUI where, in this case, extravasations, they say that, due to technique or training, that's the reason or one of the reasons behind extravasations, but that this is not in the NRC's jurisdiction or not in the purview of the NRC to regulate.

But then, in other matters before the ACMUI, say T&E criteria, when we were looking at the 700 hours of specialty training pathways or status quo methods, the ACMUI argued that it is necessary that the NRC uphold those regulations for training and experience of Authorized Users. So, it just seems

like there's a split there. And if the ACMUI could look at reconciling that at some point, that would be helpful.

Thank you.

CHAIR METTER: Thank you for your comments.

Any other public comments or questions?

MEMBER DILSIZIAN: Well, can I respond to that? Vasken Dilsizian here.

CHAIR METTER: Yes, Dr. Dilsizian.

MEMBER DILSIZIAN: Well, there's a distinction between medical training and radiation safety training. The NRC is involved in the T&E of specific radioisotope physics and isotope biology, nothing to do with putting catheters in people, injecting dyes in catheters, in the cath line. Those are medical training residencies. So, you're confusing between graduate medical education and NRC-required education.

CHAIR METTER: Thank you, Dr. Dilsizian, for that clarification.

MEMBER JADVAR: Can I make a comment, too? This is Hossein Jadvar.

CHAIR METTER: Yes, Dr. Jadvar.

MEMBER JADVAR: Yes, just listening to

these comments with regard to the report of extravasation, actually, if you look up the literature, there's a relatively robust literature on this. There was a recent systematic review of consequences and incidents of radiopharmaceutical extravasation and therapeutic interventions. This was published in 2017 in The European Journal of Nuclear Medicine and Molecular Imaging.

And they looked at more than 3,000 cases of extravasation in a good number of publications. I think there was like 37 of them. And I think it would be useful, if people are interested on this topic, to look at this particular systematic review. It's stating that, you know, it does happen in nuclear medicine clinics, but their conclusion was that, if it's a diagnostic dose, it is of no consequence and, generally, does not require any specific intervention whatsoever.

With regard to treatment, as we get into that arena, of course, as I mentioned earlier, we are going to have more of these treatments coming on. That could be an issue, but most of these treatments -- for example, the most recent one, Lutathera, those are not just by direct injection into the vein. You introduce a line because it's a drip. The drip should

go on for about two hours or so. It's not only the radiopharmaceutical; you also inject the amino acid. So, there's a lot of care taken into introducing a reliable IV access for most of these treatments.

We don't do PSMA treatments here, but I know from my colleagues in Germany that they do it in a similar way, just like they do with Lutathera. You make sure the line is there. That really reduces dramatically the problem with therapeutic extravasation. It's still possible and it has reported in literature, and there are interventions that you can do to alleviate the problem. But there is a difference between the technique that you use for just injecting the diagnostic doses, a very small amount. And as I said, the literature says you basically can ignore it; just put a warm pad on it. And usually, that should not be a problem, as opposed to therapeutic, when you actually use a different technique, because some of these things are much longer than just a push injection. You know, you have to wait 30 minutes or two hours for the entire therapy to be administered.

But, in any case, I encourage you to look into this particular paper. I can send it to the email, but this was published in 2017 from the folks

in Germany, a very interesting review of this particular issue.

CHAIR METTER: Thank you, Dr. Jadvar.

Any other last comments from the Committee or the public?

MEMBER MARTIN: Yes. Well, this is Melissa Martin. I'd like to make a comment.

CHAIR METTER: Yes.

MEMBER MARTIN: Yes, I was the chair of the Committee that looked at extravasation and submitted that report. I would just like to reiterate the last comment. We looked at that extensively and submitted a report which was accepted by the NRC. And I do understand that the NRC is now doing their own investigation. So, I think this topic is being well handled.

CHAIR METTER: Thank you.

Any other final comments?

OPERATOR: I have a question from Michael Peters.

CHAIR METTER: Okay. Sure.

MR. PETERS: Hi. Yes. Hi. This is Michael Peters, the American College of Radiology. A couple of quick comments.

One, I would suggest, in the wake of the

first and most recent public comments about extravasation, that callers are encouraged to announce their affiliation for the public record. That would be helpful.

And then, the second is the OGC comment. I think that about practice of medicine in the context that you need discussion. Now that idea that the current T&E requirements conflict with the Medical Use Policy statement did not originate with ACMUI. It came up from NRC staff and state representatives. So, we certainly disagree with the idea that NRC setting minimum T&E requirements for AUs conflicts with the practice of medicine.

Thank you.

CHAIR METTER: Thank you, Mr. Peters.

Any other public comments?

(No response.)

Operator, is there anybody else on the line?

(No response.)

Well, hearing none, let's go on to the next item. And I'm sorry, Mr. Sun, for being a bit late here. And he will be giving an NMED overview on the NRC Nuclear Material Events Database.

Mr. Sun?

MS. JAMERSON: Dr. Metter, this is Kellee Jamerson.

CHAIR METTER: Yes, Kellee.

MS. JAMERSON: Is there a motion?

CHAIR METTER: Oh, I'm sorry. Thank you very much.

Could I have a motion to approve the Subcommittee's report?

MEMBER WOLKOV: Harvey Wolkov. Moved.

CHAIR METTER: Second?

MEMBER OUHIB: This is Zoubir. Second.

CHAIR METTER: Any discussion?

(No response.)

All in favor?

(Chorus of ayes.)

Any opposed?

Any abstentions?

Thank you, Kellee.

And the Subcommittee report is unanimously approved.

Our next item is on the NMED overview by Mr. Sun.

MR. SUN: Great. Thank you.

I just want to make sure everybody can hear me.

CHAIR METTER: Yes.

MR. SUN: Okay. Great. So, I'll go ahead and get started. And I don't see the slides up there yet, but I'll just go through what's on my computer and they'll catch up, I'm sure.

So, I'm giving the presentation today on an overview of the Nuclear Material Events Database. It's NMED for short.

Again, my name is Robert Sun. I work in the Medical Safety and Events Assessment Branch at the NRC.

Next slide, please.

So, what is NMED? I want to give some background on what that is exactly. I know sometimes it can have some confusion just because of the acronym. It sounds like maybe it's specifically medical-related. It is not. The acronym is for Material Events Database. So, it covers a wide gamut of event types.

It is what the NRC uses, the database, for tracking nuclear material events, and we have over 23,000 records of events submitted to the NRC by Agreement States since 1990. It includes multiple different event types, including lost, abandoned, theft, medical events, overexposure, release,

contamination, and equipment failure, among other things. The data in here is updated daily using event data that's reported to the NRC as well as Agreement State reporting and updates from licensees.

The NMED project objectives: we collect, review, and compile material event reports into NMED; develop and maintain the NMED website for NRC and state agencies. We develop NMED software for state agencies. We provide event analysis and assessments support and provide technical assistance to the NRC and states. So, this is actually a contract that we run that's operated through Idaho National Labs, and we maintain this database for use.

Next slide, please.

Who has access to NMED? The users include federal and state regulators or their contractors with sponsorship and a need to know. The current users are primarily NRC staff. That includes the ACMUI and Agreement State users. We do have other users from other federal agencies, including DHS, Customs and Border Patrol, DOT, FBI, DOE, the Navy, and the Air Force.

Next slide, please.

So, the NRC and the Agreement State event information kind of flows into two different lodgings

here. We have a local module which Agreement States would use. These are the Agreement State database software for each specific state, and this provides them the ability for data entry, query, and reporting on their own data. They have event data that's updated and maintained locally by those individual states, and we provide them technical support.

The national module is our national database software. The event data maintained in there is updated and maintained by INL, using the reports from the NRC reporting as well as information provided by the states.

The website is read-only. States do not enter their data here. They would enter it either manually or through their local modules, and then, it's sorted by the INL staff that actually enter it into the national module. And then, website access is for NRC and state regulatory agencies. As many of you would know, the website is below there: nmed.inl.gov.

Next slide, please.

So, in the national module data collection, our data collection includes Agreement State-regulated events. That's where the states collect data and submit it to the NRC and INL. It includes NRC-regulated events. INL collects data from

the NRC daily reports that are submitted to NRC, as well as our public ADAMS. That includes information mined from inspection reports, licensee reports, consultant reports, among other things. Additional information is also pulled from, clarifying information is pulled from requests for additional information for the INL staff; requests from our licensees and Agreement States after 57 days.

NMED only uses publicly-available information. And for consistency, event report abstracts are entered manually to try to use some similar language and similar writing techniques.

Next slide, please.

Some of the key information that we look at when we do event coding includes the event date. The most conservative date is used. We frequently run into that hurdle where a couple of dates might be provided as far as when something was discovered, but we use the most conservative date.

Event reportability. In a few cases, this does not strictly match the CFR. So, our staff looks closely at the different CFR reporting requirements, and then, this equivalent CFR for Agreement State events.

Multiple event types could be for a single

event record. A single event could overlap into medical events as well as overexposure for family.

Abnormal occurrences are marked as potential and provided to the NRC's AO Working Group, in support of the annual report to Congress. At the end of the year, abnormal occurrences which previously are potential are changed to "yes," once it is reflected in the annual report.

Next slide, please.

So, the event reporting schedule is defined by SA-300. And this is just a sample from SA-300, Appendix C, for Agreement States.

You see events fall under several different categories, including immediate, 24 hours, after 60 days, and volunteer reporting, along with some reporting guidelines in this table here.

Next slide, please.

Just additional general information on the NMED website, nmed.inl.gov. It is an events database. Generally, only reportable material events are included. We do get submittals of what we would consider non-reportable events, and those are kind of self-explanatory as far as licensees or Agreement States may submit conservative event information when it's uncovered. Likewise, as events develop and more

information is found, sometimes an event can move from previously reportable to not reportable, depending on information.

A couple of the key categories that we frequently get questions on that are kind of confusing to understand are "complete" and "closed". And so, just to talk about those real quick, complete records, complete events are events that are complete if they contain all the information required by SA-300. So, INL uses that SA-300 to determine if the event is complete.

Once we have all the information there, they will change the record to note that "complete" is "yes," as opposed to "complete, no". That's also what we base our requests for additional information off of, whether or not a record is complete.

"Closed" is different, in that events are closed when the regulatory agency plans no further action. And so, sometimes we'll have an event where not all the information is known yet that's been closed by -- whether it's the NRC Region, Headquarters, or an Agreement State -- where there is a request for an event to be closed indicating that no additional information is expected or known on that event.

Next slide, please.

So, "incomplete" events, I kind of mentioned the request for additional information already. These are sent after a record is still incomplete some days after the event has been reported.

Some of the things that we typically are missing include cause, corrective action, final dose assessment, radionuclide activity, device manufacturer information, and source manufacturer information.

Next slide, please.

So, some of the uses for the NMED website for folks that may have access already, but don't regularly use it or don't have access yet but would like it. So, to develop and save advanced searches is something that you can save under your profile basically. We have a library of quarterly newsletters and quarterly and annual reports. We currently are only publishing an annual report, but we have historical records of our quarterly newsletters and reports.

Folks use it to check a licensee's event history prior to an inspection. This is one of our key uses as far as like being able to support our inspection staff having the event history for them to

take a look at before they show up onsite.

Check a prospective company event history prior to authorizing reciprocity work.

Also, researching similar events for generic issues.

Locating owner of a found source.

Or reviewing events in a state or region.

And that includes finding incomplete events, finding open events, and finding events for which an RAI was sent, but no response is received. And that's part of our IMPEP program for when they go out to review a given state and actually a region. And that kind of feeds into preparing for an IMPEP review there.

Next slide, please.

Some additional clarification on what NMED does and doesn't do. I know, during the September 2019 ACMUI meeting, the Appropriateness of Medical Event Reporting Subcommittee was reporting on a number of findings regarding NMED. Some of these were identified as gaps in the database, and those were discussed. I did have a chance to review the report and presentation. Some of these findings were outside the scope of NMED's intended function. And I'm sure we'll talk more about the specifics. But, for now,

it's a general comment on that.

And next slide, please.

We put together just a brief what NMED does and does not do. NMED does provide access to federal and state regulators or their contractors. NMED does not provide access to general members of the public. It is something that we've looked at in a lot of detail in the past, whether or not we can make a public database. We've looked at it multiple times in the past. I think our most recent review of this was 2015 or 2016, and at that time we decided that NMED would remain non-public.

NMED also does serve as a tool to assist regulators in identifying generic change or problems. It does not serve as a platform for sharing operating experience of licensees for members of the public. And this point is really more on the business side of things. We do have requests for NMED access sometimes which are clearly financially-motivated from folks that are looking for a leg up maybe on their business competitors.

No. 3, includes a narrative and summarizes the event news and publicly-available information. It does not include a narrative that includes all the details, discussions, and causes. These can be found

on the inspection report. I think this is an important one to note. For NMED records, we do include a narrative. It is approximately a paragraph, sometimes a very long paragraph. We can't include everything that everybody wants in this narrative, even though sometimes that might seem like it's missing some information. Really, all the details in the discussion are in the native documents which can be found most likely in the inspection report or the actual report.

These are listed as references in the record, and it's something that folks can look into through the public ADAMS, access if they're interested in it.

No. 4, capturing critical event information and requests for additional information within the scope of the reporting requirements. It does not have the authority to dictate level of detail or information provided in the event reports beyond what's required in 10 CFR.

This is also important to note, that the CFR has specific center reporting requirements which licensees' and Agreement States' reports are based off of. The additional detail they provide is up to them on how to provide it, you know, how it's written, and

sometimes the level of detail in which it's provided. So, I know there's a desire to understand more or collect more information, but that's really beyond the scope of what the NRC can ask for from the regulatory basis.

No. 5, operate within the confines of 10 CFR, and that does not establish new reporting criteria. So, if expanding on the reporting criteria is something that's found to be necessary, you know, that's something that the NRC would need to pursue outside of what NMED does. So, we want to make that clear, and that is a separate module. Really, it's carrying out what's defined in the CFR and the mission of the NRC.

Next slide, please.

There's just some more contact information here. My name, again, is Robert Sun, and my phone number and email address are there for you to contact me, if you need. And also, our NMED INL team contact information is there as well.

So, I think that was our last slide. I'll open it up for questions.

CHAIR METTER: Thank you, Mr. Sun.

Are there any questions from the ACMUI Committee?

MEMBER ENNIS: Hi. This is Ron Ennis.

First, thank you very much. That was really very helpful.

And I would suggest to Kellee perhaps that in the future, when new members join, maybe this could be part of their onboarding. I think it's really important for members of the ACMUI to understand well what NMED is, all that.

So now, just to focus on some of the specifics, though, how many FTEs work on NMED?

MR. SUN: It's several folks that are part-time. I'm not sure exactly what the FTE count is.

MR. EINBERG: Yes, this is Chris Einberg. So, maybe I can help.

So, Robert Sun is the NMED Project Manager, and this is certainly not his full-time duties. This is a partial duty of his. But we do have the Idaho National Lab contractor who does the coding for us and maintains the NMED database. And there are, as Robert pointed out, there are several staff members there at Idaho National Labs that do the work for us. And so, I don't have an exact number for you, but there are a few people who support that from Idaho.

MEMBER ENNIS: Okay. So, maybe some specifics. Could you show slide 10, please?

Great. Thank you.

So, I just want to focus on the next-to-last bullet, "Finding incomplete records, open events, and events for which an RAI was sent out and found no response." Could you just describe in more detail like how that is done, like how people on the staff recognize that these things are still open? What's the mechanism for tracking that and closing that loop?

And I'll be transparent. We did, our Subcommittee, an audit, if you will, and we found significant issues in this regard. This was one of our troubling findings. So, we're interested in improving that.

MR. SUN: Yes, sir. And were you asking from the perspective of like our INL contractors or for somebody that was like an inspector?

MEMBER ENNIS: No, no. I'm asking from the INL perspective.

MR. SUN: Sure. So, it's pretty simple to search for incomplete events. It's just part of our events search feature. You can just click on "incomplete events" or "complete events equals no," and you can conduct that search. As far as finding

open events, the same method.

Finding events for which an RAI was sent, but no response is received, we can look at it on an ongoing basis as far as when an RAI would be sent. Our threshold is 57 days. We do not send follow up emails to request that information. So, it is just a one-time RAI.

And the reason for that is that, as we're working with our licensees and our Agreement State partners, the level of detail that they're providing for some of this information is provided on a partnership, a voluntary level at times. So, the level of detail can vary for that.

But, as far as finding the incomplete events, finding open events, and finding events for which an RAI was sent, that's basically an automatic process for us as far as being able to search for that and generating the notification that we need to send those out.

MEMBER ENNIS: So, is there a particular person whose responsibility it is to look for these, and how often are they supposed to be looking for these?

MR. SUN: Yes, there is a specific person at INL. And I'm not sure if I understand the rest of

your question.

MEMBER ENNIS: No, just if there's a person, then how often is he or she supposed to actually look for these? I mean, we did an audit in fiscal year -- this is not that many months ago -- we looked at 2017-18 and we found 23 percent with no cause and no corrective action. We found 11 percent that were incomplete or still pending information, and a couple of years had already gone by. So, I'm just trying to understand the process and why it's not working that well.

MR. SUN: Yes. You know, I don't know the answer for why you would have found those numbers. I don't believe that they're as high as you were there.

MEMBER ENNIS: Well, I mean, it's a fact. I can show you it's --

MR. SUN: Sure. So, this feeds into our IMPEP as well. And so, it's something that they would look at. Incomplete and open events are something that are pushed to be closed on a regular basis.

MR. EINBERG: Yes. So, this is Chris Einberg.

MR. SUN: And that's not just from the INL staff. This would be from the Agreement State management as well as the NRC regional management.

So, I mean, I've seen plenty of examples of Agreement States RSOs taking ownership of completing their incomplete and open events.

MEMBER ENNIS: It would be reflected in NMED, right? No matter who took ownership, once it was completed, it would be reflected, correct?

MR. SUN: Correct.

MEMBER ENNIS: Yes.

MR. EINBERG: Yes, this is Chris Einberg.

So, after our last meeting, I had the Regional Coordinators work with the Regional Agreement State Officers. And each region has a Regional Agreement State Officer that interfaces with the Agreement States to close out some of the NMED items that were still pending information. So, she's worked with the Agreement State Officers, and the NMED database should be more up-to-date or up-to-date. And I don't want to make any promises that it's up-to-date, but a lot of the pending items that were still waiting for information have been addressed.

MEMBER ENNIS: So, like has there been a change in process that we can be assured, going forward, that's going to be the case or was this a one-time, you know, cleanup?

MR. EINBERG: Yes. No, this is, yes, a

process issue. We'll work with the Agreement State Officers and evaluate the database, or we'll work with the Agreement State Officers to make sure that any events that were still pending information have been closed or received that information. So, that's part of her duties, is to maintain interface with the Regional Agreement State Officers.

MEMBER ENNIS: Okay. Great, great.

CHAIR METTER: Okay. Thank you.

MEMBER ENNIS: Yes.

CHAIR METTER: Any other questions?

MEMBER OUHIB: Yes. This is Zoubir.

If we could look at the last slide and the very last bullet point, on the right-hand side -- no, go back. This one, yes. Sorry.

NMED does not, item No. 5, "establish new reporting criteria". Can you elaborate a little bit on that? Are there any particular items that you might be looking into or considering going on?

MR. SUN: Okay. Nothing. Nothing specific to NMED. I think the point of this is that NMED does not control the reporting requirements or reporting criteria for that actually. And that's the primary point there. I know the agency is conducting different little updates on an ongoing basis. So, I

won't comment on that, but as far as NMED goes, it does not play a role in establishing the new reporting criteria.

MEMBER OUHIB: Okay. Sorry. I misunderstood that. Thank you for the clarification.

CHAIR METTER: Okay. Thank you, Mr. Sun.

Are there any questions from the Committee or the NRC staff?

(No response.)

Okay. So, it looks like this is the end of our morning session. And I'd like to go ahead and resume the afternoon session after lunch, and I apologize for the shorter lunch break, but we'll start at 1:15.

PARTICIPANT: So, we'll call back in, right?

CHAIR METTER: No. I believe, Kellee, you will mute our lines and, then, we'll just stay on the line?

MS. JAMERSON: Yes, that is correct.

PARTICIPANT: Okay. Thank you.

CHAIR METTER: Okay. So, we're back at 1:15.

(Whereupon, the above-entitled matter went off the record at 12:49 p.m. and resumed at 1:15 p.m.)

CHAIR METTER: Good afternoon and thank you again for returning for the afternoon session of the ACMUI 2020 spring meeting.

Next on the agenda is ACMUI reporting structure by Ms. Kellee Jamerson.

MS. JAMERSON: Good afternoon. This is Kellee Jamerson, and it is time now for the ACMUI's annual review of the committee reporting structure.

So, for today's presentation I will be covering our current reporting structure, what we do for our annual review, meeting frequency, and open it for discussion to the ACMUI.

As you see on this slide, this provides a graphic of the current reporting structure. The ACMUI reports directly to Mr. Michael Layton, who is the Director of the Division of Materials Safety, Security, State, and Tribal Programs in the Office of Nuclear Material Safety and Safeguards.

My branch, the Medical Safety and Events Assessment Branch, also reports to Mr. Layton.

Mr. John Lubinski is the Director of NMSS, or the Office of Nuclear Material Safety and Safeguards. And it goes up to Executive Director of Operations, Margaret Doane, and to the Commission.

While the ACMUI does not report directly

to the Material Safety and Events Assessment Branch, this branch supports the day-to-day activities of the committee.

So, in September 2012, the ACMUI recommended to have an annual review of its reporting structure. During the bylaws presentation, former member Dr. Zanzonico presented the committee with the option to continue reporting to NMSS or to report directly to the Commission.

The subcommittee report stated that the working relationship between the NRC and the ACMUI remained excellent, and the reporting structure of the NRC staff continued to function effectively.

The subcommittee agreed also at that time that the associated logistics associated with direct reporting to the Commission, such as the need for more frequent meetings, did not and does not justify any change in ACMUI's reporting structure.

So currently the ACMUI holds two meetings at NRC headquarters each year, one in the spring, typically March or April, and one in the fall, either September or October. And the ACMUI also holds approximately two to three teleconferences on an as-needed basis throughout the year.

So, with that review of the current

reporting structure, I'd like to pose a question whether the committee is satisfied with the current reporting structure, and if there are any issues with the frequency of the face-to-face meetings, and what changes, if any, would you like to see.

And I will turn it over to you, Dr. Metter.

CHAIR METTER: Thank you, Kellee, for that review. Are there any questions or comments from the committee for Ms. Jamerson or Mr. Einberg? Does the committee feel that the frequency of our meetings is adequate? Anyone?

MEMBER JADVAR: Yes, I believe so.

CHAIR METTER: Okay. So it looks like --

MR. EINBERG: As a reminder, please identify yourselves.

MEMBER JADVAR: Oh, I'm sorry. Hossein Jadvar.

CHAIR METTER: Thank you, Dr. Jadvar.

Does anybody feel that we need to meet more often as far as face to face?

MEMBER GREEN: This is Richard Green. I think our meeting frequency is well-suited for the workload that we have today, and the reason why we could do this with so little face to face is the very

strong efforts put in by staff to support our efforts.

CHAIR METTER: Yes. This is Darlene Metter. Yes, I agree that staff has done an incredible job to help with our work and to actually be very flexible in these particularly difficult times and to continue to work on our responsibility to the public.

Are the -- Go ahead.

MEMBER OUHIB: Yes. This is Zoubir. I think it has worked very well. I would just say that in the event that we have additional issues, items, or topics to cover, it would be good to sort of do just like we're doing today perhaps and discuss those so they don't interfere with the face to face where we won't have enough time to actually deal with everything.

So it could be like an ad hoc sort of when needed.

CHAIR METTER: Thank you, Zoubir.

Do I have any other comments from the committee regarding Kellee's questions regarding the frequency of the face-to-face meeting and, I believe, our conference calls? Which in my opinion have been perfectly scheduled and really addresses the issues at the moment rather than waiting for our every-six-

months meeting.

Okay. Kellee, I don't believe anybody has any questions, unless I am -- There's a delay in responding. Okay.

MR. EINBERG: This is Chris. Yeah, this is Chris Einberg. I just want to thank the ACMUI members who have offered the kind words to the NRC staff. They do work hard to support this. And I think we do have a new tool in our belt now, you know, using these WebEx meetings that today, knock on wood, seems to be going very well. And I think we can try to incorporate some of these web tools into our teleconferences as well.

CHAIR METTER: Well, thank you. And after this we'll maybe have comments regarding -- we can be sending it to Kellee regarding the staff and regarding any suggestions for this meeting.

Although we are ahead of time, would it be all right to -- Mr. Einberg, to go ahead and go on to the next item with Mr. -- with Dr. Wolkov?

MR. EINBERG: Yes. No, it would be fine.

CHAIR METTER: Okay. So, our next presentation is by Dr. Harvey Wolkov, and he is going to be talking about the ACMUI Bylaws Subcommittee report.

MEMBER WOLKOV: Thank you. Good afternoon to the people in D.C., and good morning to the people on the West Coast. I'm Harvey Wolkov, and I am functioning as the subcommittee chair of the ACMUI's Bylaws Subcommittee. I appreciate the opportunity to present the subcommittee's report.

Next slide, please.

While the slides are going up, I will continue. The subcommittee members include Michael Sheetz, Megan Shober, Harvey Wolkov, and the NRC staff resource is Kellee Jamerson.

Next slide, please.

The subcommittee and its chair were appointed by ACMUI Chair, Dr. Christopher Palestro, on September 11, 2019. The subcommittee's charge is first to review and comment on term limits for the ACMUI Chair and Vice Chair, and if term limits were recommended, what would be the duration of term.

The second charge of the committee is to review the automatic succession of the ACMUI Vice Chair to Chair.

Next slide, please.

The subcommittee reviewed general advantages of term limits and succession, not necessarily specific to the ACMUI Subcommittee.

Next slide, please. It does not look like the slides are advancing. Thank you.

The potential advantages of term limits include bringing new ideas and initiatives, which I think we're several slides ahead. I think we jumped. And then -- Thank you. To bring new ideas and initiatives for the committee's review, including opportunities to increase the diversity of committee perspective.

So turnover rates in leadership can cause a foundation of stale ideas, whereas new perspectives inspire change that can prevent the committee from becoming stagnant. Motivation may increase with prolonged leadership and stopping of political power and maneuvering is another potential advantage of term limits.

Other potential advantages of term limits -- Next slide, please -- Including it's easier to remove passive, ineffective, or troublesome leaders term limits allows for leadership opportunities for other committee members. Members may not be willing to take the chair position if there is no end date, and board chairs require intensive commitment of both time and energy.

Term limits could potentially prevent

board chairs from burning out by shortening the duration of their commitment.

Next slide, please.

Further, potential advantages of term limits include allowing committees to adjust leadership to suit changing organizational needs. The BoardSource Nonprofit Governance Index published in 2007 demonstrated that board with term limits were more effective than those without term limits.

The report concluded that term limits can be extended to leadership. With term limits, there is no perpetual concentration of power and the group dynamic is constantly changing, preventing stagnation.

Next slide, please.

The subcommittee felt that there were several potential disadvantages to term limits, again, not all directed at ACMUI specifically. But one that was felt to be applicable to the ACMUI is good, hardworking leaders, which we have had, would be forced to leave the committee.

By having term limits, leadership vacancies must be filled, and the organization will spend more time and resources to recruit and educate a new chair. With new leadership, there is a learning curve. It has been said that it takes six months to

learn a job and another six months to be good at it.

A long-standing chair can bring invaluable knowledge such as institutional memory, better knowledge of process and procedure.

Next slide, please.

Other general disadvantages of term limits, there could be a potential for lots of networking benefits. This assumes leadership develops a professional network in government agencies or committees, such as ethics committee, or the staff, industry leaders, or others with mutual expertise.

A chair may be willing and highly motivated to continue to serve. Term limits could create professional disappointment and could create the potential for closing off leadership development and opportunity.

Next slide, please.

Further disadvantages of term limits, members may take their skills and interests to other organizations, which can result in a loss of expertise in leadership. And there could be loss of cohesion of the team or committee.

Next slide, please.

The subcommittee reviewed the duration of service. According to BoardSource's Leading with

Intent National Index of Nonprofit Board Practices published in 2015, almost two-thirds, or three-quarters actually, of organizations have term limits for board chairs.

About 38 percent serve one term, 31 percent two terms, 18 percent serve a three-year term, and only four percent serve four or more year terms. Most commonly, board chairs serve two consecutive terms.

Next slide, please.

The subcommittee reviewed the potential advantages and disadvantages of automatic succession. The main advantages for an automatic succession of vice chair to chair, it allows for smooth transition of leadership. The organization will spend less time and resources to recruit and educate a new committee chair, and the vice chair has time to be groomed for the position.

A major disadvantage that the committee saw was that there might be other committee members who might be more suited for a leadership position.

Next slide, please.

The current ACMUI bylaws state that the chair and vice chair will be appointed by the Director of NMSS. The chair and vice chair will serve at the

discretion of the Director of NMSS.

When considering term limits for the ACMUI leadership, the subcommittee did not feel most of the theoretical arguments that we looked at earlier, both pro and con, were particularly applicable to the ACMUI.

Next slide, please.

The subcommittee felt that the current structure defined in the current bylaws was working successfully and did not need to be changed.

We could advance a slide, please.

But the subcommittee felt that the relative short tenure of each of the subcommittee's members created some uncertainty amongst the subcommittee members regarding their recommendation.

If you could go back. There we go. Thank you.

Subcommittee members recommended that we canvas the opinion of two more senior members of the ACMUI regarding term limits and succession.

Next slide, please.

To this end, Drs. Ron Ennis and Vasken Dilsizian were provided the subcommittee's working material, and they were interviewed by the subcommittee chair. There was concordance of opinion

of the two more senior ACMUI members and the subcommittee with respect to both term limits and succession.

Next slide, please.

Based on these deliberations, the subcommittee recommends no change to the existing ACMUI bylaws. With respect to term limits, the subcommittee agrees that the ACMUI Chair and Vice Chair should be appointed by the Director of NMSS, and the Director should determine the duration of the term that is currently stated in the bylaws.

With respect to succession, the subcommittee agrees that the officer succession should be at the discretion of the Director of NMSS that is currently stated in the bylaws.

This concludes the report of the subcommittee.

CHAIR METTER: Thank you very much, Dr. Wolkov.

Do I have any comments or questions from the subcommittee itself? Do I have any comments or questions from the ACMUI committee itself? Do I have any questions or comments from the NRC staff?

MR. EINBERG: Chris Einberg. You know, thank you to the subcommittee for their work on this.

Reviewing the recommendations, it seems like there is sufficient flexibility within the existing bylaws, if the NMSS Director chose to instill term limits.

So, I think it's good to note that there is that flexibility there, and that the subcommittee supports that flexibility.

CHAIR METTER: Thank you very much.

Any other comments or questions from the committee or staff? Okay. Do I have a motion to approve the subcommittee report?

MEMBER JADVAR: Motion to approve. Hossein Jadvar.

CHAIR METTER: Thank you, Dr. Jadvar.

Do I have a second?

MEMBER DILSIZIAN: Yes, second. Vasken.

CHAIR METTER: Thank you, Dr. Dilsizian.

Is there any discussion? Okay. All in favor of the subcommittee report as stated, as presented, say aye.

(Chorus of ayes.)

CHAIR METTER: All opposed? Any abstentions?

Okay. Mr. Einberg and Kellee, the subcommittee report is approved by the committee unanimously.

Thank you very much, Dr. Wolkov, for your very succinct and very complete review of the current bylaws.

Believe it or not, we have another break, and we are -- we'll be following the publicized agenda. So we will reconvene at 2:45 for Dr. Howe's presentation.

So at this point I believe, Kellee, if you can just put us on mute, unless there are other comments from the committee or staff. Okay. We will be back at 2:45.

(Whereupon, the above-entitled matter went off the record at 1:37 p.m. and resumed at 2:45 p.m.)

CHAIR METTER: Thank you very much, and welcome back to the second half of the afternoon portion of the ACMUI spring 2020 meeting.

And our next presentation will be by Dr. Donna-Beth Howe on medical-related events.

VICE CHAIR SCHLEIPMAN: Dr. Howe, if you're talking, we can't hear you right now.

DR. HOWE: Just walked back into my office. I'm here.

VICE CHAIR SCHLEIPMAN: Okay.

DR. HOWE: Do you want me to start?

CHAIR METTER: Yes, go ahead, Dr. Howe,

and you'll be presenting an update on recent medical events. Thank you.

DR. HOWE: Okay. Let me get rid of something. Okay.

Next slide, please.

So I'm going to be talking to you about medical events for FY2019, and the first thing to know is that we have a dose threshold for diagnostic events, so that precludes reporting events for most years; and, second, there are approximately 150,000 therapeutic procedures performed using radioactive materials. So that's a very rough denominator.

So what you're going to see is that we do not have a lot of medical events reported, and so one cannot make statistical claims, one cannot make scientifically-based claims. All we're really doing is looking at events that were reported to the NRC, either by NRC licensees or Agreement State licensees, over the past year. And they're a snapshot in time of what was going on at that licensee's facility.

Next slide, please.

So I have more recently traditionally given the ACMUI a five-year window of what the trends are in medical events, and the numbers stay anywhere in the 40s to the 50s, and you can see that we -- for

2014/'15/'16, we had quite a few in the diagnostic medical events. Most of those are I-131 that were -- a therapeutic dose was given during a diagnostic procedure.

And then you'll see that most of our reporting events are coming down in 35.1000, and most of those events, as you'll see later, are in the Therasphere/SirSphere area.

Next slide?

That brings you up to date, and you can see that the trend over FY17 and FY18 for the diagnostic medical events kind of hit our normal of where we normally get. We don't get any. We did have one this year, and that will be an interesting one to talk about. And you'll see that we also had an increase in the number of medical events reporting in 35.300.

And part of that is due to the fact that we're having more radiopharmaceuticals that are being used for therapeutic purposes, and we're starting to see medical events with those radioactive drugs.

So, I've got a decline in 35.400. I have about the same for 35.600, and I have a slight increase for the 35.1000. Most of those are in the Therasphere/SirSphere area.

And I had kind of a bumper year; 56 medical events this year.

Next slide, please.

So, my one diagnostic medical event was the strontium/rubidium generator, and there were eight patients involved with this.

Next slide, please.

So, they received between 100 and 256 Centigray or rad to the red marrow, between 117 to 299 rad to the bone surface, and between 27 and 68 rad to -- as an effective dose. This was not my only strontium/rubidium generator event during FY19, but it was the only -- there were two, but this was the only one that resulted in medical events.

There was excessive strontium-82 and 85 breakthroughs for three days at this licensee's facility. The breakthrough tests were being performed every day, but they were being performed by three different individuals and each recorded no breakthrough values. So that is kind of unusual. You'd think that it had three different individuals doing the tests, that some of them would have picked up the right breakthrough information, but none of them did.

And, unknowingly, on day one, there was an

elution of the generator with Ringer's Lactate. You will find that I went into a much more extensive description of this event and the three other strontium/rubidium generator events in a recently published information notice.

So how did they discover that they had a problem? Because it went on for three days; they had records that said no breakthrough. Well, on the third day -- well, on the second day, we got an unexpected waste survey result. And then the next morning when they expected it to be back to background, it was still there.

So, they started looking at the vials that were used to measure breakthrough, and they discovered that there was still quite a bit of activity, which meant there was strontium-82 and 85 in those vials.

Next slide, please.

So, the primary failures were basically human error. There was the inadvertent use of Ringer's Lactate to elute the rubidium-82 generator. There was also a concern that at this point there was a shortage of sodium chloride and that this Ringer's Lactate got inadvertently placed into a normal location for the sodium chloride.

And there were inadequate practices in

conducting the quality control of the strontium breakthrough analysis.

The corrective actions are they immediately stopped the rubidium generator program. They are now automating their medication dispensing system with medication scanning prior to each administration. This is done to primarily ensure that they have sodium chloride as the elution agent, and they don't have any other liquid in that area.

And they are doing daily audits of the IV fluid, and they are modifying their forms, they are obtaining new equipment, and they are training personnel. And it ends up that if you use Ringer's Lactate, it has calcium in it, and that calcium substitutes for the strontium on the rubidium/strontium generator, and the strontium comes off in the elution.

And it only takes one elution to ruin the generator. So, as you can see, there were three days of high strontium activities in the -- in the eluent for all three days. So, it doesn't stop as soon as you switch over to sodium chloride.

Next slide, please.

So, we'll move on to the 35.300, which are the written directive radiopharmaceuticals. We had

nine of those. Normally, they are primarily Iodine-131. This time we have I-131, samarium, radium, and lutetium. And in the I-131, we have a normal oral sodium iodine-131, but we also have a monoclonal antibody.

Next slide.

So, we have two of the liquid I-131s. They were prescribing a dose of 2.7 gigabecquerels. They administered 2.7 and -- when they prescribed 6.5 roughly. And what happened? Well, the patient wasn't able to swallow, so they decided to administer the liquid sodium iodine through the feeding tube, which was inserted into the patient's gastric tube.

They thought things were going well. They did a wash, and they discovered there was a pool of radioactive liquid next to the patient on the disposal drape, on the patient, and on the imaging table, after flushing the tube.

So, the feeding tube was removed from the gastric tube, and they had no further problems.

Next slide.

So, they had the spill from the feeding tube. They contained the spill. They decontaminated the patient in the site, and no hospital personnel were contaminated. They couldn't determine how much

I-131 they had given to the patient, so they went back and looked at the activity of the spill, and from that they were able to give -- and with conservative decay calculations, they were able to estimate how much of the material spilled.

They concluded the cause was a feeding tube failure, and their corrective action is they don't plan to perform any more administrations of I-131 through a feeding tube.

Next slide.

So, in our next case, it was the wrong patient. They were treating a patient with hyperthyroidism, and instead of administering 0.5 gigabecquerel, they administered 1.2 gigabecquerel. They picked up the wrong I-131 capsules and administered it to the wrong patient. So, the techs were re-educated on the importance of following procedures for administering radiopharmaceuticals.

Next slide, please.

So, this is the antibody case. They were -- they administered 17 gigabecquerels, and they were supposed to administer 29 gigabecquerels. So, this was a clinical trial for acute myeloid leukemia, and they were using a delivery system under research and

development protocol.

The delivery system was designed, was determined to be the cause of the problem, and the design prohibited the licensee from visualizing the dose vial and it required the manufacturer to set up the infusion time. The manufacturer was present and did assist in setting up the delivery system and the infusion time. So it was more the functioning of the delivery system.

And what was the corrective action? Well, this particular licensee decided they were no longer going to continue in the trial until there was a development of a system where they could visualize the dose as it was being delivered.

Next slide, please.

So now we have samarium-153 Quadromet. They administered 86 megabecquerel, but they prescribed essentially two gigabecquerel. The samarium was leaking, initially through a crack -- they thought initially through a crack in the locking assembly on the IV tube. But later on, they concluded that it was from a location that the IV tubing itself failed.

They believe that it was abraded at the time of the need insertion, and that the added

pressure from the dose administration caused the tube wall to fail and the leakage.

Next slide.

We had two Xofigo cases. The first one was an incorrect written directive. They administered three megabecquerel per the standard dosage protocols. And it was dispensed correctly by the pharmacy, and it was administered to the patient.

So, the patient received what they should have received if the written directive had been correct. The licensee -- the problem was the licensee assayed the dosage vial using an incorrect setting on the dose calibrator, and they take that assay dosage and they write that as what is going to be delivered on the written directive.

So the written directive was filled out in accordance with the incorrectly assayed dosage, and it resulted in an incorrect written directive.

Now, the written directive regulations were set so that the physician can order the correct activity, and that they can measure the correct activity, and they can administer the correct activity. And the written directive should have that information.

It can be checked at each one of those

stages -- ordering, measuring, and administering. And in this case, they waited until the end before they put the activity on the written directive.

Next slide.

So, in the future, the written directives will receive the physician's signature and approval prior to assaying the dosage. That was the intent of the regulation. They discovered during a routine -- and they didn't discover it until a routine written directive audit, and from now on the written directives will be audited quarterly by the RSO or the RSO's designee.

Next slide, please.

Now here is the other half of our radium-223. In this case, the patient received half of two administrations. There were -- the dosage was divided into two syringes because of the size of the patient, and the doses typically arrive in 10 cc syringes.

After the first syringe, the licensee discharged the patient, and it wasn't until they realized that the second syringe was still in their possession that they realized they had a medical event. So, in this case, they had the patient return the following day, and they received the second

syringe.

So, the corrective actions include additional training and supervision to personnel.

Next slide.

Okay. And we've got two Lutathera -- three Lutathera medical events. The first one is an infusion pump issue. They prescribed seven gigabecquerel. They received only four, roughly five gigabecquerel. The infusion method had the potential for small bubbles to develop in the infusion line, causing the pump to alarm.

The primary technologist was aware of the issue, knew how to prevent it, but that technologist was called away and instructed the second technologist to pause the infusion and contact her if the pump alarmed.

Next slide.

So, of course the pump alarmed. The other technologist did not call the first one but tried to restart the pump on her own. And that resulted in a larger bubble being formed in the line. And then this technologist still didn't call on the first technologist, but they asked a nurse to assist in purging the line. But the nurse wasn't familiar with the system, and the nurse ended up draining the

lutetium-177 into the emesis basin, thinking it was saline.

So, they contaminated the staff, the patient's clothing, and the areas of the treatment bay. They held the clothing for decay, and the treatment bay was decontaminated. So, the makeup dose was administered the next day to complete the patient's planned therapy. So, they retrained applicable staff members and modified the lutetium-177 infusion method.

Next slide.

Our second lutetium medical event. This was a vial issue. They administered five gigabecquerel. They intended to administer seven gigabecquerel. There was a loss of integrity of the air seal on the Lutathera vial. It caused the fluid level to rise within the vial.

They leave a positive pressure cap on the peripherally inserted central catheter, offered resistance to the flow, and led to the fluid level raise in the vial. And they also thought the height of the vial was too low relative to the entry point in the patient and that affected the gravity influence on the flow.

Next slide, please.

So their corrective actions were they revised their written procedures to require replacing a positive pressure cap on the line from the vial to the patient with the free flow cap to reduce back pressure in the line, to increase the height of the dose vial above the patient's catheter input port to provide added gravity assist, and inserting needles into the vial septum at an angle to keep the needles from moving and causing stretching of the rubber cap from the weight of the attached tubing. And they revised the written directive form.

Next slide, please.

And the third one was a pretty interesting one. The licensee essentially asserted that there was a problem with the FDA protocol and the medical license restrictions with the root cause. They intended four treatments of lutetium-177 at seven gigabecquerels, 200 millicuries each, to the midgut.

The physician changed the dosage on the fourth and final treatment from 200 millicuries to 100 millicuries. Per the FDA protocol, the commercial nuclear pharmacy said it could only ship full vials of Lutathera at 200 millicuries, and if the physician wanted to administer half the dose, then the medical facility would have to do it. But the medical use RSO

informed the medical physicist and the physician that they were not licensed to split doses.

Next slide.

So, the patient agreed to a full dosage of the 200 millicuries but needed a prescribing -- but they didn't revise the written directive, and so the RSO notified the prescribing physician, the patient, the written directive was not updated and that caused a medical event.

So, the highest critical organ doses in excess of the prescribed written directive to the spleen were 304, and the kidneys 235 Centigray.

The licensee will consult with the primary physician and update the written directive if the dose in the written directive cannot be provided by the radiopharmacy.

So, in this case, the physician revised the written directive from 200 millicuries -- do I have it right? To 100 millicuries. And when they gave the administration, they did not go back and revise the written directive back to 200, which is what they gave them.

So next slide, please.

So now we move on to the 35.400 medical events. And in this case, I have five prostate

events. One licensee had two separate reports. We have wrong site, we have source activity error, and we have no post-implant procedures.

Next slide, please.

So, this is -- I'm going to start with the licensee that had two separate reports. So, in Report 1, they prescribed 10,000 Centigray with palladium seeds. The pre-planning treatment plan was revised periodically during implantation using ultrasound images of seed positions. They determined in the end they had a D90 of 102 percent. But at the 30-day post-implant CT scan dosimetry evaluation, the D90 was determined to be 74.8 percent of the intended dose.

And they determined that the prostate gland was larger at 30-day CT compared to the day of implant. And they assumed the cause was post-operative swelling, and it was identified on inspection. So, it was identified way after the event happened.

Next slide, please.

So, this is Report 2. In this case, they once again wanted to prescribe 10,000 Centigray with palladium seeds, and they delivered, but they didn't deliver that amount. So, once again, they were taking the pre-planned treatment plan, and they were revising

it as they went using ultrasound. And they determined their D90 was 82 percent.

But 30 days post-implant, the scan dosimetry evaluation was that D90 was 62 percent of the intended dose, and the cause, once again, was post-operative swelling and it was identified on inspection.

Next slide, please.

Wrong site. In this case, they were trying to give 10,000 Centigray to the prostate with 52 seeds. All of them were implanted inferior to the prostate by four centimeters in the penile bulb. They misread the ultrasound image. It was discovered 42 days later during a post-implant dosimetry review. The estimated dose to the prostate was zero Centigray, and exposure to 90 percent of the penile bulb was 7,000, rough 400 Centigray.

A second implant was planned. It was human error. The corrective actions include providing additional instruction to personnel.

Next slide.

So, this one is a wrong seed activity. They prescribed six gigabecquerels, but they administered almost eight gigabecquerels. The dosimetrist entered an incorrect source strength,

weaker seeds into the planning system. So the total source -- So that caused the number of seeds to increase, and so the total source strength was 29 percent greater than intended, and the dose was 24.4 greater than prescribed. They discovered it during the post-treatment review and CT scans.

Next slide.

So, their corrective actions were during receipt and assay they are going to highlight the source strength on the manufacturer's data sheet, so that they carry over the right source strength. And the physician and the dosimetrist physicist will ensure prior to implantation that the correct seed strength is being used and is being input into the planning system.

Next slide.

This was an interesting one. This licensee had no post-implant procedures. They prescribed 6,000 Centigray, and they delivered 12,000 Centigray. It was discovered during inspection.

Actually, the inspectors identified a potential of six cases that may have been medical events, but the licensee didn't have written procedures for prostate seed therapies to ensure the

administrations were in accordance with the written directive. So some of those were very difficult to calculate what doses actually -- what activity was actually given. So, and actually two had no post-operational dosimetry report.

The good news is the licensee no longer actively is engaged in brachytherapy, and the Authorized User is no longer with the licensee.

Next slide, please.

The report talked about the appropriate nomogram and/or procedures referenced were no longer available at the licensee's site. So, for corrective action, the licensee will ensure that either procedures are established, or the modality authorization will be removed from the license.

Now, part of the problem was the Authorized User moved to another facility utilizing the same procedures. So the regulator is going to follow up with a new facility to ensure that the procedures are adequate and implemented at this new facility.

Next slide, please.

So now we have 35.600 medical events. All of them this time were for the HDR unit. There were nine medical events, and there were 10 patients. So

we had device malfunction, we had wrong site five times, wrong plan once, catheter issues once, and unidentified human error.

Next slide, please.

Wrong site. In this case, they prescribed 2,400 Centigray to the uterus in three equal fractions using three guide tubes. But the patient only received 1,600 Centigray. All three source guide tubes in the final fraction were too long. They used 132-centimeter-long guide tubes instead of the 120-centimeter ones, and the entire 800 Centigray was delivered to the vagina.

The patient returned for monitoring and had very mild skin reaction that resolved without any major intervention.

Next slide.

The cause was determined to be human error. The corrective action is they are now going to split up the different length guide tubes, so that one series, the 120 centimeters, will be on a wall, and then the 132, which are green, so they were different colors, will now be on a different rack. So they won't be stored together. And the doctor is also going to use a ruler to verify the length of the guide tubes before each treatment.

Next slide.

Wrong site. Once again, we have a catheter length problem, but it's slightly different. They prescribed three fractions, intending the target to receive 50 percent of the 1,400 Centigray. And the intended tissue -- and in this case, the intended tissue received only 50 percent of the 1,400 Centigray, and the unintended tissue, the thighs, received 700 Centigray.

The catheter length should have been 1,500 millimeters. The planner noticed the length incorrectly set at 1,293 millimeters and changed the setting to 1,500 millimeters but failed to press the enter key. So they corrected it, but didn't enter it in, so it wasn't corrected.

The plan approved with the incorrect setting, and the first and second fractions were completed. Another physicist reviewed the plan and discovered the error before the third fraction.

Next slide.

The error -- is somebody talking? Okay. The error was due to failure of the technician to correctly change the distance in the treatment plan, and the failure of individuals who reviewed the first two treatments to catch the error.

Corrective action is treatment plans will be developed to correct the exposure to the intended -- future treatment plans will be done to correct the exposure to the unintended -- the intended tissue, and individuals will receive additional instructions on performing thorough reviews of treatment plans prior to performing a treatment.

Next slide.

They prescribed two fractions at 500 Centigray to the vaginal cuff per fraction. In the first fraction, a vaginal cylinder was placed in the vaginal canal and the positioning was verified by the cone beam CT scan, and the cylinder was then connected to the afterloader.

After completing treatment, the vaginal cylinder was discovered to be dislodged from the initial position and between the patient's legs. They estimated a 500 Centigray skin dose was delivered, but there was no erythema at discovery.

Next slide.

The patient indicated that she had coughed at some point during the treatment, which may have contributed to the dislodgement of the cylinder. The corrective actions were to purchase a more rigorous immobilization device for the applicator, the

researchers do an update of the brachytherapy monitoring procedures and devices throughout the system.

Next slide.

Wrong site. Two patients. Both patients were prescribed 1,000 Centigray to the vaginal cavity across two fractions, but only received five percent of the dose to the target area. They both received 10,000 Centigray to a distal part of the vaginal wall instead of 200 Centigray for the first patient, if it had been given correctly, and 50 Centigray for the second patient, if it had been given correctly.

The technician entered the applicator length at 120 centimeters into the device console instead of 125 centimeters. So it caused a five centimeter offset.

Next slide.

The problem was that two years earlier the length of the vaginal applicator changed from 120 centimeters to 125 centimeters. So, obviously, this licensee doesn't do a lot of these procedures, but -- so the corrective actions were to reorganize the applicator and the catheter storage, separate the cabinet for the applicator using different treatment lengths, and they added and posted timeout procedures

with items to be verified before treatment.

And the Quality Management Program form, they added the total length of the rigid tube connecting to the transfer tube verification, and they also color-coded on the quality management form those high-risk items that need to be checked.

Next slide, please. Next slide.

Okay. Corrective actions were annual review training by the physicists for AUs, AMPs, and therapists, emphasizing the importance of timeout; verifying plan parameters versus delivery parameters; and that the rigid guide tube and the transfer guide tube total length can differ between applicators. And they are also conducting a risk management meeting to further analyze their workflow in place.

Next slide.

Wrong site application position. They prescribed four fractions, and the bowel, the non-target tissue, received in excess of 50 centisieverts or rem and 150 percent of the expected dose from all fractions. The cause was positioned the uterus/ovary applicator in the wrong location on the last fractions.

The intended target tissue received the intended dose in each fraction. They also did a

recalculation to the larger volume and decided it came below the reporting level.

Next slide, please.

In this case, we have a series of errors. They copied the wrong length for catheter. They were prescribing 550 Centigray over five fractions for a total dose of 2,750 Centigray to the cervix. They were using a Syeb-Neblett template and seven catheters, two being 25 centimeters in length and five being 30 centimeters in length.

The inferior surface of the right vaginal wall, two-centimeter volume and approximately five centimeters from the cervix, received a total of 726 Centigray and 236 Centigray from later makeup treatment. So over the five -- so it received -- intended to receive 590 over the five fractions, a difference of 372 Centigray or 63 percent.

Next slide, please. Next slide.

Okay. The physicist copied -- back one. Can we go back a slide? No, not the equipment failure. I need -- it may be 42. Let's go to 40 -- yeah, okay. This is it. No, next slide. Maybe 43. There we go.

The physicist copied the catheter length from one of the 25-centimeter catheters in the first

fractional plan and pasted it into two of the 30-centimeter catheter locations in the second, third, and fourth fraction plans. The error was identified prior to administration of the fifth fraction.

So ultimately the patient got the full intended dose to the tumor. The corrective actions are they updated procedures to record catheter length in a separate document during measurement, and they no longer use different catheter lengths.

Next slide, please.

Equipment failure. In this case, the licensee intended to deliver three HDR treatment fractions with a total treatment time of 222.6 seconds divided through eight source positions. Twenty-five seconds into the treatment, the HDR unit issued an inactive source error and retracted the source.

The physicist confirmed the source had retracted. The manufacturer recommended turning off the console key and then turning it back on, and they did that, and then the system came back on and it failed 25 seconds into the reset treatment.

Next slide, please.

So, the remaining treatment plan was saved. The patient -- they removed the applicator and sent the patient home. The service representative

replaced the Muller board and verified functionality, and the final position of the treatment was delivered a few days later without incident, and the patient was informed at this time that the attending physician was not notified for another six months.

Next slide, please.

Okay. Wrong treatment plan.

Okay, they prescribed 10 fractions of 625 centigray per fraction for five days. One fraction received 187 percent of the fractional dose. There was a pretreatment setup.

It went satisfactorily. It included a timeout. They did a test run of the dummy source for clearance of each channel and it resulted in an electronic defect error, so the treatment was aborted.

The physicist confirmed that no dose was delivered. The physicist loaded, in this case, the first treatment plan in the list, not this particular patient's treatment plan, and then looked at the pretreatment report and got a treatment code needed to start. Next slide, please.

So, the doctor started the treatment and the doctor and the physicist were monitoring the patient via the closed circuit TV, but they weren't monitoring the treatment console.

So, the physicist didn't hear the system change to a different channel, and finally looked at the treatment console and recognized that something was wrong, and all of the dwell times were in channel one.

So, the physicist stopped the treatment and informed the doctor of the wrong treatment plan, and the cause was that after the aborted test, there was neither a timeout or a plan verification, and the treatment console wasn't being monitored. Next slide, please.

So, for corrective actions, now when they have an aborted treatment, the entire review process is to be redone to confirm no changes in the patient setup or treatment plan parameters, the pretreatment report to be printed out, reviewed, and compared to the approved treatment plan.

Both treatment console and TV will be monitored at all times during the treatment. Training in updating the timeout and the plan verification process as planned. Next slide, please.

In this case, the error wasn't identified, and by that, I mean we got so little information off of this medical event that we really don't know what the problem was, and the corrective actions are so

generic that it doesn't give you any clue to what the error was, but they prescribed 700 centigray per fraction and received 467 centigray in the first two fractions, and it was identified before finishing the third fraction.

The cause, human error. Corrective actions: amend the written directive to give additional fractions, and this is a corrective action for the future, so that the patient gets the right treatment, and then they're going to update the procedures and provide retraining. So, that was not very informative. Next slide.

So, now we'll move on to our 35.1000 medical events. We had a total of 32. We had two Perfexion events and we had two intravascular brachytherapy events, and then we will go into the final 28 yttrium-90 microsphere events. Next slide, please.

So, the Perfexion, in this case, the head frame slipped. We've got two of those. On the first one, the patient's head may have slipped forward in the stereotactic frame by two millimeters. There could have been a collimator collision error during treatment.

The treatment was halted. The patient was

removed from the gamma knife, and then the AU recognized looking at the frame, he didn't see anything wrong and the treatment was resumed. Next slide.

But after treatment, the neurosurgeon noted when removing the frame that the frame had shifted. They didn't know when the slippage had occurred, and the dose could be 50 percent of the prescribed dose if that was during treatment.

They intended to use a follow up MRI scheduled 51 days later to help determine if a medical event had occurred. Unfortunately, the patient died before the MRI date. Next slide.

In the second incident, they were planning for 2,500 centigray or a 36, or 37-minute trigeminal neuralgia treatment at a single position. With eight to nine minutes remaining, there was significant patient movement, but the patient complied when asked to hold still.

At about four minutes remaining, the treatment was stopped when the head fixation frame was recognized to have been shifted. The anterior pins almost touched the skin two inches above the original pin sites. Next slide.

They estimated that the unintended target

volume may have received four to five minutes of dose or roughly 270 to 340 centigray, and the intended treatment site received between 2,230 to 2,160 centigray.

The incident is now going to be covered in the licensee's annual training review, and the licensee contracted Elekta to assess possibilities for managing the frame fixation issue. Next slide.

So, now we're moving on to the intravascular brachytherapy. We have the wrong treatment site and both of these events occurred at the same licensee's facility. They were identified at inspection, and one of them had happened about a year before the inspectors identified the first medical event.

So, in the first, they were prescribed to receive 1,800 centigray to a coronary artery. They received zero. The regulator estimated that the aorta 60 millimeters proximal to the intended target received 66 centisievert. The licensee calculated that the intended target -- unintended target received only 0.6 centisievert.

They aborted after attempting to reach the treatment site three times. The source train was retracted without complication. There was no

procedural or regulatory violations and no equipment failures. Next -- next slide. Somebody is not on mute.

So, in the second one, they prescribed 1,800 centigray to the circumflex artery and they received zero centigray. The unintended site received 98 centigray. They attempted the procedure three times.

The source stopped 10 millimeters proximal to the treatment site, the junction between the left coronary and the circumflex artery. They aborted the treatment. The source was retracted and there was no indication of delivery catheter kinks. Next slide.

We missed the second slide on the first one because in both cases, the root cause was determined to be tortuous patient anatomy.

In this one, it was failure to follow procedures, and their procedure they didn't follow was they were supposed to insert the delivery catheter, withdraw the guide wire, and then extend it back out using it as a dummy run to check for restrictions prior to sending the source train, and they didn't do that.

So, the corrective actions are additional personnel receiving training and commit to follow

previously submitted procedures. Next slide.

Okay, now we're moving into the yttrium-90 microspheres, and normally I break them down into Theraspheres and SirSpheres because they are slightly different systems and they function slightly differently. In this case, I've got one that's unknown. Next slide.

So, the patient received 76 percent of the planned dose. The remainder of the activity leaked out because of a faulty stopcock assembly, and the affected area was contained and decontaminated. Not a lot of information. Next slide.

So, now we'll get down into the ones that were identified as either Theraspheres or SirSpheres and I'm going to address the Theraspheres first. There were 15 of those.

There were three overdoses, one wrong lobe, two air bubbles, two kinks, one stasis, two catheter diameter, one calibration date, and three equipment failure. Some of these overlap and have multiple -- some of these causes will show up in multiple cases. Next slide, please.

The overdose, no procedures or not followed. They prescribed 12,000 centigray. They received 69,000 centigray. The correct dose order

either was never received by the Nordion/BTG or was never ordered.

The staff didn't properly assay the microspheres in the hot laboratory, and they did not reconcile it with the prescribed dosage. The dosage was not confirmed prior to administration. They did not perform an additional timeout to use the usual timeout checklist in addition to confirming the prescribed and assayed dose to be infused. Next slide.

So, also, they didn't have adequate documentation processes, and they needed to document retention of -- they didn't bother to document retention of order, dose orders.

So, now they have a formal timeout in the procedure room when a dosage is brought into the treatment room. It includes the same checklist as the original procedural timeout in addition to the prescribed and assay dosage.

The dosage assay process and documentation now require two nuclear medicine technologists. They have an enhanced radiopharmaceutical ordering and shipping, tracking, and reconciliation process. Next slide.

So, they are going to retain all

radiopharmaceutical ordering forms and written directives. They are going to revise the written directive worksheet to differentiate between prescribed and administered dosage. They're going to use patient identifiers in the Nordion/BTG order reference number field so they get the right patient.

They're going to add administered dosage in the standard radiological report template. They're going to provide training to the interventional nursing and associates in post-procedural care and radiation safety for the microsphere patients. Next slide.

Wrong patient, so this patient received 25,000 centigray when they were supposed to -- oh, they were supposed to get 25,000 centigray. They got 56,000 centigray. The dose was intended for a different patient. The cause was human error. The corrective actions are a procedural review and revision and personnel retraining. Next slide.

Now, we have a vial labeling error. There were two liver lesions. The treatment was with two vials. One vial contained an activity of seven gigabecquerel and the other contained nine gigabecquerel.

The doctor reviewed the treatment records

and discovered afterwards there was a labeling error and the vials may have been switched. The smaller lesion received the larger dose and the larger lesion received the smaller dose. Next slide.

So, now we go into another one with two lobes. They prescribed 584 megabecquerel to the left lobe and 3,000, roughly 4,000 megabecquerel to the right lobe. The left lobe's dose was delivered to the right lobe.

The right lobe received 1,700 centigray, 15 percent of the prescribed 12,000 centigray dose. The corrective actions was generate a new procedure and providing new training to personnel. Next slide, please.

Air bubbles, actually we've got two of them that air bubbles are included as part of the problem. They prescribed 12,700 centigray, but they only received about 6,000 centigray or 47 percent of the dose.

There were two vials. There was no issue with the first. The second was relatively full when it was returned for disposal and the activity was higher than expected. The physician saw multiple air bubbles trapped in the line after connecting the line between the microcatheter and the delivery vial. Next

slide.

So, the physician worked with a three-way stopcock and syringes and used it to bleed out air and flush back the dose to the patient. It worked in preventing spillage or contamination and residual dose was retained in the syringes and the stopcock, but the activity remained in the delivery equipment and did not go into the patient.

The root cause was human error. The corrective actions were refresher training and change procedure to confirm no air is in the line between the microcatheter and the dose vial prior to connection. Next slide.

This is another air bubble one with possible kinks. So, they prescribed 1.2 gigabecquerel to the right lobe. It received only 0.5 gigabecquerel to the right lobe, and there was also a planned 42 megabecquerel to the lungs.

There were no issues with the catheter placement, the physician verification, the flow during contrast, and the normal saline phases. The administration started.

The interventional radiologist saw several small air bubbles in the delivery line, experienced high resistance. The saline went into the vented vial

and they stopped the procedure. Next slide.

They used the PET scanner to evaluate the activity in the patient and the delivery system. The cause was either a small air pocket or kink in the catheter. The delivery system and the catheter were sent to the vendor for evaluation.

The corrective actions were proper setup of the delivery system and retraining, and the procedures were modified to check for air bubbles before piercing the dose vial and perform wet connections when connecting the catheter to the delivery system. Next slide.

Okay, this one was a kink. They prescribed 13,500 centigray, but they only received about 5,000 centigray. They weren't sure if it was caused by patient stasis or the delivery system.

So, the Authorized User physician had used a thinner microcatheter, 2.4 French Maestro, but the manufacturer indicated the catheter size was one commonly used, so that didn't appear to be a problem.

There was a tortuous path causing resistance in the circuit higher than the administration box could tolerate and the delivery system could not work properly. They concluded that the problem was not due to patient stasis. Next

slide, please.

So, one of the things you're going to see in this year's medical events is a lot more of the licensees are sending the kit back to the manufacturer for evaluation, and that's a good thing because we're getting more information on the potential causes.

So, in this case, the manufacturer evaluated the Yttrium-90 kit for cause. The microspheres were found from the outlet tubing to the microcatheter. The location observed kinks, had elevated radiation readings.

The pressure flow test confirmed the set functioned as expected. The septum fragment in the dose vial was not thought to have blocked the flow path, and there was obstruction within the microcatheter.

The root cause, obstruction within the microcatheter due to a kink and difficulty placing the catheter before the treatment may have increased the likelihood of a kink. Next slide.

So, we had another kink event. They prescribed 12,300 centigray to segment II of the left hepatic lobe. They only received about 3,000 centigray. The back pressure during treatment with significant flow of saline into the pressure relief

valve.

The procedural images reviewed to look for failure. The catheter was kinked and likely created the blockage. The catheter moved between the verification and administration from the manipulation of the system connected to the catheter. Next slide.

So, the delivery system was sent to the manufacturer for evaluation and no problems were identified, so the corrective actions were the physician and the RSO will monitor the pressure relief vial for increased back pressure, and they will have a verbal countdown for administering pressure during the administration and they'll terminate the procedure when excessive back pressure cannot be corrected by simple catheter manipulation. Next slide.

Resistance due to a complex hepatic artery system stasis, so they prescribed 12,000 centigray but only delivered 600. All pre-procedural safety checks were conducted and the appropriate imaging, cone beam CT, was performed for catheter position and lesion location. There was high resistance felt on the syringe during the first set of infusions and continued for the next set of infusions.

They stopped the treatment because they felt the risk of inadequate delivery of the

microspheres due to the possibility of stasis and they were concerned about non-target embolization to other sites. Next slide.

So, they did a PET CT post-procedure for the microsphere distribution and there were no microspheres in non-targeted areas. The undelivered microspheres were in the catheter. The licensee concluded the incident was due to emergent patient conditions and resistance of the patient's complex hepatic artery system stasis.

There was no evidence of catheter misplacement. There was no non-target disposition. There was no mechanical failure of the microsphere delivery system and no evidence of any noncompliance with NRC guidelines. Next slide, please.

Catheter diameter, I think we've got two of these. They prescribed 2.3 gigabecquerel, but the patient only received 1.4 gigabecquerel or 40 percent of the dose. There were two vials.

There were no issues with the first administration, but only 51 percent of the second vial of microspheres -- but 51 percent of the second vial of microspheres was stuck in the catheter. The primary cause was equipment malfunction. The catheter and device tubing was sent to the manufacturer.

The manufacturer concluded that the microspheres remained in the catheter because the catheter used had an internal diameter of 0.4 millimeters smaller than the manufacturer's requirements, greater than or equal to 0.5 millimeters. So, the licensee's corrective action is they will use a larger diameter catheter in the future. Next slide, please.

So, my second catheter diameter, in this one, they prescribed 22,000 centigray, but the patient received only 10,000 centigray. There was particular tortuous anatomy after consulting with the manufacturer and the use of the smaller 2.0 French catheter. The microspheres were stuck in the microcatheter.

The delivery kit and the catheter were sent to the manufacturer where the manufacturer did a visual investigation and a radioactive measurement, and a digital microscope and flow test, and the results were in line with the licensee's initial conclusion.

The later procedure with a larger -- and so the licensee decided to do the later procedures with a larger microcatheter, and they were successful, so the physician will continue to use the larger

microcatheters. Next slide, please.

Okay, this was a calibration date error. They prescribed 11,000 centigray to the right lobe. They administered roughly 2,000 centigray or 16 percent of the dose. They administered microspheres with a calibration date of July 28, 2019 instead of a calibration date of August 4, 2019. So, the technologist and the AU reviewed the ordering paperwork, but they failed to identify the incorrect calibration date prior to ordering.

They compared the dose activity to the order form instead of the written directive. They used a vendor provided locked spreadsheet to determine ordering dose, but it doesn't flag when the dose varies significantly from the prescribed dose. Next slide.

One of the other problems was that the Therasphere doses must be ordered in gigabecquerel, but the licensee is more familiar with millicuries, so neither the technologist nor the AU recognized that the activity was abnormally low.

Corrective actions, they modified the spreadsheet to flag doses not within 10 percent of the prescribed dose on the day of administration, and the technologist and the AU will review the written

directive and the ordering form together prior to administration to ensure that there are no discrepancies with the prescription or dose. Next slide.

Okay, we have a leak at the injector needle/septum interface. They prescribed 12,000 centigray to the left lobe of the liver, but they only delivered 8,000 centigray or 67 percent of the dose. The delivery system was sent to the manufacturer for the visual inspection, the radiation measurement, the digital microscopy and the pressure flow testing.

The microspheres were in the acrylic vial shield indicating a leak at the injector needle/septum interface. It was thought to be produced from product defect and routine administration pressures do not produce this kind of leakage. No damage or visible defect was observed in the delivery system or the dose vial. Next slide, please.

Tubing defect, they prescribed 20,000 centigray. They received 14,500 centigray, 89 percent of the intended dose. There were two vials. There was no issue with the first administration, but the second vial failed to empty into the administration catheter. Further attempts were unsuccessful.

The vial and the administration kit were

sent to the manufacturer for analysis. The tubing had a manufacturing defect that restricted the flow and eventually caused the blockage. The defect could not be seen or felt by inspection. Next slide, please.

Now, we have a problem in the microsphere tubing and catheter connection. So, they prescribed 14,000 centigray and they received about 5,500 centigray or 38.5 percent of the dose. The dose stayed in the connector of the tubing and the catheter.

The manufacturer tested the tubing and catheter and found the flow through the catheter was insufficient, probably from the overall length and inner diameter of the microcatheter, septum fragments from the dose vial, possible changes from the time of treatment to inspection.

In other words, they had dried saline, these coiled in tight bends for an extended time. The AU did not use the manufacturer's recommended size microcatheter. Next slide.

There were several potential causes and contributing factors, so no definitive root cause was identified. Corrective actions, they're going to continue to follow their standard operating procedures of performing three flushes, ensuring the electronic

dosimetry is reading zero, and surveying the patient.

They're going to flush an addition time with 20 milliliters of saline after the electron dosimeter reads zero, and they're going to use a catheter with a larger diameter greater than or equal to 0.02 inches. Next slide, please.

So, now we move onto the SirSpheres, and we had 12 medical events with the SirSpheres. We had four wrong sites. We had one measurement issue. We had one equipment issue. We had five catheter issues and then we had no information. Next slide.

Wrong site, they delivered the dose to the other lobe and the stomach. They prescribed 1.1 gigabecquerel to the right lobe of the liver. The patient received 2.9 centigray to the right lobe of the liver, 83.2 percent of the dose, and they received 2,170 centigray to the left lobe or 33.5 percent of the dose, and 9,190 centigray to the stomach or 3.3 percent of the dosage.

Post-treatment Bremsstrahlung scan, the microspheres were in the left lobe and the stomach, the prescribed prophylactic medication to prevent ulceration. Subsequently, the patient had nausea and vomiting. Next slide, please.

They did an endoscopy 24 days later with

mild to moderate erythema in the gastric antrum they expected to resolve in one to two weeks with continued treatment.

The most likely cause was undetected movement of the catheter tip, possibly from patient movement, movement exacerbated by reduced slack in the catheter after pulling it back to correct its initial position.

Corrective actions, they're going to update their procedures and they're going to retrain personnel. Next slide, please.

Wrong site, the activity went to the spleen. They were prescribed to receive roughly 800 megabecquerel to the liver. They only received about 100 megabecquerel, 15 percent of the dosage. 259 megabecquerel was delivered to the patient's spleen.

They felt syringe pressure, and using a smaller gauge syringe made no difference, so they stopped the treatment. The microspheres clumped in the catheter and were obstructing the flow.

They suspected during the catheter withdrawal that the microspheres flowed into the larger splenic artery. Three days later, they reported observed uptake in the spleen. Next slide, please.

As a result of the investigation, there was no physical obstruction. The catheter placement was correct. There were no errors in the administration and there were no other causes identified.

The patient was monitored for any adverse impacts developed. Possible ways to prevent recurrence were identified and detailed in the licensee's report. Corrective actions included generating a new written procedure. Next slide, please.

Oh, this was a good one, wrong site. They used a work around. What could go wrong did go wrong. The patient was scheduled for treatment to segments seven and eight of the right lobe of the liver followed by a second administration to segments five and six of the right lobe.

The written directive, first treatment to the left lobe, but that one had already been surgically removed. The manufacturer's calculation sheet did not allow two treatments to the same lobe.

The Authorized User put one treatment in each lobe to get activity for each part of the right lobe. It was not corrected when going from the planned treatment to the written directive. Next slide.

The Radiation Safety Office prepares the written directive for signature of the Authorized User. The Authorized User failed to correct the written directive error but realized after the first treatment. Intended for the right lobe and administered correct dosage to the right lobe. They discovered it 22 days later. Next slide.

So, their corrective actions, they revised the written directive preparation process. They added another timeout for treatment details. They trained all Authorized Users on modifications, and the Authorized User, not the Radiation Safety Office, is to complete the written directive.

The radiation safety personnel will be present before the procedure starts to verify the correct patient is treated, the proper dose is administered, and the proper site is treated. Next slide.

Wrong lobe, they prescribed roughly 650 megabecquerel to the left lobe of the liver and 700, about 800 megabecquerel to the right lobe at a later date. The facility typically treats the right lobe before the left. They failed to follow the written directive and recognize for this case, the left lobe was to be treated first.

The dosage administered to the right lobe was less than 20 percent of the planned later dosage. The interventional radiologist discovered the error shortly after the procedure but did not think it had to be reported. Next slide.

So, the event was discovered during routine inspection. The written directive was not followed. The dosage was delivered to an unintended site and the regulator concluded this event should have been reported.

The corrective actions, they revised their policy and procedures. They will prominently note the treatment lobe and stating the Y-90 procedure in the interventional radiology schedule and procedure board. There will be a timeout prior to the procedure start and it will include stating the laterality of the lobe. Next slide.

Okay, we have one licensee with multiple events and issue number one was an aliquot. They prescribed 400 megabecquerels and they received 316 or 74 percent of the dosage, and the dosage was supposed to be 425 megabecquerels. It was a very small portion of the seven gigabecquerels in the unit vial, and the microspheres remained in the administration system. Next slide.

So, their corrective actions, they're going to order a dosage calibrated to give an activity closer to what is needed for the date and time of the administration. They're going to draw 10 percent greater than the prescribed dosage for low administration activity, and they flush the system more in hopes of pushing more of the residual activity into the patient. Next slide.

Okay, same licensee, issue number two, equipment. They prescribed 1.2 gigabecquerel and the patient received 0.5 gigabecquerel, 38 percent of the dosage and less than 20 percent.

The interventional radiologist reported resistance in the line with microspheres appearing to come out of the top of the vial. They consulted with the onsite manufacturer representative. Next slide.

The vial and administration kit were sent to the manufacturer for analysis. The cause was failure of the administration equipment setup.

Corrective action: use an updated administration set for all future administrations and complete the patient administration, the new written directive and a new administration kit. Oh, they completed the patient administration with a new written directive and a new administration kit. Next

slide.

So, now we have another licensee with two issues and this first one was catheter backflow. They had two administrations, no issues with the first, backflow into the administration vial seen in the second. They prescribed 453 megabecquerels to the right lobe in the second administration and they only received 28 percent of the dosage. Next slide.

And this is the second issue for that licensee, and this is a catheter clogging. They prescribed 1,100 centigray to segments five and eight of the liver. They only received 250 centigrays or 23 percent of the dose.

The cause was a clog or other issue with either the stopcock or the microcatheter. The corrective action is procedure updates. Next slide, please.

Now we have the catheter clogged tip. The patient received 31,000 centigray, 65 percent of the dose. There were issues with the delivery catheter during the procedure. The catheter clogged. It was removed and replaced during the procedure.

They thought the Direxion HI-FLO microcatheter and angled tip was the root cause of the clog. The manufacturer indicated all types of

catheters can clog in normal use and they planned other follow-up. The Authorized User will use a microcatheter without the angled tip to avoid a similar event. Next slide.

Catheter occluded, they prescribed 1.5 gigabecquerel. The patient received 0.07 gigabecquerel or 4.7 percent of the dosage. The catheter could not be flushed. The procedure was stopped.

This was the first time they had used an Embolx Sniper microcatheter and they had a lot number. It uses a balloon to prevent potential backflow of the dose, the smaller lumen than the catheters routinely used for this purpose. The catheter model will not be used for future treatments. Next slide, please.

Patient movement dislodged IV. They were prescribed to receive roughly 580 megabecquerels, but they received roughly 360 megabecquerels. It was stated that the patient moved during the procedure and dislodged the IV.

The licensee concluded no corrective actions needed to prevent recurrence. The incident did not result in permanent functional damage to the organ, unavoidable due to patient movement. Next

slide.

This is one of my more informative events. They prescribed the dosage. They received 68 percent of the drawn activity, and that's all the information I got. And I believe this concludes my slides. Yes, any questions or discussion?

CHAIR METTER: Thank you, Dr. Howe. Do we have any questions from the committee?

MEMBER JADVAR: This is Hossein Jadvar. I have a quick question regarding that one event that was at the very beginning regarding the feeding tube with the administration of radioiodine.

DR. HOWE: Yes.

MEMBER JADVAR: So, they said they're not going to use a feeding tube anymore for liquid radioiodine, but did they say what they're going to use if they come into contact or are faced with the same situation, a patient who cannot swallow and needs to receive --

DR. HOWE: That information was not provided in the NMED. I know we had one other one where they were not going to give it to patients that could not swallow, but -- no, that was this coming year. That's a different situation. They did not say.

MEMBER JADVAR: Yeah, I'm just wondering are they going to just not do these kind of patients, not treat these kind of patients or -- I hope they don't run into the same issue trying to figure out what to do and then something else happens.

DR. HOWE: I know.

CHAIR METTER: Thank you.

MEMBER JADVAR: Thank you.

CHAIR METTER: This is Darlene Metter. Has anybody else run into that issue before?

MEMBER JADVAR: We did treat a patient with a similar situation, but we had no problem giving it through a G tube and it worked just fine.

DR. HOWE: And I think this licensee said that they thought that the G tube was not working correctly.

MEMBER JADVAR: Yeah.

DR. HOWE: So, they might try it again if they believe the G tube is working.

MEMBER JADVAR: Exactly, yeah, you have to make sure that the G tube is not kinked or patent.

MEMBER OUHIB: This is Zoubir. Dr. Howe, just to clarify, is this the case where the patient needed to go to the bathroom by any chance or is this a different one? Because there was one similar and --

DR. HOWE: This is oral sodium iodide if you're talking about the same one, we were just talking about using the G tube.

MEMBER OUHIB: Right.

DR. HOWE: The one you're thinking about was, I think, last year when we had someone that was in the middle of an IV and then they had to go to the bathroom --

MEMBER OUHIB: Oh, you're right. You're right.

DR. HOWE: -- and when they came back, and they connected it.

MEMBER OUHIB: You are correct. Yes, thank you, yes.

MEMBER MARTIN: This is Melissa Martin. I just have a question. Several of those corrective actions included further training. I was just wondering who is that training to be provided by?

DR. HOWE: Melissa, you have all of the information I have. It ends up that many licensees like to put as a corrective action further training.

MEMBER MARTIN: Yeah.

DR. HOWE: And they don't specify.

MEMBER MARTIN: Yeah, okay.

MEMBER OUHIB: The trainer or the

manufacturer.

DR. HOWE: Generally, it's not the manufacturer. I think generally it's supposed to be the licensee, but you kind of wonder if they had all of these issues, who is going to train them?

MEMBER WOLKOV: Right. Hello, this is Harvey Wolkov. I wanted to thank you for the thorough report. I did have a comment regarding one of the cases that was presented in the 35.1000 series --

DR. HOWE: Okay.

MEMBER WOLKOV: -- related to slide 53. It was a report about head frame slippage.

DR. HOWE: Yes.

MEMBER WOLKOV: But I believe in the presentation, there may have been a bookkeeping error as presented. The planned dose to treat the trigeminal neuralgia is recorded on the slide as 2,500 centigray, and since one would never use that dose, I suspect it may have been inaccurately recorded.

DR. HOWE: Okay.

MEMBER WOLKOV: This is something we can discuss offline if you would like.

DR. HOWE: And I can do a quick look up to find out, you know, if I had a digit -- normally I look these things over and then delete unnecessary

words to keep from having errors. Let's see, slide 53?

MEMBER WOLKOV: That's correct.

MEMBER OUHIB: This is Zoubir. If I may, listening to this presentation, it is hard for me to believe that anybody who is looking at this or reading this cannot benefit from this or learn something on how to prevent events, you know, in all of these procedures.

And I think the reason I'm saying this is, to go back to this morning's comment, is that I feel like this is really valuable information for anybody who is doing these types of procedures.

DR. HOWE: And Zoubir, what we do is -- we've gotten that comment before, and so what we'll do is we'll put these slides up on our medical toolkit so that the public can look at them and see what kind of events we had.

And to go back to the gamma knife, it said the planned treatment time was 36 minutes with a single treatment position targeting a volume of 0.1 cubic centimeters for a prescribed dose of 2,500 centigray rad, so that's directly from the NMED report.

If you believe that is not a correct

number, then we can go back and see if we can straighten that out with the licensee.

MEMBER WOLKOV: I believe it's not correct. It could be a bookkeeping error.

DR. HOWE: Okay, and what do you think would be more realistic if it were just off by orders of, you know, tens?

MEMBER WOLKOV: The dose would be 90 gray unless it was a retreatment, in which case you probably wouldn't be treating below, say, 45 gray.

DR. HOWE: Okay.

MEMBER WOLKOV: So, this does doesn't make any, or much sense to me.

DR. HOWE: It doesn't make any sense?

MEMBER WOLKOV: Correct.

DR. HOWE: Okay, because then they repeated it further down with the 2,200 and the 2,160, so I will check on that.

MEMBER OUHIB: Just as a follow-up, this is Zoubir. We don't do any of these with the fraction. Could it be like if it was a fractionated dose as a total dose, no? I'm just curious.

MEMBER WOLKOV: You'd never fractionate this.

MEMBER OUHIB: Okay, thank you.

MEMBER WOLKOV: When we prescribe, it's 100 percent, in this line somebody may have written this in a very, very unusual manner, but it just doesn't look right.

DR. HOWE: Okay.

MEMBER WOLKOV: But again, we can look at this offline.

DR. HOWE: Yeah, and since you've pointed it out, I'll go back and see if we can get information from the licensee.

MEMBER WOLKOV: Thank you.

DR. HOWE: So, I'll follow up.

CHAIR METTER: Okay, thank you, Dr. Howe. And are there any other final sort of comments? Because we need to be on time here and I believe our next --

MEMBER O'HARA: Yeah, this is Michael O'Hara. I just want to say thank you to Dr. Howe for a great report. And I noticed with the spheres that we have a lot of kinking going on, relatively speaking a lot of kinking going on, and what appears to be maybe other non-product related substitutions being given or being used for some of these deliveries, and we will look into this with the manufacturers. Thank you.

DR. HOWE: And I have to say that this is really the first year that I have seen, especially for the -- I didn't see it with the SirSpheres, but with Theraspheres, they're actually sending things back to the manufacturer for the manufacturer to evaluate, and this is the first year I've seen that.

MEMBER O'HARA: That's good.

CHAIR METTER: Thank you, and that's a very important thing. We've started doing more Theraspheres at our site too and we are sending our devices, our catheters and all back to the manufacturers also. So, do I have any other --

DR. HOWE: One thing --

CHAIR METTER: Go ahead.

DR. HOWE: I think one other general comment is this is probably the first year I have seen more detail on procedures that people are following and their corrective actions that are more specific than just training, so I think that's a good thing.

CHAIR METTER: Yes, thank you, Dr. Howe. That was an excellent report. So, our next --

MEMBER O'HARA: I had -- Darlene, sorry, but I just had one more quick thing. Dr. Howe, thanks, Donna-Beth, but there were two prostate medical events that were defined by dose which --

DR. HOWE: Yes.

MEMBER O'HARA: -- should have gone away with the new change in Part 35, so did these predate that change or are they in Agreement States who have not adopted the change?

DR. HOWE: They're in Agreement States and Agreement States have three more years to adopt the change.

MEMBER O'HARA: Thank you.

CHAIR METTER: Okay, any other final comments before we go to our next presentation on the agenda?

MEMBER BLOOM: I have a quick comment. This is Gary Bloom. Dr. Howe, both great presentation, and as a patient, I found it very discouraging. How do these lay out in terms of patients being treated in medical centers versus in community facilities?

I mean, when I think of the population of people that I represent, I think they would be very unnerved to find out that there were so many problems. When we go in for a treatment of radiation, we're expecting it to be pristine, perfect. I know my radiation treatments were always perfectly done, at least I think they were. Now I don't know.

DR. HOWE: Gary, I did not go through and look at small facilities versus larger facilities, so that's not one way that I slice and diced the data. I think you also need to keep in mind that I have presented on 56 cases.

MEMBER BLOOM: Right.

DR. HOWE: And there are 150,000 procedures, so we're not seeing large numbers. I think maybe the ACMUI back in the '90s thought there was a ratio of maybe one times 10 to the minus four for errors in the nuclear medicine, nuclear oncology field, and it may be about in that area, except I think the Theraspheres are higher.

There are fewer of them and there's more problems. That doesn't mean they're not a good procedure. It just means there are more difficulties in administering it.

MEMBER OUHIB: This is Zoubir. If I may add, some procedures are a little bit more unpredictable situations, a little bit more complex perhaps. Just when you think that everything will be perfect, it doesn't go the way you want to.

DR. HOWE: And Zoubir, I think I saw that in this particular set of reports in that there were a number where there were problems at the beginning and

it appeared as if they never quite recovered to get it right when they started again, so they --

MEMBER OUHIB: Yeah, the technique -- I'm sorry, go ahead.

DR. HOWE: And that, we see a lot of medical events when it's the first time that somebody does it or there's something unusual. They just don't pick up that extra part that they need to be extra careful because it's going to be slightly different.

MEMBER OUHIB: Right, and there was the example of one case where there was a representative from the manufacturer present trying to assist and they still did not recover.

DR. HOWE: Right.

CHAIR METTER: Okay, thank you for your comments. Do we have any other suggestions or comments before we go to our next item?

Okay, I think our next item is most appropriate after our report from Dr. Howe and all of the Y-90 medical events that occurred, and so Ms. Megan Shober will be talking about the Interventional Radiologist Subcommittee report.

MEMBER SHOBER: Yes, I'll wait just a second here for Kellee to switch the slides.

CHAIR METTER: Okay.

MEMBER SHOBER: Okay, yes, I'm representing the Interventional Radiologist Subcommittee. Next slide, please. Our subcommittee members were Dr. Dilsizian, Dr. Ennis, Dr. Jadvar, Dr. Metter, myself, and Dr. Tapp is the NRC staff resource. Next slide, please.

So, kind of the impetus for starting this subcommittee, there are several different reasons here. As you just heard, there are quite a number of Yttrium-90 medical events. Again, not a lot compared to the number of treatments given, but just in terms of medical events reported, the Y-90 cases do seem to dominate the medical event category.

In addition to that, over the last 10 or 15 years, the licensing for Y-90 microspheres is pretty complex. They have the most complicated licensing guidance.

Another reason for our subcommittee to gather was just looking out on the horizon with numerous other emerging radiotherapies that are involving interventional radiologists. We heard some at the fall ACMUI meeting about the P-32 microparticles.

So, we're hearing about kind of all of these different areas from actual treatment,

licensing, things on the horizon, and then kind of looking at who is on the ACMUI right now and identifying the relative lack of interventional radiology expertise among our current members. Next slide, please.

So, our subcommittee charge was to investigate whether or not we should have an interventional radiologist on the ACMUI, and then if so, should this position be a non-voting consultant or a full ACMUI member?

Okay, so first, we're going to just -- you know, we took a look at who is currently on the ACMUI. We currently have 13 members. This membership composition was last amended a little over 10 years ago when the diagnostic radiologist position was added.

For approximately one year prior to the Commission approval in 2009, NRC staff had invited a diagnostic radiologist to serve as a non-voting consultant to the ACMUI. Part of that is because any change to the ACMUI membership composition does require Commission approval. Next slide, please.

So, as many of you are aware, the ACMUI does already have a number of physicians on it, a diagnostic radiologist, a nuclear medicine physician,

and two radiation oncologists.

So, in 2009, it was thought that the newly added diagnostic radiology position could provide expertise in the area of existing and emerging diagnostic and image-guided therapeutic techniques, including interventional radiology.

Over the last 10 years, the field of interventional radiology has continued to mature and specialize. Practicing diagnostic radiologists may not be able to provide detailed knowledge on microspheres and other emerging technologies designed for therapeutic use by interventional radiologists.

So, we have a relative lack of expertise on the committee as it currently stands. The diagnostic radiologist, nuclear medicine physician, and radiation oncologists all know some aspects of using and handling microspheres, but none are subject matter experts. Next slide.

Okay, and again, you know, why are we looking at this? Y-90 microspheres are the modality with the greatest number of reported medical events. We just heard that from Dr. Howe, and as she mentioned, many of these medical events are due to problems with interventional equipment, the tubes, the catheters, the device, the setup, and the

interventional radiologist is the person that's present that's responsible for that equipment.

Sometimes the interventional radiologist is an Authorized User and sometimes they're not, but regardless, the equipment that's in the treatment room, that's under the domain of the interventional radiologist. Next slide, please.

Every indication that we've heard is that these interventional radiologist-administered radiotherapies are likely to increase in the future, and so next slide, please.

The subcommittee's conclusion here is that an interventional radiologist expert could provide valuable perspective to the ACMUI on these issues. Next slide.

Okay, so then, you know, once we talk about the value of that expertise, then we have to look at whether -- is it enough to permanently add the position to the ACMUI? And at this point, we don't know what we don't know. So, next slide, please.

So, if we're going to consider a consultant, there's really two questions: how long should a consultant serve, and is it necessary for that interventional radiologist to be an Authorized User?

So, we talked about this quite a bit in the subcommittee and there are a few different perspectives, but relatively quickly, we came to a consensus. We're going to leave the ACMUI here with three recommendations. Next slide, please.

The first recommendation is that at this point, we don't recommend adding an interventional radiologist as a full voting member of the ACMUI. With the kind of administrative hurdles that go into that, we don't yet know whether that expertise really warrants the effort that would be involved in adding a permanent voting member to the ACMUI.

However, we do recommend inviting an interventional radiologist to be a non-voting member of the ACMUI for a trial period, we're suggesting two or three years, after which this issue should be reassessed. Hopefully by that point, we would have a sense of the value and the significance of the interventional radiologist's contribution to the discussions. Next slide.

And then the third recommendation is that this invitation should be extended to a practicing interventional radiologist who regularly uses both types of Y-90 microspheres and who is an Authorized User.

So, our discussion around that is if you're going to invite someone to be a consultant to the committee, we might as well have someone who is an Authorized User.

And then again, to provide the best kind of advice and discussion, that person needs to be familiar with both SirSpheres and Theraspheres, so this is what we thought would be the best candidate for a consultant in this type of position.

And that concludes my presentation. Thank you.

CHAIR METTER: Thank you, Ms. Shober, for that very good report and for the work of your Subcommittee and really thoroughly looking into the value of interventional radiologists for the ACMUI.

Do I have any comments or suggestions or questions from the Subcommittee?

Do I have any comments or questions from the ACMUI Committee?

VICE CHAIR SCHLEIPMAN: Hello, it's Robert Schleipman.

CHAIR METTER: Yes, Robert.

VICE CHAIR SCHLEIPMAN: Perhaps Mr. Einberg can answer. I'm just curious how the process of identifying and appointing a part-time consultant

would actually work?

MR. EINBERG: So, the last time we, this is Chris Einberg, the last time we added the diagnostic radiologist, I believe one of the professional societies offered someone for our consideration. So, we can use that model, or we can put out a federal register notice and solicit individuals who would like to apply for that position and do an evaluation and interview various candidates for that position.

CHAIR METTER: Thank you. Are there any other questions or comments from the Committee?

Any questions or comments from the NRC Staff?

MR. EINBERG: No. This is Chris Einberg once again. Yes, thank you so much to the Subcommittee for their extensive and thoughtful consideration of this.

As was pointed out, now we do see quite a few Y-90 medical events and having a, we've been debating whether to have an interventional radiologist on the Committee. And we certainly will take the recommendations, or consider the recommendations, of the ACMUI once you guys vote. Thank you.

MEMBER OUHIB: This is Zoubir. Just a

quick question for Megan. Are you looking at someone who has done, say, so many cases or still doing it on a regular basis per year and so on and so forth?

MEMBER SHOBER: Yes, this is Megan. So, we didn't attach any specific numbers to, like, in terms of number of cases that needed to be performed, but we did want to say someone who is actively practicing and actively using microspheres at their facilities.

MEMBER OUHIB: Thank you.

CHAIR METTER: Do I have any other --

MEMBER DILSIZIAN: Vasken Dilsizian. And the reason I think Megan is absolutely right is that it's not just the individuals, it's not just the microspheres, that you will learn that there's a lot of tubing issues. Different styles of tubing with a hook at the end and clotting.

So, the individual who is going to be consulting should currently be practicing because those tubings change very quickly year-to-year. And he or she should be very much informed about all the various kinks that can be occurring during these adverse events.

MEMBER JADVAR: This is Hossein Jadvar. I just wanted to second what Vasken said.

In general, many, and this is anecdotal, but I believe many IR folks actually are not involved with this type of treatment. I mean, they do their bread and butter stuff, like placing the frost (phonetic) in the tubes and drainages of abscesses and different, this type of work.

Especially in community hospitals. Most of these types of studies are, or not studies, these treatments are done at tertiary centers, academic centers, transfer centers.

And that's why I think it's important that we have, that if we want to add a consultant, IR consultant, somebody that is actually quite familiar, not only with the procedure itself and knows the science behind it, but also with all the tubings and all the changes that goes on with this type of treatment. Which is not exactly done by all IR physicians.

CHAIR METTER: Thank you, Dr. Jadvar. And also, I would like to mention, to add that, the Subcommittee also recommended that the individual be an Authorized User.

MEMBER JADVAR: That's right.

CHAIR METTER: Are there any other comments or suggestions from the Committee? The NRC

Staff?

DR. HOWE: Yes, Dr. Metter. I think one of the most important things, especially for the TheraSpheres, is it has evolved a lot from just being one catheter you get from the manufacturer to, in treating the liver as a whole, to getting down into individual segments and finer and finer points.

So, I think if we do get somebody from interventional radiology, we would only need somebody that is active enough that is going with where the process is going and not just stagnant back into the early procedures.

CHAIR METTER: Thank you, Dr. Howe. Any other comments?

Okay, do I have a motion to accept the Interventional Radiologist Subcommittee report?

VICE CHAIR SCHLEIPMAN: So moved. This is Robert Schleipman.

MEMBER MARTIN: This is Melissa. I second that.

(Simultaneously speaking.)

CHAIR METTER: Melissa Martin has seconded?

MEMBER MARTIN: Correct.

CHAIR METTER: Do I have any other

discussion? Okay, all in favor?

(Chorus of ayes.)

MR. EINBERG: Excuse me?

CHAIR METTER: Oh, yes.

MR. EINBERG: Yes, would you like to consult with the public before voting?

CHAIR METTER: Yes, thank you. Operator, can you unmute the lines for any public comments or concerns?

THE OPERATOR: Yes. To ask a question please press *1 to unmute your phone. And record your name. One moment please.

We have one, and they have not recorded their name. Can you please announce your name and go ahead please?

MS. THOMPSON: Hi, can you hear me?

THE OPERATOR: Yes, but could you please tell us your name?

MS. THOMPSON: Oh, sure. Yes, I think I had a mute problem.

Hi, my name is Diana Thompson and I'm calling in from Sirtex Medical, the SirSpheres microspheres.

I had a question and I wanted to ask why the stipulation that the IR member need be an

Authorized User?

In the guidance, we do have the team approach where sometimes the Authorized User is a nuclear medicine physician or the radiation oncologist, while the interventional radiologist is acting essentially under the supervision. Is there a reason specifically why the Authorized User was being consider instead of somebody that's part of that team?

MEMBER SHOBER: This is Megan Shober, I can answer that. So, we did have a, actually a pretty extended discussion about whether the physician should be an Authorized User or didn't necessarily need to be an Authorized User.

And we were looking at it from a broader perspective as well. So, if someone, if that interventional radiologist is an Authorized User, we thought that they might be more valuable to the Committee as a whole since the rest of physician positions on the ACMUI are Authorized Users.

So, we recognize that there may be interventional radiologists who are not Authorized Users and would be very experienced with that microsphere's procedures.

But just in terms of value to the ACMUI as a whole, we thought it would be best to, if we can

find someone who meets all those criteria and is an Authorized User, that would be the best. And we thought that they would be able to participate in just the more general discussion on all kinds of these medical topics.

I don't know if anybody else from the Subcommittee wants to add anything to that.

MEMBER DILSIZIAN: Well, I agree, Megan. Vasken Dilsizian here.

I think, you know, most of us who sit through two days of meetings twice a year, if you're just expertise is narrowly an IR and don't really have an Authorized User background to discuss all the other topics, two days may be very long after the events discussions.

So, we thought that even though the interventional radiologist will be spending his two days consulting, it probably would be nice if he or she has an Authorized User background, just for interests and discussion purposes Megan points out.

CHAIR METTER: Any other comments from the Committee?

MEMBER OUHIB: Yes, this is Zoubir. I think the Authorized User has only a lot more responsibility, and I think that's what will make them

a better fit, in my opinion.

CHAIR METTER: Thank you, Zoubir. Do I have any other comments or concerns?

THE OPERATOR: Yes. Our next question comes from Michael Peters. You may go ahead.

MR. PETERS: Yes, this is Mike Peters, American College for Radiology. We tend to agree with the idea of Federal Register notification of the opportunity, just to provide ample candidates for NRC's consideration. And you'd have more transparency to do the process. Thank you.

CHAIR METTER: Thank you, Mr. Peters. Is there anybody else on the public line?

THE OPERATOR: There are no further questions.

CHAIR METTER: Okay. So, we'll start at the beginning. Do I have a motion to approve the Interventional Radiologist Subcommittee Report?

VICE CHAIR SCHLEIPMAN: So moved. Robert Schleipman.

CHAIR METTER: Thank you. And do I have a second?

MEMBER BLOOM: Second.

CHAIR METTER: And that was?

MEMBER BLOOM: Gary Bloom.

CHAIR METTER: Thank you, Gary. Any further discussion? All in favor?

(Chorus of ayes.)

CHAIR METTER: Any against? Any abstained? So, the Interventional Radiologist Subcommittee Report is unanimously approved. Thank you very much, Megan, and your Subcommittee for a very thorough review and excellent report.

So, the next item on the agenda is the Open Forum. And this is where the ACMUI will discuss medical topics of interests for the future.

Are there any medical topics that the Committee would like to bring up at this time?

Okay, I do have two topics here, or at least a few. I would like to form a new subcommittee, with the charge at the request of the NRC Staff, to review the impact on the medical community of the COVID-19 pandemic to prepare the NRC for any potential future regulatory impacts affecting the regulation of the medical use of radioactive material while protecting the public's health and safety.

I'd like to have the Chair of this Subcommittee to be Dr. Hossein Jadvar. And the members of the committee to be Dr. Vasken Dilsizian, Dr. Harvey Wolkov, Ms. Melissa Martin, Mr. Richard

Green, Ms. Megan Shober.

And I'd like to suggest two subcommittee consultants as Mr. Gary Bloom as the patient advocate and Mr. Zoubir Ouhib as the treatment therapist physicists. And the NRC Staff to be Lisa Dimmick.

The second item I believe is, Dr. Schleipman, you had requested for the T&E subcommittee. Do you want to make that request now? For adding a member.

VICE CHAIR SCHLEIPMAN: Oh, yes, thank you. I spoke about it this morning. I would like to invite Dr. Hossein Jadvar to join us.

I think his nuclear medicine expertise will be very helpful in evaluating T&E requirements and potentially new board certifications.

CHAIR METTER: And I believe at that time you also wanted Mr. Gary Bloom to be a consultant to the T&E Committee?

VICE CHAIR SCHLEIPMAN: His perspective is quite valued as well but given our earlier conversation of having no more than six people, we would, I would invite Mr. Bloom to certainly participate, but as a consultant.

CHAIR METTER: Okay, thank you. And I do, I would like to form one other subcommittee. This

would be a new subcommittee regarding abnormal occurrences.

And I believe Mr. Zoubir brought it by the NRC Staff last year on a report about abnormal occurrences.

And the subcommittee charge would be, define patient harm in abnormal occurrences. The second would be to reassess the current abnormal occurrence criteria. The third would be, define the goals of the abnormal occurrence criteria and reporting. And fourthly, are the current abnormal occurrence criteria appropriate in regards to public health and safety.

As chair of the committee, I would like to have Mr. Michael Sheetz, the radiation safety officer. And members of the subcommittee to be Dr. Hossein Jadvar, Dr. Ronald Ennis, Mr. Zoubir Ouhib, Ms. Megan Shober and Mr. Gary Bloom.

Are there any comments or any other items of interests that the Committee would like to bring up at this time?

VICE CHAIR SCHLEIPMAN: It's Robert Schleipman again. Maybe I should have spoken earlier.

The T&E evaluation subcommittee has, to date, presented a report based on the SECY paper of

the NRC Staff evaluation on training and experience requirements for those procedures requiring a written directive.

We also had prepared a report to the Commission for that. And in the interim, the Staff have submitted a rulemaking proposal, which essentially changes a number of proposals.

And I thought perhaps the main piece of that was that the T&E Subcommittee might want to start investigating or evaluating what would be required training and experience hours, and so forth. Or at least to look at the historical background of how we got to those 700-hour numbers.

We don't have a charge for that, so I'm just putting it out there for the Committee at-large to consider whether this should be the next goal for the T&E Subcommittee.

CHAIR METTER: Okay, thank you. Dr. Schleipman. Can I pose a question to Kellee and to Chris Einberg?

At this time, should we be proceeding on with this or should we wait for the Commission's response to your --

MR. EINBERG: Yes, this is Chris Einberg. I'm going to actually ask Lisa Dimmick to weigh in on

whether this Subcommittee should proceed or not.

MS. DIMMICK: Hi, it's Lisa Dimmick, Medical Radiation Safety Team Leader.

So, with regard to the Commission paper, the rulemaking plan for the Commission, I would probably suggest the ACMUI T&E Subcommittee hold off until the Commission votes on that rulemaking before we begin, before the Committee begins supporting staff and formulating recommendations with regard to hours of training or specialty board criteria.

We don't have any votes yet on that paper, to my knowledge. So, I think we need to not get ahead of the Commission on that one.

The T&E Subcommittee could continue with its original charge. And that is to evaluate each modality in Part 35, to determine if the T&E that is established is appropriate.

So, the Committee could go back and evaluate where it had started with regarding each modality in Part 35 and pick up on one of the other modalities in evaluating that criteria. So that's a consideration.

CHAIR METTER: Okay. Dr. Schleipman, does that seem reasonable at this time?

VICE CHAIR SCHLEIPMAN: It's very

reasonable not to get ahead of ourselves. I just wasn't sure where we were and what the Committee and Staff wanted us to do.

CHAIR METTER: Okay. So, I think right now you had, they're looking at 35.390, but we have others, 35.392 and 394 and some other items that you might, I think, may be of interest to look at.

Okay. So, let's see. Okay, do I have any other comments or any other suggestions?

MS. JAMERSON: Dr. Metter, this is Kellee Jamerson. Just to clarify your formation of the new abnormal occurrence subcommittee, can you provide me with the subcommittee charge again?

The different items --

CHAIR METTER: Right.

MS. JAMERSON: -- that they are going to look at.

CHAIR METTER: Yes, I had four items here because this was brought up in a presentation by the NRC Staff last year regarding the abnormal occurrence. And I believe, was it Lisa Dimmick that had presented it.

And the first was to define patient harm in abnormal occurrences. The second one was to reassess the current abnormal occurrence criteria.

Three, define the goals of the abnormal occurrence criteria and reporting. And four, are the current abnormal occurrence criteria appropriate in regards to public health and safety. I can send you an email on this, Kellee.

And the members of the committee, the Chair will be Michael Sheetz, the members would be Dr. Jadvar, Ennis, Mr. Ouhib, Megan Shober and Gary Bloom.

MS. JAMERSON: Okay, thank you.

CHAIR METTER: You're welcome. Do I have --

MS. DIMMICK: Hi, Dr. Meter, it's Lisa Dimmick again. I just felt I should offer up.

With regard to the AO criteria, it's great to go ahead and establish that subcommittee to evaluate criteria. That is also another Commission paper with the Commission. So once the Commission takes action then the Subcommittee could be ready to go on conducting its evaluation.

CHAIR METTER: Okay. So, at this point --

MS. DIMMICK: At the Commission.

CHAIR METTER: So, let me, to clarify, Lisa, then, at this point in time we have the Subcommittee, but we'll wait on the Commission paper before they look at these items?

MS. DIMMICK: Yes. I think that would be the course of action to take.

CHAIR METTER: Okay. And do you mind if, could I have an NRC Staff for this or is there already a staff for this?

MS. DIMMICK: You can put Katie Tapp, Dr. Tapp, as your staff resource.

CHAIR METTER: Okay.

MS. DIMMICK: Should we need to change that we can, but for now it would be Katie Tapp. Dr. Tapp.

CHAIR METTER: Okay. Thank you. Thank you very much for that clarification.

So the Subcommittee will right now be on hold until we receive the Commission paper. And then we'll go ahead and discuss the charge again at that time. Thank you very much.

Any other topics of interests from the Committee or the NRC Staff?

MR. EINBERG: So this is Chris Einberg again. This morning we talked about the clarifying and, well, the practice of medicine. And then we had some discussion on that.

I'm not sure where we ended up with that. Whether, how we were going to try to clarify that.

Do you have any thoughts on that, Dr. Metter?

CHAIR METTER: Yes. I spoke with Dr. Schleipman about that and we agree that, you know, as far as that's a very broad topic, and I think rather than being, coming down, confirming what the practice of medicine is, I think it needs to be kind of on a case-by-case basis.

And as far as when the topic comes up we can discuss that and actually review it at that time. Dr. Schleipman, do you want to go ahead and add to that?

VICE CHAIR SCHLEIPMAN: I think the discussion we had this morning, my personal feeling, is that we don't have to prescribe and proscribe what is the practice of medicine.

I think the NRC had basically come up with a medical policy statement. We maybe can review that. But in general, I think that our charge as the ACMUI is to avoid intruding on medical practice.

And I'm not sure that we have to come up with a very precise definition, which obviously might change with practice.

CHAIR METTER: And I think, this is Darlene Metter again, I think if the NRC Staff has any particular question regarding regulatory issues on a

subcommittee report or investigation, we'll be happy to look at that.

Because I think the practice of medicine is just a very flexible and a very broad area that it's difficult to actually, and I really would like to continue the flexibility of the Committee's response on that.

MR. EINBERG: Okay, very good. Thank you.

CHAIR METTER: Okay, thank you for that. Any other topics of interest?

MEMBER OUHIB: This is Zoubir. This is not a new topic but this is the, going back to the impact of the coronavirus on institutions in performing brachytherapy and so on and so forth.

There has been a discussion, like I said earlier this morning, among the brachytherapy subcommittee. And there are, it is already impacting some institutions in meeting perhaps certain requirements and so on and so forth.

And I think having a subcommittee is a great idea, however, that's going to take a while before coming up with the assumption of the report while people are actually faced with some issues.

I just think that, I'm not sure how we're going to meet that in a timely fashion, per se, so

people feel better about what's going on. Because I think that's probably more like an NRC issue more than an ACMUI issue.

I think Dr. Tapp was part of when these discussions took place within the PTSC.

CHAIR METTER: This is Darlene Metter. Chris and Katie and Lisa and, Kellee, correct me if I'm wrong but my understanding is that the NRC Staff would like to look at the impact effecting the future regulation of the medical uses of isotopes and their approval of regulatory issues to protect the public.

And not the practice of what's going on now but more, how can they regulate, provide regulatory guidance to protect the public. Is my understanding, correct, Chris?

MR. EINBERG: Yes, that is correct.

CHAIR METTER: Does that help you, Zoubir?

MEMBER OUHIB: No, not at all.

(Laughter.)

CHAIR METTER: Okay.

MEMBER OUHIB: What I'm referring to is there might be some institutions that would be in a situation where they might not meet certain requirements, okay, in these circumstances. And I guess the question is, is the NRC looking at that and

perhaps providing some, I wouldn't say looser rules but looking at how they can actually assist an institution in meeting some, but certainly might not be able to meet other requirements?

CHAIR METTER: You mind giving us an example of what you're trying to get at?

MEMBER OUHIB: There was one case, I wish I can remember, but that was brought up. I honestly cannot remember all the details about it, but I think it's just the definition, this is just speculating on this.

So, with the institution going to two different shifts, per se, and they're doing ACR brachytherapy, the stereotactic XL team and so on and so forth, and they only, usually they have four physicists in the institution, now they only have two. And they might not be able to meet the requirements having the physicist by the HDR unit, by the SPRT and so on and so forth.

This is just an example, it's not a reality.

MEMBER JADVAR: This is Hossein Jadvar. Since I was named to be the chair of this proposed subcommittee, I thought I'll, I guess I'll put forward some of my thoughts.

First of all, I have to think about it exactly what it is that the subcommittee is being asked for and try to obviously provide that. But this is a very fluid situation right now as you know.

MEMBER OUHIB: Right.

MEMBER JADVAR: Things change all the time. And at this, in my institution we have guidelines that are coming on almost a daily basis for the university administration and the leadership there. And then there are some from the hospitals, there are some from the divisions and the departments and the school of medicine.

I mean, at least in the beginning it was not exactly coordinated. They're trying to make it a lot more coordinated so that not everybody says something.

But the most, the denominator for all of this, most of it, is they reduced the number of people being at work, for example, in our department. Basically, all non-urgent imaging or studies are all delayed for at least 90 days.

And if a certain physician wants to have a specific study, it has to be cleared by three levels of bureaucracy now to be able to actually order that test and get the imaging done. Because they just want

to limit the traffic of patients and possibility of contamination of the equipment and things of that sort.

Of course, some of the things that you have to do, like the patients who are cancer patients who are undergoing chemotherapy and they need to know if their treatment is working or not or some patients who were already on a schedule to get treatments, like radium or Lutathera, things of that sort.

But for the most part, as I said, the common denominator is limit as much as possible either the traffic of the care givers or the traffic of patients to the hospitals so that we minimize the possibility of exposure. We are now at 50 percent in our covering of the clinic.

So, for example, if we have four physicians in nuclear medicine, only two will be on campus at any one time. So that if somebody gets sick, not everybody gets sick. And then we just don't have that service any more to offer.

So, as I said, I just need to understand exactly what it means with this kind of dynamic situation that we are in --

CHAIR METTER: Okay.

MEMBER JADVAR: -- what it is that NRC

wants from this subcommittee.

CHAIR METTER: Okay, thank you, Dr. Jadvar. We know that this is a trying time, and like you said, the situation is very fluid and changing.

I think what we would like to have, and correct me if I'm wrong, Chris and Kellee and Lisa, that we would like to see over the next several -- over a period of time, how can the NRC -- how will this current situation effect regulatory matters in regards to the use of radioactive materials from medical uses. And we're not in a -- it's more the regulatory aspect and not the daily, like the practice part of what you're talking about, and just it's more like, what are the things that they need to be aware of, that would be an issue for the future as they come up.

So we're going to be tracking this, the current status of this period of time, is that correct, Chris?

MR. EINBERG: So the --- Chris Einberg once again. So, what we're doing right now is we're looking at all kinds of regulatory flexibilities we can provide licensees.

We're in the process of drafting the enforcement guidance memorandum to issue to the NRC

licensees. And the Agreement States are looking into regulatory flexibilities that they can provide their licensees as well.

So, we're looking at the types of things that we would inspect against, and we do that on a regular frequency. And so, what are the things that, where we can provide some flexibilities during this current situation.

So we are talking with our regional inspectors right now, but any advice or guidance that the ACMUI can do, or provide us, would be appreciated.

We're looking at doing something, again, this is a priority issue, so I can't give you a date, but I know that we're working on this in real-time. And it is a priority to get some guidance out to our licensees.

If this is going to be with us for an extended period of time, what are some of the impacts from the licensee's perspectives, what are the regulatory flexibilities that we should be providing as well?

Lisa Dimmick is working with this issue from a medical team, from the NRC standpoint with the regions, and I would like to give her the opportunity to provide any additional insight on this.

MS. DIMMICK: Sure. So, yes, it's Lisa Dimmick. So, we're really just trying to prepare for any regulatory impact that we can expect to see.

And one, so that next time, well, any regulatory impact, I mean, and I think various medical institutions are at various stages in dealing with COVID-19 and how they're making adjustments and how these impacts are affecting the day-to-day operations in the nuclear medicine and radiation oncology departments.

So, we're just looking to see how these are truly affecting your operations. If there was any quick insights to that today, that would be great to take if anyone had some thoughts on that. Especially since we're wrapping up, finalizing our enforcement guidance memorandum that would include specific items for medical licensees.

So I think that was a part for including it on the forum today, was just getting an idea of how things are currently affecting any day-to-day operations in nuclear medicine and radiation oncology. And then also, we would be interested in maybe a long-term evaluation that would be the work of the subcommittee that would be formed. Did that help?

MR. EINBERG: Yes.

MEMBER OUHIB: Yes, it helped. Yes, thank you.

MS. DIMMICK: Yes.

MEMBER OUHIB: Let me just add something to that. Pick a situation where you have a solo physicist in a clinic where they have an HDR program, for instance and what not, and all of a sudden, we wake up in the morning and find out he's got some symptoms, high fever, sneezing, coughing, whatever it might be. And all of a sudden, now he obviously cannot go to that institution and there is a GYN brachytherapy case scheduled for 8 o'clock and he cannot find a physicist.

Can that physicist do his work, or her work, remotely and be on the phone assisting procedure, reviewing the plan remotely and so on and so forth?

I think that's the kind of, I mean, this might be the worst case situation, but it doesn't mean that it won't happen.

CHAIR METTER: Okay. All right, so, do we have --

MEMBER O'HARA: So, this is Mike O'Hara.

CHAIR METTER: Yes.

MEMBER O'HARA: Just to give you some idea

of what's going on at FDA, specifically within the division of radiological health. The division I'm in.

We are involved with emergency use authorization requests and there has been a number of votes that have come in for a number of different devices. But one of the other things we're doing is we're doing the limited, actually, a large number of limited guidance documents that are only going to be enforced for this time of trouble.

And in addition to that, we are reaching out to the manufacturers to see if there is going to be parts shortages or device shortages. And another guidance document that came out last week, it was different ways to -- some specific sterilization guidance on personal protective equipment.

So we are trying to utilize, well, like I call them, mini guidance or the emergency use authorization process, to get products out on the market or to more widely distribute products that can be out on the market.

CHAIR METTER: Thank you for that clarification. Do you have any other --

VICE CHAIR SCHLEIPMAN: Hello, this is Robert --

CHAIR METTER: Yes.

VICE CHAIR SCHLEIPMAN: -- Schleipman. I echo Dr. Jadvar's comments that the practice is changing, not only daily but almost every three or four hours you got a new change of plan and new policy and so forth.

So, I'm not sure also that this subcommittee would be able to keep up with that or how meaningful that would be to the NRC. I think the NRC can certainly solicit, from licensees or establish a hotline if they have questions of changing practice, as in the case that Mr. Ouhib mentioned.

But perhaps the subcommittee, if we're meeting in September, maybe the subcommittee then is compiling a lessons learned sort of plan for future pandemics or other national emergencies. But I don't think they would be able to very quickly come up with something that wouldn't change in a few weeks based on what's going on.

Also, the NRC could reach out to other agencies, such as the FDA, to see how they're quickly adapting.

(Simultaneously speaking.)

MEMBER JADVAR: I agree. Well said. This is Hossein Jadvar.

VICE CHAIR SCHLEIPMAN: And also, just to,

this is Robert Schleipman again, just to say that, for example, Dr. Dilsizian sent a message on behalf of the Society of Nuclear Medicine with a whole host of resources in changes in practices and policies going on, so those are all available as well to users in the field.

MEMBER OUHIB: Yes, this is Zoubir. Thank you. That was exactly my point really to sort of like, it's not like in September but it's now, what can NRC do, and cannot do for that matter, and where should we go from here and be proactive, per se, so that way we don't end up with some issues down the road.

MEMBER SHEETZ: This is Mike Sheetz. I think it would be helpful if the NRC could identify those areas where they could provide regulatory relief from certain tasks or functions that are in conflict with the COVID-19 precautions. And especially if they continue for weeks or months.

An example may be like annual emergency training for HDR and gamma knives. Where you'd have to get people together to provide this training. And that's just one example.

It's actually more important on the x-ray side. And the ACR has already provided relief from

annual equipment surveys for CT and MR, out to 16 months.

And Joint Commission is looking at that. The FDA has issued some extensions also for annual mammographic equipment surveys. And it will be nice if there were would be a generic statement from the regulatory community to provide this regulatory relief as opposed to requiring each licensee or registrant to request that relief. Because that's a lot of work and everybody is in the same boat.

So, looking through the regulations while providing some type of generic statement, and I know it's not easy for the regulator to say you don't have to follow the regulations.

But we're in a challenging time right now and I think any area where they can identify things that are, from a safety standpoint, can be delayed and the precautionary procedures from the COVID-19 far outweigh the benefit from that, that would be very helpful. Thank you.

CHAIR METTER: Thank you for that additional comment and suggestion. And really --

MEMBER ENNIS: Darlene?

CHAIR METTER: Yes.

MEMBER ENNIS: Just to follow up on those

good suggestions from Mike and the others. And it's great to hear the NRC is open to doing these kinds of things.

I mean, even Medicare, which is generally, same as generally, very slow to change, has been incredibly responsive to the medical community in a variety of ways.

And it might be useful for the NRC in that vein to, besides reaching out to our subcommittee, and we've actually thrown out a couple of ideas here on our Committee, but reaching out to the professional societies who are hearing from the membership, such as SNMMI, ACR, ASTRO, et cetera, to find out what the members, and ask those people to query their members or find out what they're already hearing from their members, ACMUI could maybe be a resource if it was helpful to kind of have a meeting to talk about some of those things that have been put forward. And NRC to quickly brainstorm about what regulatory relief could be provided given what the provider community is telling their specialty societies.

But I do think the time frame is urgent, not, you know, in three months, to get our answer, kind of making some regulatory changes on a temporary basis. But really, we're talking about a week or two,

in my opinion, is what is needed.

COURT REPORTER: Can you identify yourself for the record?

CHAIR METTER: Thank you.

MEMBER ENNIS: Apologies. Ron Ennis.

CHAIR METTER: Thank you. Thank you, that's a very good, this is Darlene Metter, thank you, Dr. Ennis, that's a very good suggestion.

Would it be possible, Chris Einberg, if the NRC could put together a conference call and we could go to our individual different communities, like SNMMI, the ACRS, AAPM, ASTRO, and see what the issues are that are going on and how the NRC could help them with the regulatory aspects of the current situation?

MR. EINBERG: Thank you, Dr. Metter. Chris Einberg.

So, a couple of thoughts here. Some actual suggestions in reaching out to the medical community as a whole.

We can do that ourselves or we can use the ACMUI Subcommittee to maybe do that for us. The issue we are facing if we have a teleconference in the short-time, we have to comply with the Federal Advisory Committee Act and we have to do the public notice and put it out ten days in advance.

But if we have a subcommittee in place, that subcommittee can start reaching out to the medical community, the professional society in soliciting ideas from them.

And what somebody suggested to me is that perhaps we could go ahead and proceed with drafting our, or finalizing our enforcement guidance memorandum and run that by the subcommittee for the subcommittee's comments on that, see if we're in the right space and get the input and the insights from the subcommittee on this enforcement guidance memorandum.

CHAIR METTER: Okay, thank you, Chris. Dr. Jadvar, does that sound reasonable, if you can --

MEMBER JADVAR: Yes. Yes, that's all good. And I think if we can definitely try to turn around our input, that's not possible.

MEMBER MARTIN: This is Melissa.

CHAIR METTER: Yes.

MEMBER MARTIN: Sorry, if I get an opportunity? AAPM has been working, the ACR I know extensively has been working with the, like CMS, ACR.

And what Zoubir was referring to is, both CMS and ACR and the Intersociety Commission, all the accreditation agencies have actually put out a relief,

basically to the physics and clinical communities, that basically the requirements are out from 12, what was annual to now a 16-month period.

I think what would be really nice is if that could come also from the NRC, as far as inspections, calibration notices. What we're finding is the ADCL labs may not be able to turn around the equipment that is supposed to be turned around in 12 months. They just may not have the ability to do that.

I think any type of relief that could come from the NRC would be very welcome to the clinical sites compatible with, or comparable to what we're getting from CMS and the accreditation agencies.

CHAIR METTER: Thank you. Thank you, Ms. Martin.

Do I have any other comments? Okay, so, it looks like the subcommittee has a lot of work to do right now, but I think we've got an excellent group. And thank you very much for bringing all the comments up and for working on this.

Now, are there other topics of interest that we need to discuss before administrative closing by Kellee Jamerson?

And I can --

MEMBER MARTIN: Are we going to do calendars?

CHAIR METTER: I beg your pardon?

MEMBER MARTIN: Are we going to do the calendar for the fall meeting?

CHAIR METTER: I believe Kellee will be doing that, yes.

MEMBER MARTIN: Okay.

CHAIR METTER: And so, I apologize for the length of this meeting, but I know we're trying to put a two-day meeting into a one-day conference call. Anyway, I really appreciate everybody's effort and flexibility and dedication to the work of this committee.

Now I'd like to turn the meeting over for administrative closing to Kellee Jamerson.

MS. JAMERSON: Okay, thank you. This is Kellee Jamerson and it is time for our administrative closing.

And I, as you can see, we have our calendars here available. I did put out a Doodle poll to all of the members quite some time ago, but I received some input about select tentative dates for the fall meeting.

And just to note that our fall meeting is

expected to be, hopefully back to our regular interval of our two-day meeting. So, it would need to be a two-day time frame.

And I received input from nine committee members. So we're looking for two days available in September or October that doesn't interfere with any professional meetings or holidays of any sort.

So this is the calendar for September. And I will note that I got quite a bit of feedback from the Committee Members that did participate for September 21st and the 22nd. Or the 22nd and 23rd. And then secondly, for October 5th and October 6th.

So, if there is any discussion at this time for those particular dates or any other dates that you would like to propose for the fall meeting?

MEMBER ENNIS: This is Ron Ennis. The week of September 20th would be fine for me, but the week of October 5th and 6th would not.

CHAIR METTER: Okay.

MEMBER JADVAR: Yes. And this is Hossein Jadvar. Also, the week of October, October 5th, it's just very close, just before the Board for Nuclear Imaging Society meeting, which is in Prague. If we can go there by then. But it's before an international meeting.

CHAIR METTER: Okay. Any other issues? So, the first meeting --

MEMBER JADVAR: Yes, for me September 21st was fine.

CHAIR METTER: Okay. So, with the --

MS. JAMERSON: This is Kellee. It was the 21st and the 22nd for the fall meeting. That's a proposed date for our first option.

CHAIR METTER: Okay. Anybody have any problems with that first option?

PARTICIPANT: No, it's good.

CHAIR METTER: Okay.

VICE CHAIR SCHLEIPMAN: As long as we don't have a hurricane in Florida.

(Laughter.)

CHAIR METTER: All right. And our second option, Kellee?

MS. JAMERSON: So, the second option was for that same week, for Tuesday and Wednesday.

CHAIR METTER: Okay.

MS. JAMERSON: So I have noted that the 5th and the 6th of October are not a good week. If you prefer to move to October, is there another date in October, or maybe the following week in September, that would work as an alternate date?

CHAIR METTER: Anybody have a preference? I have no preference.

MEMBER JADVAR: Yes, October, again, there is another major meeting in nuclear medicine. The UPN meeting.

MEMBER MARTIN: Yes, another meeting in September. Yes, I would rather have another date in September.

MEMBER JADVAR: Yes.

CHAIR METTER: Okay. So, how about our first one be the 21st and the 22nd.

COURT REPORTER: Excuse me, this is the court reporter and I need people to identify themselves.

CHAIR METTER: Okay.

MEMBER MARTIN: Sorry, that was Melissa Martin.

CHAIR METTER: And this is Darlene Metter. How about, so the first option is September 21 and 22nd. But shall we go ahead and do the second one as being the 22nd and 23rd of that same week or just, shall we go to another week?

VICE CHAIR SCHLEIPMAN: That's already been, this is Robert Schleipman, I think that's already been proposed as number two.

MS. JAMERSON: Correct.

CHAIR METTER: Okay. So would that be still all right for, the first one would be 21st and 22nd and the second one would be 22nd and 23rd.

MS. JAMERSON: Yes.

MEMBER JADVAR: And this is Hossein Jadvar again. The thing with 22nd and 23rd is that you basically, if you're coming from Prague you basically have to take three days off because you have a day of travel.

So that means the 23rd, 22nd and 23rd being away from work. But if it's 21st, I think that's my suggestion, that we can travel on Sunday, for me, I can travel on Sunday and be able to spend two days of work in Washington.

CHAIR METTER: Okay. Thank you, Dr. Jadvar.

Then how about the following week, to make that the 28th and the 29th, which would also be Monday and Tuesday as a second choice? Would that be a problem for anyone?

MEMBER MARTIN: This is Melissa Martin. Yom Kippur that falls on the 28th, is that going to be a problem?

MEMBER ENNIS: Right. That would be a

problem.

MEMBER MARTIN: Yes.

CHAIR METTER: Okay. How about the 14th and the 15th, the week before?

MEMBER MARTIN: Yes, that would work.

CHAIR METTER: Anybody have an issue with that?

MEMBER JADVAR: No, it's okay.

CHAIR METTER: Okay. So let's make our first choice. September 21 and 22 and our second choice as September 14th and 15th.

MS. JAMERSON: Okay. This is Kellee Jamerson, I am just confirming the first choice for the fall meeting 2020 is September 21st and 22nd, which is a Monday and Tuesday, and the second option would be Monday and Tuesday, September 14th and 15th.

CHAIR METTER: Yes.

VICE CHAIR SCHLEIPMAN: This is Robert Schleipman. I can make it with a number of adjustments to my schedule but the 14th and 15th is not ideal, but I will try and make it. But likely I would make it.

But is there a time in which we will know which one of these is chosen?

MS. JAMERSON: Yes. I should know and

hope to know not too long after this meeting.

VICE CHAIR SCHLEIPMAN: Oh, okay. Thank you.

CHAIR METTER: Okay, excellent. Thank you. Any other issues with these dates with anybody else on the Committee?

Okay, Kellee, I think those are our dates for now. And any other items?

MS. JAMERSON: Yes. So I will move to our actions from this meeting that I have captured. And please correct me if I am wrong.

So, I have the following actions and recommendations as captured on the 2020 Chart. Item Number 2, Dr. Metter formed a subcommittee to review the impacts that COVID-19 could have or is having on the medical use community and determine if those potential impacts could help the NRC prepare for any regulatory impacts in the future.

And just from our most recent discussion, the fact that the subcommittee will provide any form of lessons learned or future, for future pandemic situations as soon as possible. And also, to look at the forward looking for long-term impacts.

And that subcommittee membership includes Dr. Dilsizian, Mr. Richard Green, Dr. Jadvar as the

chair, Ms. Melissa Martin, Ms. Megan Shober and Dr. Wolkov.

And non-voting subcommittee consultants include Mr. Gary Bloom and Mr. Zoubir Ouhib. And the NRC Staff resource as Ms. Lisa Dimmick.

For Item Number 3, Dr. Metter amended the membership of the training and experience requirements subcommittee. The subcommittee membership now will add Dr. Hossein Jadvar. The subcommittee membership now includes Dr. Ronald Ennis, Dr. Hossein Jadvar, Dr. Darlene Metter, Dr. Robert Schleipman as chair, Mr. Michael Sheetz, and Ms. Megan Shober and Mr. Gary Bloom will serve as a nonvoting subcommittee consultant.

Item Number 4. The ACMUI endorsed the Patient Intervention Subcommittee report as presented and the recommendations provided therein.

Item Number 5, the ACMUI endorsed the Bylaws Subcommittee report as presented and the recommendations provided therein.

Item Number 6, I think I'm missing one. Item Number 6, Dr. Metter formed the Subcommittee to review the abnormal occurrences criteria with the following:

To define the patient harm from abnormal

occurrence, two, reassess the current abnormal occurrence criteria, three, define goals of abnormal occurrence criteria and reporting and four, determine if the current abnormal occurrence criteria is sufficient in regards to public health.

And the subcommittee membership includes Mr. Gary Bloom, Dr. Ronald Ennis, Dr. Hossein Jadvar, Mr. Zoubir Ouhib, Mr. Michael Sheetz, and Ms. Megan Shober. And I left off the subcommittee chair. The subcommittee chair is Mr. Michael Sheetz. And Dr. Katie Tapp will serve as the NRC Staff resource. And the subcommittee is on hold until further notice from the Staff.

CHAIR METTER: Thank you, Ms. Jamerson.

MS. JAMERSON: A few more. Lastly --

CHAIR METTER: Oh, sorry.

MS. JAMERSON: The, I didn't get a chance to add it here, but the Interventional Radiologist Subcommittee, the ACMUI endorsed the interventional radiologist subcommittee report as presented. And the recommendations provided therein.

And as we just noted, that September 21st and 22nd serve as our first option and September 14th and 15th will serve as our alternative option for our fall 2020 meeting.

And those are the recommendations and action items that I have captured. If there is anything that I have misstated or omitted, please let me know.

CHAIR METTER: Thank you, Ms. Jamerson. Do I have any other final comments from the Committee for the NRC Staff before we close?

VICE CHAIR SCHLEIPMAN: This is Robert Schleipman. Who was our staff member? I think we had first Ms. Ayoade and then Ms. Jamerson for the T&E Committee?

MS. DIMMICK: Dr. Schleipman, it's Maryann Ayoade. She will be back in May.

VICE CHAIR SCHLEIPMAN: Okay. That's fine.

MS. DIMMICK: But if the subcommittee convenes before then I can serve in her position. Lisa Dimmick. Okay?

VICE CHAIR SCHLEIPMAN: Okay, thank you.

MS. DIMMICK: Sure.

CHAIR METTER: Thank you. Are there any other final closing items that we need to cover before the meeting is adjourned?

MEMBER OUHIB: If I may, this is Zoubir. Just a thought. For any, until we have some

recommendation for NRC and all that, perhaps the best thing is that if any institution has any issues in meeting certain requirements is to simply reach out to the regulatory agency, whether it's NRC or state or whatever, and work with them until there is some guidance or something.

CHAIR METTER: Thank you, Zoubir. Okay, so, in closing I'd like to thank you all again, and to the NRC Staff, and to all the ACMUI Members for working to make this meeting possible during this very challenging time.

And I'm sure you all wish for the safety of all our health care team, our medical community and our patients. And you all be safe.

And it is my hope that we will be able to meet again together in the fall.

MEMBER MARTIN: Thank you.

CHAIR METTER: Thank you. The meeting is adjourned.

(Whereupon, the above-entitled matter went off the record at 5:27 p.m.)