UNITED STATES OF AMERICA

DEPARTMENT OF HEALTH AND HUMAN SERVICES

FOOD AND DRUG ADMINISTRATION

+ + +

CENTER FOR DEVICES AND RADIOLOGICAL HEALTH

MEDICAL DEVICES ADVISORY COMMITTEE

+ + +

ORTHOPAEDIC AND REHABILITATION DEVICES PANEL

+ + +

September 9, 2020
8:00 a.m.

Via Webcast

PANEL MEMBERS:

HARVEY E. SMITH, M.D.	Panel Chair
MAUREEN A. FINNEGAN, M.D.	Voting Member
BRENT A. BLUMENSTEIN, Ph.D.	Voting Member
LYNDA J-S YANG, M.D., Ph.D.	Voting Member
JEREMY L. GILBERT, Ph.D.	Voting Member
KARLA V. BALLMAN, Ph.D.	Temporary Non-Voting Member
DIRK H. ALANDER, M.D.	Temporary Non-Voting Member
BENJAMIN ELDER, M.D. Ph.D.	Temporary Non-Voting Member
GLENN B. PFEFFER, M.D.	Temporary Non-Voting Member
EDWARD EBRAMZADEH ABRAMS, Ph.D.	Temporary Non-Voting Member
COL PATRICK M. OSBORN, M.D.	Temporary Non-Voting Member
FRANK R. LEWIS, JR., M.D.	Temporary Non-Voting Member
HOBART W. HARRIS, M.D.	Temporary Non-Voting Member
STACEY BONNELL, M.B.A., RAC	Industry Representative
JOSEPH P. O'BRIEN, M.B.A.	Patient Representative
AMY PRICE, D.PHIL.	Consumer Representative
JAMES SWINK	Designated Federal Officer

FDA REPRESENTATIVES:

CAPT RAQUEL PEAT, Ph.D., M.P.H., USPHS
Director, OHT6: Office of Orthopedic Devices
Office of Product Evaluation and Quality

LCDR RANDOSHIA MILLER, M.S., BSN, RN
Regulatory Health Project Manager
OHT6: Office of Orthopedic Devices
Office of Product Evaluation and Quality

MARK TRUMBORE, Ph.D.
Regulatory Health Project Manager
Division of General Surgical Devices
OHT4: Office of Surgery and Infection Control Devices
Office of Product Evaluation and Quality

FDA PRESENTERS:

MICHAEL OWENS, M.S.
Division of Joint Arthroplasty Devices
OHT6: Office of Orthopedic Devices
Office of Product Evaluation and Quality

VICTORIA LILLING, M.D.
Division of Joint Arthroplasty Devices
OHT6: Office of Orthopedic Devices
Office of Product Evaluation and Quality

PETER ALLEN, M.S.
Division of Arthroplasty
OHT6: Office of Orthopedic Devices
Office of Product Evaluation and Quality

NEIL BARKIN, M.D.
Division of Arthroplasty
OHT6: Office of Orthopedic Devices
Office of Product Evaluation and Quality

CAL RABANG, Ph.D.
Non-Light Based Energy Device Team
Division of General Surgical Devices
OHT4: Office of Surgery and Infection Control Devices
Office of Product Evaluation and Quality

INDEX

INDEX

M E E T I N G

(8:06 a.m.)

DR. SMITH: I would like to call the FDA's Center for Devices and Radiological Health's Orthopaedic and Rehabilitation Devices Panel of the Medical Devices Advisory Committee on September 9th, 2020 to order. It is now 8:06 a.m.

I'm Dr. Harvey Smith, the Chair of this Panel. I'm Associate Professor of Orthopaedic Surgery and a spine surgeon at the University of Pennsylvania.

I would like to introduce Captain Raquel Peat, Director of OHT6: Office of Orthopedic Devices in the Office of Product Evaluation and Quality at FDA, who has some introductory remarks for the Panel.

Captain Peat, you may proceed.

DR. PEAT: Good morning to all and welcome to the Orthopaedic and Rehabilitation Devices Panel of the Medical Devices Advisory Committee meeting.

My name is Captain Raquel Peat and I am the director for the Office of Health Technology 6: Office of Orthopedic Devices within the Office of Product Evaluation and Quality here at CDRH.

I am really excited to have all of you participating in today's event. This is a unique period in our history as we respond as a nation to the COVID-19 pandemic with the first virtual panel meeting of this type within our office.

Additionally, there are a number of participants that further emphasizes the importance and interest in having our September 8th and 9th, 2020 Orthopaedic and Rehabilitation Devices Panel meeting.

Of the many who are participating in this panel meeting, I want to extend special thanks to our Advisory Committee staff, specifically James Swink and Commander Patricio Garcia and Lieutenant Commander Randoshia Miller, Regulatory Health Project Manager,

who has been instrumental in leading this panel meeting; staff and managers in the Office of Health Technology 4 and 6 and other areas of FDA that includes the FDA studio staff; presenters; and our esteemed panelists who are contributing to the implementation of a successful panel meeting; and of course you, our participants.

The objective of our panel meeting is as follows: As required by Section 513(b) of the Federal Food, Drug, and Cosmetic Act, the Food and Drug Administration is convening the Orthopaedic and Rehabilitation Devices Advisory Panel for the purposes of obtaining recommendations about the classification and reclassification of identified orthopedic medical devices. FDA is holding this panel meeting to obtain input from the Panel to provide input on the appropriate classification, as well as ensuing discussion on the available scientific evidence that includes dialoguing on the appropriate controls necessary to mitigate the risks to health and assure the safety and effectiveness of these devices.

As such, we will discuss the reclassification of noninvasive bone growth stimulator devices and four preamendments on classified medical devices, notably facet screw systems, semi-constrained toe joint prostheses, intracompartmental pressure monitor devices, and intra-abdominal pressure monitoring devices.

I wanted to highlight that the general public can submit either electronic or written comments on the proposed order for the reclassification of noninvasive bone growth stimulators to the docket on the *Federal Register* by October 16th, 2020. I have noted the docket number on the slide for ease of reference. Intermittently and as a gentle reminder, FDA's studio will repost information on how to submit comments to the docket on your screen each day.

In closing, I wanted to thank all of the panelists and contributors to our 2-day panel meeting. We look forward to having productive and informative discussions over the next couple of days.

I will now turn it back over to our Panel Chair, Dr. Harvey Smith. Thank you.

DR. SMITH: Thank you, Captain Peat.

I note for the record that the members present constitute a quorum as required by 21 C.F.R. Part 14. I would also like to add that the Panel participating in the meeting today has received training in FDA device law and regulations.

For today's agenda, the Committee will discuss and make recommendations regarding the classification of three devices, which are currently unclassified preamendment devices, to Class II (general and special controls). The Committee, during Session 1, will discuss semi-constrained toe metatarsophalangeal joint prostheses. During Session 2, we'll discuss intracompartmental pressure monitors. And during Session 3, we'll discuss intra-abdominal pressure monitoring devices.

I wanted to lay down a few ground rules. If a panelist wants to ask a question, please use the hand-raising function on your Zoom platform and I will get to your question as we proceed throughout the day. We want to prevent multiple persons from speaking over each other as we proceed, as this entire meeting is being transcribed for the official record.

Before we begin, I would like to ask our distinguished Panel members and FDA attending virtually to introduce themselves. I will call your name, please state your area of expertise, your position, and affiliation.

Captain Raquel Peat.

DR. PEAT: Good morning, everyone. Again, I'm Captain Raquel Peat, microbiologist and officer in the United States Public Health Service. I'm also the director for the Office of

Health Technology 6: Office of Orthopedic Devices in the Office of Product Evaluation and Quality here within the Center for Devices and Radiological Health. Good morning.

DR. SMITH: Stacey Bonnell, our Industry Representative on the Panel.

MS. BONNELL: Good morning. My name is Stacey Bonnell, I am serving this Panel as the non-voting Industry Representative. I am fully -- full time employed with Johnson & Johnson/DePuy Synthes. I also serve in a leadership capacity as president of board of directors of OSMA, which stands for Orthopaedic Surgical Manufacturers Association, an industry advocacy group which comprises about 35 industry members.

DR. SMITH: Amy Price, M.S., M.P.H., M.A. (sic), our Consumer Representative on the Panel.

(No response.)

DR. SMITH: I believe Ms. Price will be joining us shortly. Oh, excuse me, the microphone's muted.

DR. PRICE: Sorry. Hi, I'm Amy Price. I'm a senior research scientist with Stanford University and also research editor with the *British Medical Journal*, and my interest is in consumers and their part in research and also in research methods. Thank you..

DR. SMITH: Joseph O'Brien, our Patient Representative on the Panel.

MR. O'BRIEN: I'm Joseph O'Brien, I'm president and CEO of the National Scoliosis Foundation. I'm also a patient with six spinal surgeries for scoliosis, and I am the Patient Representative.

DR. SMITH: Maureen Finnegan, M.D.

DR. FINNEGAN: I am an orthopedic surgeon at UT Southwestern and Parkland Hospital in Dallas, specializing in sports and trauma.

DR. SMITH: Dr. Ballman will be joining us shortly.

Brent Blumenstein, Ph.D.

DR. BLUMENSTEIN: My name is Brent Blumenstein and I'm a biostatistician working as an independent consultant to various sponsors throughout industry.

DR. SMITH: Lynda Yang, M.D., Ph.D.

DR. YANG: Good morning. I'm Professor of Neurosurgery at the University of Michigan, specializing in spine and peripheral nerves.

DR. SMITH: Jeremy Gilbert, M.D. (sic).

DR. GILBERT: Hi, I'm Jeremy Gilbert, I'm a Professor of Bioengineering at Clemson University, director of the Clemson University Medical University, South Carolina bioengineering program. I'm editor-in-chief of the *Journal of Biomedical Materials Research Part B*. I do research on biomaterials and medical devices focused on orthopedics.

DR. SMITH: Dirk Alander, M.D.

DR. ALANDER: Good morning. Dirk Alander. I'm an orthopedic spine surgeon, Professor of Orthopedic Surgery at the Geisinger Commonwealth School of Medicine, and chief of quality for the Musculoskeletal Institute at Geisinger Health System.

DR. SMITH: Benjamin Elder, M.D., Ph.D.

DR. ELDER: Hi, I'm Ben Elder. I'm an Associate Professor of Neurosurgery, Orthopedics, and Biomedical Engineering at Mayo Clinic in Rochester, Minnesota. My expertise is in spinal surgery and bone and cartilage tissue engineering.

DR. SMITH: Glenn Pfeffer, M.D.

DR. PFEFFER: Good morning. Glenn Pfeffer, I'm in Los Angeles, an orthopedic surgeon. I'm an academic surgeon at Cedars-Sinai, director of their foot and ankle center. I only do foot and ankle orthopedics and I was past -- and I'm past president of the American Orthopaedic Foot & Ankle Society.

DR. SMITH: Frank Lewis, M.D.

DR. LEWIS: I'm a retired trauma surgeon and in the immediate period before my

retirement, served for 15 years as the executive director of the American Board of Surgery.

DR. SMITH: Edward Abrams, Ph.D.

DR. EBRAMZADEH: Hi, I am Eddie Ebramzadeh Abrams. I'm a research professor in the UCLA Department of Orthopaedic Surgery. I am a bio-mechanician.

DR. SMITH: Hobart Harris, M.D.

DR. HARRIS: Good morning, everyone. Hobart Harris. As of a week ago I stepped down as the chief of general surgery at UCSF for 18 years. My clinical practice is focused on complex abdominal reconstruction and surgery of the pancreas and biliary system.

DR. SMITH: Patrick Osborn, M.D.

DR. OSBORN: Good morning, everyone. Patrick Osborn, Air Force colonel and orthopedic trauma and foot and ankle surgeon at Brooke Army Medical Center.

DR. SMITH: James Swink, the Designated Federal Officer for this meeting, will make some introductory remarks.

MR. SWINK: Good morning. I will now read the Conflict of Interest Statement.

The Food and Drug Administration is convening today's meeting of the Orthopaedic and Rehabilitation Devices Panel of the Medical Devices Advisory Committee under the authority of the Federal Advisory Committee Act of 1972. With the exception of the Industry Representative, all members and consultants of the Panel are special Government employees or regular Federal employees from other agencies and are subject to Federal conflict of interest laws and regulations.

The following information of the status of this Panel's compliance with Federal ethics and conflict of interest laws covered by, but not limited to, those found at 18 U.S.C. Section 208 are being provided to participants in today's meeting and to the public.

FDA has determined that members and consultants of this Panel are in compliance with Federal ethics and conflict of interest laws. Under 18 U.S.C. Section 208, Congress has authorized FDA to grant waivers to special Government employees and regular Federal employees who have financial conflicts when it is determined that the Agency's need for a particular individual's services outweighs his or her potential financial conflict of interest.

Related to the discussions of today's meeting, members and consultants of this Panel who are special Government employees or regular Federal employees have been screened for potential financial conflicts of interest of their own as well as those imputed to them, including those of their spouses or minor children and, for purposes of 18 U.S.C. Section 208, their employers. These interests may include investments; consulting; expert witness testimony; contracts/grants/CRADAs; teaching/speaking/writing; patents and royalties; and primary employment.

For today's agenda, the Panel will discuss and make recommendations regarding the classification of three devices, which are currently unclassified preamendment devices, to Class II (general and special controls). The Panel during Session 1 will discuss semi-constrained toe joint prosthesis. During Session 2, the Panel will discuss intracompartmental pressure monitors. And during Session 3, the Panel will discuss intra-abdominal pressure monitoring devices.

Based on the agenda for today's meeting and all financial interests reported by the Panel members and consultants, no conflict of interest waivers have been issued in accordance with 18 U.S.C. Section 208.

Stacey Bonnell is serving as the Industry Representative, acting on behalf of all related industry. She is employed by DePuy Synthes, a company of Johnson & Johnson.

We would like to remind members and consultants that if the discussions involve any other products or firms not already on the agenda for which an FDA participant has a personal

or imputed financial interest, the participant needs to exclude themselves from such involvement and their exclusion will be noted for the record.

FDA encourages all other participants to advise the Panel of any financial relationships they may have with any firms at issue.

A copy of this statement will be available and will be included as a part of the official transcript. Thank you.

Before I turn the meeting back over to Dr. Smith, I would like to make a few general announcements.

Transcripts of today's meeting will be available from Free State Court Reporting, Incorporated.

And in order to help the transcriber identify who is speaking, please be sure to identify yourself each and every time that you speak.

Thank you very much.

DR. SMITH: Thank you, James.

At this time we have the Open Public Hearing session. There have been no requests to speak for today's session, so we'll move forward with the agenda.

I would like to introduce Michael Owens, lead reviewer in the Office of Product Evaluation and Quality for FDA, who will be presenting on behalf of the FDA. Michael Owens has been with the FDA for 13 years. He is currently the assistant director of the Shoulder Arthroplasty Devices Team. Before joining the Agency, he obtained a bachelor of science degree in mechanical engineering from the University of Florida, and a master's of science degree in biomedical engineering from the University of Tennessee.

Next, I would like to introduce Dr. Victoria Lilling. Dr. Lilling has been with the FDA for approximately 5 years. She is a medical officer in the Division of Joint Arthroplasty Devices, Shoulder Arthroplasty Devices Team. She received her bachelor of science degree

with honors in physiology and neurobiology from the University of Maryland; her doctor of medicine degree with high honors from State University of New York, Buffalo School of Medicine. She received her medical training in orthopedic surgery at State University of New York, Stony Brook Residency Program. She is double-fellowship trained, specializing in hand, upper extremity and microsurgery training from Rutgers School of Medicine in Newark, New Jersey, and shoulder and elbow surgery trained from Johns Hopkins Hospital.

FDA, you have the floor.

MR. OWENS: Good morning and welcome again to the FDA panel meeting. My name is Michael Owens, I'm a biomedical engineer and assistant director in the Division of Joint Arthroplasty Devices, Office of Health Technology 6: Office of Orthopedic Devices in CDRH's Office of Product Evaluation and Quality.

Today my colleague, Dr. Victoria Lilling, and I will be discussing the classification of cemented total first metatarsophalangeal, or MTP, replacement devices. These are currently unclassified and we are looking for your feedback and recommendation on the appropriate regulatory classification of these devices.

Here is an outline for today's presentation. These are the items we will be discussing.

The cemented total first MTP joint implant is a device intended to be implanted to replace the first MTP joint. The device limits translation and rotation in one or more planes via the geometry of its articulating surfaces. It has no linkage across the joint.

This generic type of device includes prostheses that have a metatarsal component made of alloys such as cobalt-chromium-molybdenum, and a phalangeal component or components made of alloys such as titanium alloy and ultra-high molecular weight polyethylene. This generic device is limited to those prostheses intended for use with bone cement.

It is important to note that today's classification effort is limited to cemented total first MTP joint implants and does not cover uncemented use.

This slide includes several examples of existing designs which illustrate the three main components of the total first MTP joint replacement devices.

The indications for use statement identifies the condition and patient population for which a device should be appropriately used. There is some minor variability in the indications for use for these products, but representative indications for use for cemented total first MTP joint implants under product code LZJ are listed here.

The cemented total first MTP joint implant is a preamendment, unclassified device type. This means that this device type was marketed prior to the Medical Device Amendments of 1976 but was not classified by the original classification panels. Currently these devices are being regulated through the 510(k) pathway and are cleared for marketing if their intended use and technological characteristics are substantially equivalent to a legally marketed predicate device. Since these devices are unclassified, there is no regulation associated with the product code LZJ.

This table lists the existing 510(k) clearances for cemented total first MTP joint implants. As you can see in the table, the first post-amendment clearance was K860163 for the DePuy bicondylar toe prosthesis, and the most recent clearance in K132496 for the Arthrosurface ToeMotion device.

I would now like to hand it over to Dr. Lilling.

DR. LILLING: Thank you, Michael.

Hello, my name is Dr. Victoria Lilling. I am an orthopedic surgeon and medical officer in the Division of Joint Arthroplasty Devices in OHT6: Office of Orthopedic Devices, Office of Product Evaluation and Quality here at CDRH. I will be providing a brief clinical background on disease characteristics that affect the integrity of the MTP joint, currently

available treatments, and a summary of clinical experience found in the literature.

The integrity of the MTP joint may be compromised by a range of conditions, as listed here. They include hallux rigidus, which is considered to be the end stage of hallux limitus, and it usually involves erosion of the joint cartilage and the development of osteoarthritis or degenerative joint disease, including rheumatoid arthritis; prior surgical treatment, including failed hallux valgus operations or previously failed toe prostheses. These conditions result in pain, loss of function, and decreased quality of life.

Here we have listed the currently available treatments for patients with a compromised MTP joint due to the conditions listed in the previous slide.

Arthrodesis, or fusion, is considered the standard of care for the treatment of hallux rigidus. Another option is joint arthroplasty, which has theoretical benefits including relief of pain, restoration of motion, improvement in function, and maintenance of joint stability.

Currently there are four types of arthroplasty procedures. First, silastic implants. These are silicone-based implants that maintain length and act as a dynamic spacer. There were many complications with silastic implants, including reactive synovitis, late failures due to wear, osteolysis, foreign body immune reactions, fracture, and displacement of the components.

Next is interposition arthroplasty. Traditionally, in this procedure tissue from another body part, a donor site or a graft made from animal or synthetic materials is placed over the bone to resurface the joint. It is considered the most effective alternative to fusion.

An example of this new technique for interposition arthroplasty is using a synthetic plug as a spacer without covering the surface area of the joint. The Cartiva synthetic cartilage implant was approved in PMA P150017 to treat hallux rigidus for the first MTP joint. The device is a molded cylindrical implant created from hydrogel made of polyvinyl

alcohol and saline. Theoretical benefits include relief of pain and restoration of motion.

Next is metallic hemiarthroplasties. These devices replace one side of the joint with a metallic implant.

And finally, total joint replacement. These devices replace the entire MTP joint with metallic and plastic components and are the subject of this classification effort.

We conducted a literature review to identify any published information regarding the safety and effectiveness of cemented total first MTP joint implants. It is important to recognize that the literature related to the use of cemented total MTP joint implants is limited due to the size of the studies and the study designs.

Of the articles that were reviewed in detail, only eight included summary clinical data on the primary use of total first MTP implants. All but one were Level IV case series. Therefore, it is difficult to reach definitive conclusions on the performance of this device type.

It is important to point out the resultant published literature for total first MTP joint implants that was reviewed included a mix of cemented and uncemented experience. Merkle and Papagelopoulos were the only case series the FDA identified that reported on cemented use only. The remaining studies used no cement in some or all the patients and do not stratify their results according to the method of fixation.

However, the other studies were included for reference since they either provided some data on cemented use of this device type, studied one of the FDA-cleared devices, or studied a device similar to those cleared in the U.S.

Based on our review, it was concluded that while positive results have been documented in the literature, effectiveness for relief of pain and restoration of motion had mixed results. In addition, some reports showed high adverse event rates, mixed results, and notable revision rates due to pain and loosening. Finally, according to the literature,

revision of the MTP joint implants are challenging to manage as significant bone loss is introduced by the initial procedure and places the patients at risk for multiple secondary surgeries. Additional details from our literature review are included in Appendix A of the Executive Summary.

Given the apparently equivocal and low-quality data available in published literature, the Panel will be asked to comment on how available evidence is used to determine the choice to use these devices in cemented total first MTP joint implant arthroplasty. As part of this discussion, the Panel will be asked to explore the outcomes that provide clinically meaningful benefit and what types of evidence, such as clinical evidence, would be helpful to support mitigation of the identified risks.

I will now hand it back over to Michael.

MR. OWENS: Thank you, Dr. Lilling.

As a part of our evaluation of cemented total first MTP joint implants, we also conducted a search of FDA's Medical Device Reporting system. Medical device reports, or MDR reporting, is the mechanism for the FDA to receive significant medical device adverse events from mandatory reporters such as manufacturers, importers, and user facilities, and voluntary reporters such healthcare professionals, patients, and consumers.

MDR reports can be used effectively to establish a qualitative snapshot of adverse events for a specific device or a device type, and detect actual or potential device problems used in a real-world setting or environment. Some examples are listed here.

Before we go over the results of our search, it is important to note the limitations of medical device reports in order to provide proper context. There is the potential for incomplete, inaccurate, untimely, unverified, or biased data in the submitted reports. The incidence or prevalence of an event cannot be determined from this reporting system alone. Confirming whether a device actually caused a specific event can be difficult based

solely on information provided in a given report. MAUDE data does not represent all known safety information for a reported medical device.

We searched the MAUDE database for adverse events up to and including February 7th, 2020. Two different searches were performed to identify all MDRs related to devices under the LZJ product code. One search was conducted using product code LZJ and one search was conducted using brand names that include toe. The results of these queries were combined, and duplicate results were identified and removed. Reports for different devices were removed using the following fields:

- Manufacturing names
- Brand names
- Catalogue number
- Model number
- Premarket submission number
- Narrative

Multiple events for the same patient event were removed during the individual review. MDRs representing uncemented use and literature articles were also removed. The resulting 40 MDRs are the focus of this review. It is important to note that the method of fixation could not be confirmed for the remaining reports. The reports were received between April 1994 and September 2019.

The adverse events described in these reports are listed in this table. You will note that the count adds up to more than 40. It is possible that more than one adverse event descriptor was noted within an individual report. For example, if a report was received for a revision due to pain, it was counted as one for revision and one for pain.

The types of events listed are expected for this device type. Secondary to removal and revision, the most frequently reported patient event was pain. The most common

device issues included loosening, loss of range of motion, and device failure.

Please keep in mind the limitations of the MDR reports I outlined earlier when evaluating this data.

Time to revision was analyzed, as cemented total first MTP joint implants are considered permanent implants. Time to revision was calculated by subtracting the date of implantation from the date of device explantation. This information was correctly provided in 22 MDRs. Three additional reports contained the time to revision in their narrative fields. These are also included.

This figure shows that a large percentage of the reports documented revisions within the first 2 years. However, please keep in mind the limitations of the MDR reports I outlined earlier when evaluating this data.

The FDA has identified the following risks to health for cemented total first MTP replacement devices based upon literature findings, the Manufacturer and User Facility Device Experience database, and the risks associated with total joint arthroplasty devices; however, this list may not be exhaustive.

There is a risk of failure at the bone-implant interface. Components may loosen, migrate, or disengage from the bone, which can result in pain, injury or loss of correction.

There is a risk of fracturing of the metatarsal head or base of the proximal failing during implantation. This may cause prolonged surgery time, pain, and loss of correction.

There is a risk of osteolysis or heterotopic ossification around the implant system. This may lead to pain, implant failure, loss of function or loss of correction.

There is a risk of sesamoid pathology, for example, subluxation, arthrosis of the metatarso-sesamoid junction associated with total MTP joint replacement, which may cause pain and loss of function.

There is a risk that the hallux deformity may recur due to user error, disease state, or

patient noncompliance. This may result in pain, loss of function, or additional procedures.

There is a risk of pain and stiffness associated with MTP joint replacement, which may limit the range of motion.

Components may fracture, wear, or disassemble resulting in mechanical or functional failure. This may result in pain, injury, or loss of correction.

There is a risk of infection in the wound or around the implant. This may cause pain, stiffness, swelling, fever, or fatigue.

Components may partially or fully dislocate leading to pain, loss of function, or loss of correction.

There is a risk of use error, which may include difficulty or inability to implant the device components or incorrect placement of the device. This may lead to mechanical or functional failure and result in pain or injury.

Device materials may elicit adverse tissue reactions such as foreign body response, metal allergy, and metal toxicity.

Some of the materials used to manufacture cemented total first MTP joint replacements may create a risk of migration and heating in the MR environment, which may lead to pain, injury, and loss of function.

There is also a risk of image distortion which may affect the ability to image the surrounding area for new pathologies.

Finally, there is a risk of multiple secondary surgeries as revision of arthroplasty is challenging to manage as significant bone loss is introduced by the initial procedure.

The Panel will be asked to comment on whether this is an accurate list of all of the risks in the overall risk assessment of cemented total first MTP joint implants under product code LZJ. In addition, the Panel will be asked to comment on whether any additional risks should be included in the overall risk assessment of these cemented total first MTP joint

implants.

The risk mitigation table seen in the following three slides outlines the identified risks to health and potential controls that FDA could apply to mitigate each identified risk. These mitigation measures include clinical information that could come from a variety of premarket and postmarket sources:

- Nonclinical performance testing
- Labeling
- Design characterization
- Cleaning and sterilization testing
- Biocompatibility testing

We propose that these mitigation measures can be implemented as special controls as part of the device regulation process.

The Panel will be asked to discuss each of these potential controls and whether it, either alone or in combination with others, adequately mitigates the identified risks.

In addition, the risks associated with multiple secondary surgeries are particularly significant and possibly long lasting. The Panel will be asked to discuss how the risk of multiple secondary surgeries should influence the selection of cemented total first MTP joint implant arthroplasty when considering the overall benefit and risk profile of the subject devices. The Panel will be asked to comment on the recommended mitigations to address this risk.

FDA believes general controls by themselves are insufficient to provide reasonable assurance of the safety and effectiveness, and sufficient information exists to establish special controls to adequately mitigate the risks to health and provide reasonable assurance of device safety and effectiveness for this device type. As such, FDA believes that Class II is the appropriate classification for cemented total first MTP joint implants.

Considering all information in the panel package, the Panel will be asked to comment on the classification recommendation for cemented total first MTP joint implants.

Thank you very much for your time and attention.

DR. SMITH: I would like to thank the FDA experts for their very thorough presentation.

I want to open the floor to the experts around the table to begin deliberating, using all information from the panel presentation, public comment, or the material that you have read in your panel packs.

Although this portion is open to public observers, public attendees may not participate except at the specific request of the Panel Chair. Additionally, we request that all persons who are asked to speak identify themselves each time. This helps the transcriptionist identify the speakers.

Do any Panel members have a question or comments for the FDA?

Yes, Dr. Finnegan.

DR. FINNEGAN: So a question for the FDA. This is originally recommended for patients with low demand. Are the studies that you looked at usually low-demand patients or do they include younger and higher-demand patients?

MR. OWENS: Hi, this is Mike Owens. I'm going to defer that to Dr. Lilling.

DR. LILLING: So all of the studies -- sorry. All of the studies had a mixture of patients. There wasn't any specification of demand.

DR. FINNEGAN: Was there any --

DR. SMITH: Yes, Dr. Pfeffer.

(Pause.)

DR. SMITH: Excuse me, Dr. Pfeffer, your microphone's muted.

DR. LEWIS: This is Frank Lewis.

DR. PFEFFER: Thank you. Oh.

DR. LEWIS: I wanted to ask if there is any incidence data available regarding the frequency of any of the complications. The MDAs (sic) were collected over a 25-year period, the total of 30-some events doesn't seem unreasonable, but no incidence data of frequency of any kind is given. Can you give us any impressions just to how often any of these complications occur?

MR. OWENS: I'll take a shot at this and then defer to -- I also would like Dr. Lilling to weigh in. But yes, that's one of the actual limitations of the -- our MDR reporting system is, to kind of put in context, to get rates is a little difficult because we're getting it on an individual report basis. But I think what we can look to is the incidence rates in the literature that we do see in the case series studies, but that also is limited. But I think that we would have to rely on that as far as getting any kind of percentages on these incidence rates.

Dr. Lilling.

DR. LILLING: Yes, we don't have any specifications of the incidence rates because that's not how the MAUDE database is set up, unfortunately.

DR. PFEFFER: Now we can't hear you, Dr. Smith.

DR. OWENS: Go ahead, Dr. Pfeffer.

DR. SMITH: Excuse me, Dr. Pfeffer.

DR. PFEFFER: Thank you very much. I just have a little bit to say about this because I've been in practice for 32 years and I've only done foot and ankle, although I ran -- I did hand, as well, and I ran the hand service at the Letterman Army Hospital for a while. These were nice presentations you had and your presentations of the FDA flowed along and to, really, the novice listener who didn't know what FDA's recommendations are, I thought you were working up to saying these devices should be pulled from the market. Forget about

Class II. If you just look to your papers, poor results, problems, used off label, patient pain and suffering, difficult salvage equals no devices. So that's actually what my opinion is, that these devices should not be allowed ever again to be put into a human being, it created huge suffering and huge loss of dollars and people's lives.

Implants in the great toe are usually put into women who want to continue to be able to wear a heel or people with very specific activities, yoga, issues like that. This all came up in the Cartiva meeting that I was part of and the Cartiva people agreed.

In terms of Dr. Lewis' comment, we have to understand that this is not like looking at data from the *Journal of Surgery* or the *Journal of Bone and Joint Surgery*. The reason the MAUDE has only 40 patients in it is because it's not reported. The physicians look at this, who put this in and they go wow, it's a complication that can happen, and it's not reported. If all failures of this joint was reported, you probably have 80 or 90% of those put in that were reported as failures. Years ago I spent my entire -- well, not entire, I see every week a failure of these types of implants.

So that's all. I guess my question to FDA is how do you go one plus one plus one equals 80? I'm sorry to be sarcastic, your reviews were excellent, but where do we possibly come up with a Class II? If there was a Class VI, that's what it should be.

MR. OWENS: Yes. So this is Michael Owens, I'll take a shot at that. So I think our existing, you know, previously cleared precedent has played a role, but I certainly understand, and as we noted in our presentation, the mixed results, and we were cognizant of the risks that you identified and given that things like clinical data are potential special controls, we felt that it was possible that we could move forward with the proposed classification. However, that is the purpose of the panel meeting today, is to seek your input from experts like yourself, to discuss and hear your concerns about the risks and the proposed mitigation measures and if they are possible, so we welcome your input.

DR. PFEFFER: It's just everyone remembers -- and I'll yield the floor. It's terrible literature. Dr. Lewis, this is miserable literature and it's literature that's actually made to obfuscate the problems that are going on. It's politicized. And if those joints are being put in anywhere, I'm not even aware of it, maybe in small pockets around the world. In my world, everybody knows they're bad, dangerous, and would never be done.

DR. SMITH: Before we move forward to panel deliberations, are there any other questions or comments for the FDA?

Yes, Dr. Finnegan, you had your hand up.

DR. FINNEGAN: So I didn't actually think I was going to agree with Dr. Pfeffer, I thought I was going to have him popping up and down in his chair, but I totally agree with him. I'm not a foot and ankle person, but I know from my -- from our rounds that these are a problem. I also know that the younger generation is not interested in fusions, they want something that's mobile.

So the indications are going to creep, if they haven't already been creeping, and I think that a Class III is exactly where this belongs. Part of the problem is we don't understand the mechanics of the first MTP joint. I'm not sure we understand the mechanics of the ankle, but -- and how that got to be a Class II I'm not entirely sure, but I think this is an even bigger problem.

DR. SMITH: Yes, Dr. Alander.

DR. ALANDER: I trained with Al Swanson and so, Glenn, you probably know that name among the others, but I had a lot of experience with implanting hand flexible hinges in the hand and in the foot and my -- I would echo Glenn's comments, I think this is not a great operation and a great prosthesis to use.

DR. SMITH: And so does anyone have any further questions for the FDA before we open the Panel for the deliberations?

MR. OWENS: Dr. Osborn would like to be called and I saw a message, Dr. Smith.

DR. OSBORN: Yeah.

DR. SMITH: Yes, Dr. Osborn.

DR. OSBORN: Yeah. And I'll quadruple down on those comments, especially the part about people not wanting fusions, and I see these in younger and younger patients. And the bone loss with a press fit is bad enough, but with the cemented arthroplasty I think it's going to be a disaster and you're not going to limit this to patients that will be low demand. Not that they should get this implant, either.

DR. SMITH: Dr. Ebramzadeh, you have your hand up.

(Pause.)

DR. SMITH: Your microphone is muted, sir.

DR. EBRAMZADEH: Sorry about that. I'd like to explore three areas with regard to the implant. One is that it's presented as cemented only, whereas, at least the examples that are shown and what is in the literature, these are often used without cement. The designs are obviously intended for use without cement because they have grit-blasted surfaces.

And in particular, if there's titanium alloy used, titanium alloy, we know from hip and knee replacements, we've known for a long time that the titanium alloy should never be used in conjunction with cement, it's asking for trouble. It creates a lot of cement, wear debris and third-body debris, and it could create osteolysis and exacerbate polyethylene wear and so forth.

And so one question I have is why is the Panel just addressing cemented devices? But the second bigger question is, are these designs intended for cemented and if so, why are they using titanium?

The second area, is cross-linked polyethylene considered for these designs? Is it

used in any of the designs? I haven't seen any mention and that has been a major, major contributor to the almost elimination of osteolysis in hip replacements, and why wouldn't the foot and ankle people take advantage of such a thing in their designs?

And then the third question is related to those. Are there any wear experiments, wear testing of this implant? Are there any done and should that be a recommendation as far as mitigation of risks? That's proven again with hip and knee and other replacements, spine joint replacements, to contribute a lot to our understanding of how prostheses will function and predicting them. Especially with hip replacements it's been very successful.

MR. OWENS: This is Michael, I can -- I think the Panel may want to weigh in on some of these. I think I missed the middle one, a major -- repeat that. But the first one just kind of goes back historically, so the preamendments devices started cemented and all of the subsequent submissions came in that way, but I think your points are well taken in regards to that.

And in regards to uncemented use, whether it's -- you know, practice of medicine being one thing, but for us on the regulatory side, that we have to be focused on classifying the preamendments device, and if a company wanted to come in and was interested in marketing a device for uncemented use, they would have to explore the proper regulatory pathways for that, for that submission. But because we are following classifying a preamendments device, we are limited to the way that that device was utilized, which was with cemented use. And, you know, previously companies have come in interested in uncemented use, but that is not the way that they were cleared early to be marketed.

And in regards to the polyethylene, the third question, I think historically, if you look at when these were cleared was, I think -- you know, a majority of them were very early in the '90s, I think, and I would maybe defer to some of the members on the Panel, before things like possibly polyethylene kind of took off. So I think it's a good question for a future

design. And I forgot what the second question is, but I see that Dr. Pfeffer wants to make a point.

DR. PFEFFER: A quick question, Dr. Owens (sic), to the FDA. For postmarket surveillance, when that's being done by the FDA for total joints, new products, take foot and ankle, total ankles, for example, or even new toe joints, what the orthopedic surgeons might say, who were proposing their device to the FDA is we're not going to use cement, ever. We know that happened. So the FDA passes it and allows it, we're going to say it's a technique for cement, so -- but we're not going to use it.

If FDA does surveillance on a great toe like this, for example, or any of the devices you've approved, how do you look at that when 95% of them are being put in without cement, which is considered off label and up to the physician, but I don't -- how does the FDA deal with that? And it's germane to this total joint.

MR. OWENS: Well, I would say, from a surveillance perspective, you know, if we were aware of marketing something, I guess if it would say off label, we would -- you know, there are proper compliance actions. You know, if nothing, that could come in to play. But I mean, as far as how that informs us, we have to take into consideration the differences, which I think you raised a good point, is what makes the -- what makes it a little bit difficult to get an accurate picture of these devices when we're limiting ourselves to cemented use.

DR. PFEFFER: It's not being reported, right. Thank you.

DR. SMITH: Dr. Alander.

DR. ALANDER: Just for the FDA. Is it possible, we've been asked to go to Class II, is it -- can we go to a Class III designation --

DR. LILLING: Yes.

DR. ALANDER: -- in the discussion?

DR. LILLING: Yes, you -- yes. Is that correct, Captain Peat?

DR. PEAT: The deliberation here is to go to -- we're proposing Class II with special controls. I'm understanding some of the concerns that you have raised. We've put forward a series of mitigating actions that can be addressed, but to the user error and how these products are actually used, as well as postmarket with our special controls, it speaks to clinical information.

One of the questions that we have posed to you is that if it's not Class II with the special controls that we have identified to mitigate the risks, it could be something where you could put forward your recommendation on another class that can be used to regulate these particular products as far as the recommendation is concerned.

However, I really want to draw your attention to the Executive Summary that speaks to a lot of the identified risks that were posed by the panelists here and how we have put forward our mitigating measures to be able to address that. Within it there is an aspect that speaks to clinical information, and clinical information can be for the full realm, whether premarket or postmarket, and it can go from different aspects, not just randomized controlled trials, but as well as real-world evidence, literature, valid scientific evidence, as we discussed yesterday. So I just wanted to put that forward as a point of discussion.

DR. SMITH: Dr. Gilbert.

DR. GILBERT: Yeah, Jeremy Gilbert. Since I'm not a practicing clinician, I'm a Ph.D. bioengineer, I'll defer to the clinicians on the experience and past history of the toe implant in particular, but I want to ask some questions to the FDA about their identified risks.

For these devices, on first blush, in terms of the materials, are not dissimilar to what you see in a hip or a knee, there's titanium alloys, there's cobalt alloys, there's polyethylene, they articulate, they are embedded in bone, you can cement, these are all similarities. And, you know, Dr. Ebramzadeh indicated you don't use cement with titanium.

Well, you do in knee implants where you cement the tibial tray. I mean, there are -- these do occur and they are across the total joint spectrum. Shoulder arthroplasty, I think, probably maybe 10, 15 years ago you would say the same things about a shoulder arthroplasty that are being said about a toe implant today. For me, I don't have the clinical perspective, really, and the past history as well as others here, but those similarities stand out to me. And so that's one statement.

And then a second comment is in the identified risks, and this goes back to something I said yesterday about biocompatibility assessment. So when we talk about these risks, we categorize them as if they are standalone things, since we say the device can fracture, can wear and so on and so forth. And then later, there was a comment that says the materials could elicit toxic responses or an allergy or things of that sort, as if those reactions are simply to the materials as they exist in the device, and that's not the case. There's very often what I would describe as conjoint interactions, conjoint effects, and it's the degradation products in their use that may lead to adverse reactions such as allergy or inflammation or osteolysis, these other identified risks.

So I get a little concerned about that discretizing of these risks, they are an interplay, perhaps, and I don't know that we know all of the ways that the interplays occur, but that lack of appreciation of that conjoint mechanism of risk isn't kind of described in this risk to health description that was used. Not just for the toe implant, but just generally how it's approached by FDA. So I'm curious and I'd like a comment from FDA about that.

MR. OWENS: So I'll take a stab at that, Dr. Gilbert. So I just want to make sure I understand it. Your question is about how the interrelation between -- between the risks and that we are kind of considering them discretely? Is that it or am I missing something?

DR. GILBERT: Yeah. I think you have it correctly that the risks aren't discrete individual risks that are not dependent on one another, but there are a range of risks that

arise because of the interplay of these multiple mechanisms.

MR. OWENS: Yeah, yeah, where -- yeah, where it relates to a biologic response, where it can be an event --

(Crosstalk.)

DR. GILBERT: Exactly. Particles get generated, they induce osteolysis and so on. You know, cement particles can do that. Perhaps metal particles, although there's some mixed understanding of that. So debris, I would call them degradation products and elicit some of these other risks. It's not the implant, it's not the material per se, it's the degradation products of the material that lead to the risk of biologic reaction and so on.

And then just one other part of this that I didn't speak to. Corrosion is missing from this list of risks and again, this is an interplay phenomenon. Wear of a metal implant in a biological system in contact with an aqueous electrolyte necessitates an electrochemical reaction or corrosion. So when you have metal in the body it creates a corrosion reaction and so there's tribocorrosion is -- that's what I studied, it's what many people --

MR. OWENS: Yeah.

DR. GILBERT: -- are focused on in these joint implants these days and that conjoint interaction of wear and corrosion lead to degradation products and the potential for biological reaction, is kind of where I'm thinking.

MR. OWENS: Yeah, I agree with that. I actually agree, I think that that might -- that risk possibly was omitted on accident, but I would agree that corrosion is a risk for these types of devices as similar to other joint arthroplasty devices.

And to your initial point, I would say that we do take that into consideration in regards to the connection between the two, an example being in a wear test we're not only looking at volume but also -- and distributions and things of that nature. So we do consider the interconnection, but your point is well taken, it's something that we can take back and

consider how -- the way that they're specifically listed.

DR. GILBERT: Thank you.

DR. LILLING: I think Dr. Osborn had a question, too. Did he already ask the question?

DR. OSBORN: Yeah, I already asked, thanks.

DR. LILLING: All right.

DR. SMITH: If there are no further questions or comments for the FDA, then at this time I want to open the Panel to deliberations. Do any panelists have any questions they want to pose to the rest of this Committee?

Dr. Gilbert.

DR. GILBERT: Well, to Dr. Pfeffer, I'm just -- so my statements about the seeming similarities, for a poor material scientist sitting on this Committee, of the devices to other devices in orthopedics and the horrible clinical outcome that you describe, I'm curious about the disconnect there. And I think Dr. Finnegan maybe said something about we don't understand the mechanics. But I'm curious, for cemented metal, polyethylene metal implants that we're describing here or considering here, talk to me about that clinical performance.

DR. PFEFFER: For all of us who want to design a better implant, let's get together after the call. I'm completely joking. It's very interesting comments you made. These types of implants never really get a chance to wear. They loosen. Dr. Alexander (sic) mentioned the silicone implants. These were used extensively in the hand and they still are sometimes, as I understand it. And then they were used in the foot and they stayed in place, they didn't fracture through the bone, they didn't cut out, and their problem was silicone wear. It became a very difficult clinical bone destructive process because -- but they stayed in long enough to wear. Wear, as you know better than I, doesn't occur in the

first year or two. With these great toe implants, they don't have a chance even to wear, usually; they just fracture out the bone, they loosen and they never incorporate.

The difference is if you look at the most marked difference, the hip has a lot of soft tissue around it, a big muscle mass, and it's a very unconstrained joint with not high forces initially over the implant. The great toe is very different, huge forces with walking. All of the forces with walking are placed right on that first metatarsal bone, heel joint, essentially, as we step down with gait, and it's a very tiny surface area with very little cancellous bone. So the cortical bone to cancellous ratio is very different than it is in something like the knee, which has a tremendously high surface area.

They've been doomed. People keep trying, but they've been doomed for that reason. With early failure. This is very different than the total knees where "gee, some are failing at 8 years, some are failing at 20 years " These joints never even get a chance to be there and it's not reported to FDA, I'm a hundred percent sure, most of the time because it's not really what anyone would consider a design failure. It's just more a bad indication with a patient who's not gotten adequate informed consent. And let us all remember that as we deliberate. FDA's job is to protect patients.

DR. SMITH: Dr. Alander.

DR. ALANDER: I wonder if really one of the risks here is what Maureen had alluded to, is the relaxation of indications, and I think they should be fairly stringent. And so I think that's probably one of the risks on the clinical side that I don't know if we can address that from the FDA or not, but I think that's a big risk, this relaxation of indications, and so -- of really informed consent for patients.

DR. SMITH: Dr. Finnegan.

DR. FINNEGAN: Glenn, can you talk about what's available as salvage procedures when these fail?

DR. PFEFFER: Good question, Maureen. Very difficult. Take the Cartiva the FDA just approved that I was on the FDA panel for, it leaves a small hole in the metatarsal head and the Cartiva is removed and the small hole refilled. It requires a second surgery and you have a defect, a cup-sized defect, and you can fill that with some bone graft taken out of the bone bank or the person's own body and then you fuse the joint with a plate. Not too difficult.

Here, what's happened is to put the implant in, large amounts of bone have to be removed. This is not just a thin little wafer, this is not just a little polyethylene insert, and there's so much bone been removed that you're left with a huge defect. It's a very difficult problem. You have to take an iliac crest graft, you'd have to take some type of prefabricated wedge and fill the defect and hold it with the plate, and the problem with the fusions here is you're taking such a large piece of allograft or dead bone that initially you think it works, only to find out a year later that it's fractured, as with any large allograft, you know. So it's a horrible life-altering problem for patients. It's just the big toe, but if your big toe hurts, a lot of these people simply want amputations when they've failed two or three operations.

DR. FINNEGAN: Maureen Finnegan.

And what about transfer problems, do you significantly transfer problems to the lesser arrays when you do this?

DR. PFEFFER: The surgery or the salvage?

DR. FINNEGAN: Either.

DR. PFEFFER: Yes, because what happens is the great toe, which maybe takes 40% of your weight while you're walking, doesn't bear any weight. So now the weight's borne on the lesser metatarsal. You end up with a floppy toe that doesn't work at best, and at worst, you end up with a painful toe that's been infected with skin breakdown. I have no skin in

this game, just so you understand that. My conflict of interest has been clearly vetted. What affects my opinion, and most orthopedic foot and ankle people including, I'm sure, some on the Panel, if you've been around long enough, is the disasters that occur with this. Maybe if I see 10,000 patients in a year or whatever the number is, I can't remember, in 15 years, anyone ever coming in and going "oh, yeah, I had a metal cemented implant, I'm so happy with it." Never. It may be a moot point. I really don't think anyone ever wants to put these in anymore and we should strongly defer the people who might even consider it in their wildest dreams.

DR. SMITH: A number of hands just went up, we'll call on Dr. Price first and then Dr. Yang.

DR. PRICE: I have two questions. What if nothing was done, what's the end result? And what would be the preferred device? Like, what would you do instead?

DR. PFEFFER: Is that for me, you're asking?

DR. PRICE: Yes, please.

DR. PFEFFER: Oh. If nothing is done with the implant in place?

DR. PRICE: No, without an implant in place. Nothing.

DR. PFEFFER: Well, these are great questions. I think if I could sum this up as absolutely objectively as I can, when people come in with arthritis of their great toe, once they are -- once they have true informed consent, right, with my resident or fellow resident, present true informed consent, most of them will say "I'll live with it, I'll modify my shoe wear" once they hear about the risks, right?

Again, if you look at the Cartiva that was recently approved by the FDA, the small seemingly harmless implant, there have been a lot of problems with it. When I speak to orthopedic surgeons around the country, they say they're taking more out than they're putting in, and that's an implant that's only been approved for 2 or 3 years. I can't speak

pro or con for the Cartiva, I'm just saying that's what I hear. So people live with it and they modify their shoes. FDA's excellent review shows that the gold standard here is a fusion of the great toe. I think Dr. Owens showed that in the literature, very low complication. There's a systematic review of the literature that shows it was vastly superior to implants. It sounds terrible, but if someone told you, Amy, you had to have a fusion of your great toe, you would just balk at it. Unless the person's like me with gray hair and said you're going to have a wonderful result with it and you'll walk fine.

Otherwise, what FDA has said is people do a different array of operations now, they may put an acellular dermal matrix skin over the top of the arthritic toe to allow some motion. So basically, you have motion-sparing procedures which don't do as well at all as motion fusing -- blanking (ph.) procedures like a fusion.

So there's no great options for the person who says I want to wear a 4-inch heel, I'm a professional yoga instructor and I need to move my toe like this. We're not there yet, but I'd rather have that person live with pain, modify their shoes, than to have an operation that could destroy the rest of their life, literally destroy the rest of their life.

DR. SMITH: Dr. Yang.

DR. YANG: Well, as I sit here and listen to these Panel deliberations, as someone who doesn't primarily do these procedures, I guess I start to worry that what we're talking about is the practice of medicine, which is regulating medicine, not our charge here today. So what I'm actually after is do we have enough information, enough good quality data that gives us enough information to actually put special controls on this? Or, as I'm listening to Dr. Pfeffer and Dr. Finnegan and others, that we simply don't have enough good quality data and that's what leaves this in a Class III. Would any of the other panelists like to help me out here?

DR. PFEFFER: I completely agree with that. The literature on this, excuse my

language, is garbage. You wouldn't accept it in a throw-away journal these days, unless it was one that shows the high complication rate. And that's exactly why any new device on the market, in my humble opinion, should have a rigorous PMA and not be allowed any -- sliding in with a 501(3)(k) (ph.) no matter how specific the controls are.

DR. SMITH: There were two --

DR. YANG: Thank you, I appreciate that.

DR. SMITH: Two hands went up, Mr. O'Brien and then Dr. Finnegan.

MR. O'BRIEN: Thank you. And I would agree with Dr. Yang and with Dr. Pfeffer. You know, ultimately what was said is we've got to control true informed consent and informed consent, if you're a patient, generally means you have four pieces of paper stuck in front of you on the day you're going in for surgery and you have to sign this off, that's what you get, but you have a very difficult -- it's a quandary, not just for toes, which I suffer from gout so I know pain in the toe, but in the spine or the hip or the knee, whatever the case may be, because it's not just pain you're trying to get away from but function.

So it is legitimate. I don't think we can illegitimize someone wanting to do yoga or someone wanting to do other activities of daily living, those are essential to life and they're just as important as that. So when a patient is looking at "can I do this versus that," that's a very hard issue for them and they generally do not get true informed consent, whether that be the toe or the spine or the knee or the hip. So that is a difficult problem.

But I don't know you can regulate the practice of medicine because that's definitely what's needed, and if there's a special control that could require -- you know, I think about it. You know, even yesterday when we were talking about some of the issues about placement error, etc.. You know, I also sit on the drug panel and the drug panel, they came up with opioids, they had to say "listen, we have to instruct and educate the doctors, the prescribers," so they came up with REMS, which required education to the surgeons. So it

does seem that there is possibly some way to develop the special control to require what's actually essential here, is to have informed consent so the patient really knows what they should or shouldn't do.

DR. SMITH: Dr. Finnegan.

DR. FINNEGAN: I think it's Dr. Ballman you want.

DR. SMITH: Dr. Ballman.

DR. BALLMAN: Yeah, I'm just sitting here and listening, and I'm really troubled with the lack of data that shows that these things were effective in the first place. I'm just wondering sort of why they're out there. I understand informed consent and so forth and, you know, I'm not sure exactly what the informed consent would be other than there's no data.

And so I just, I don't see how special controls necessarily would do it unless they can really require the necessary sort of follow-up long term. I mean, I want to know what the revision rates are. If they're high, that's a problem because it sounds like there's no bone there in the first place, and if you have to go back and replace something you're just sort of in a quandary at that point. So I'm just really puzzled at the lack of data and how this is out there in the first place.

DR. SMITH: Are there any other comments?

Yes, Dr. Finnegan.

DR. FINNEGAN: I don't know if this is legal or not, but I really factor in can we, as a primary question, just say do we think there are enough special controls to justify putting this in II because if the answer is no, then you've got your answer.

DR. SMITH: Yes.

MR. OWENS: So that is actually and would be -- you know, when we move into the question section, that is a proposed question. I just want to put out there that one of the

things we've listed is clinical data, clinical information, I should say, that can come in the form of pre- and postmarket clinical information. So I just want to throw out there, I did hear that long-term data was brought up as an issue that might lend itself to postmarket studies, possibly, but that data is something that we listed as a potential mitigation measure and that information can circularly inform other mitigation measures like labeling and bench testing and so forth. So I just wanted to make sure that the group saw that we listed that and if they need to discuss that, or if we need to answer any questions.

DR. LEWIS: Dr. Smith, this is Dr. Frank Lewis. My raising of the hand doesn't seem to be working on the Zoom, so I apologize for speaking up. But in listening to this, I'm not an orthopedist and have no experience with these, but in view of the relatively unanimous opinion of those who do have experience with it, and the complete lack of data which appears to exist, it seems that the mitigation strategies of labeling and clinical information are relatively meaningless since there's really no data out there to provide useful information for patients in deciding.

In light of that, it would seem that the appropriate thing would be a Class III so that the FDA could institute some sort of mandatory data collection regarding these devices going forward, assuming they do continue to be done, so that some data could be generated which would allow, potentially in the future, for them to be used assuming that greater success is achieved in some future dimension. But since these have been around for decades and the experience seems to be so poor, it's not particularly likely that that improvement is going to be forthcoming. So it would really seem that a Class III action here would be the only appropriate way to go.

MR. OWENS: If I could just pose a discussion topic, it would be -- you know, it's not impossible to request quality clinical data through the Class II pathway as valid scientific evidence. So can the Panel discuss what -- or maybe, you know, the nuances of not getting

your questions answered with a quality -- some type of quality clinical information that represents valid scientific evidence as a control.

DR. PFEFFER: Michael, I would just ask you why would you want to do a Class II? I mean, why? Because it's easier, it's cheaper for the companies? Why would you ever want to do it?

MR. OWENS: Well, we're certainly not influenced by making things, you know, the cost aspect and we're looking at the risks and looking at past precedents, and the way we think that we can mitigate those risks and we proposed -- again, I would just reiterate my previous comments that we propose these as consideration for controls to mitigate -- to mitigate the risks. But we're certainly here to seek your input on if the proposed controls, as listed, would -- you feel would not be adequate and to get your feedback on what you consider appropriate mitigation measures.

DR. PFEFFER: Thank you.

DR. SMITH: There's three hands that have gone up. In order: Dr. Alander, Dr. Price, and then Dr. Gilbert.

DR. ALANDER: Dirk Alander.

Yeah, I guess I just want to understand, from the FDA's standpoint, what's the roadblock in going to a Class III? I mean, you said "well, we can do it in Class II with special considerations," but why -- what is really making you hesitant about saying "well, yeah, we can do it in Class III"?

MR. OWENS: Well, I guess I would say there's not a roadblock. We do have one of our regulatory people on that can also chime in here. But, you know, I would say that if the risks and proposed mitigation measures are not adequate, if the conclusion is that special controls cannot be generated, that that is a possibility. It's not a roadblock, but I would -- I don't know. I'm looking to see. I think if our regulatory affairs representative is on the line,

so chime in.

But I see Stacey might want to chime in, as well. Stacey.

MS. BONNELL: Sure. Stacey Bonnell, the non-voting Industry Rep.

I think just to carry on that thought, Michael, you might be thinking also of the definition of a Class III device. And I fully appreciate, and I'm following the conversation in terms of the lack of robust data in support of its performance to date, but that data could be generated in terms of having that special control of the data, as a moderate risk Class II.

But if we look at the definition of a Class III device, life-sustaining, life-supporting, and of substantial importance to human health, so perhaps that might be a defining factor where this Panel decides to lean in Class II or Class III. If there are the appropriate special controls that can be applied, does this device then fit into the Class II designation of moderate risk?

DR. SMITH: We have Dr. Price and then Dr. Gilbert, Dr. Finnegan and then Dr. Yang.

DR. PRICE: Yeah, my concern is that this is a very high-risk device and it does impair human health because when someone loses their ability to move, that affects all the rest of their quality of life and their organs and everything else, as well. So it's not possible to do informed consent because we don't have enough information to direct about consent or to prepare somebody because there's not enough data available.

And I'm thinking that if manufacturers want this particular type of device, then the onus is on them to design it better and to design something that works. Not first do the stores of what they already have produced to the detriment of patients.

I don't see any -- I don't see that the special controls actually are sufficient to -- you know, even if you collect more data, I mean, you would actually need a randomized trial. If you have a randomized trial and you have this much adverse effects, then you're going to have difficulties in terms of even putting that through ethics. So I don't think the controls

are sufficient and if anyone wants to -- from the FDA wants to address this, that'll be great.

MR. OWENS: Yeah. I mean, I would -- I hear your point. I just want to point out that in regard to the type of study that, you know, the valid scientific evidence applies to a PMA and there are things besides a randomized controlled trial that meet that definition, but I understand your point that the bar to get the best quality data may be the randomized controlled trial.

And, Stacey, I think you wanted to --

MS. BONNELL: Yes. Stacey Bonnell speaking here maybe in response to Dr. Price, and I hear your concerns, as well, and the consideration that this could be a high-risk device. But I also want to liken to the -- how other motion-preservation or arthroplasty devices that do fall into Class II. So with special controls, but that's -- here is determining if those controls are appropriate for regulation within moderateness.

DR. SMITH: We have three -- I see Captain Peat.

DR. PEAT: I just wanted to offer up a comment that when we're thinking about Class III and looking for some valid scientific evidence, it does not equate to randomized controlled trials. So when we're saying clinical information, whether we are proposing Class II or Class III, if you comment about -- and not just randomized controlled trials. I just wanted to make sure that I put in that particular nuance, because I hear some conversations regarding Class III and the need for having randomized controlled trials but that was not put in for that proposal, this does not equate to having randomized controlled trials.

And as it stands now, when we look at the information, we agree that the literature is mixed, hence the reason why we put forward special controls that are different from how we have cleared the products in the market before. Before, when we actually put them on the market, we did not have clinical information, it was specifically done with nonclinical

information, hence the reason why the special controls as we have it now, we have put forward all of the identified risks that we believe exists based on our information, not just in the literature but what we've reviewed, but also put forward those mitigations including clinical information for all of the things that we're discussing here today. So I just want to make sure that we think about the mitigation and know that Class III does not automatically trump it to having randomized controlled trials. Thank you.

DR. SMITH: There are four panelists who have been waiting to speak, so in order it's Dr. Gilbert, Dr. Finnegan, Dr. Yang, Dr. Pfeffer. And I apologize, I believe the FDA had a comment.

DR. LILLING: Yes, I just wanted to interject about randomized controlled trials and I'd like the Panel to consider that we did find in literature, there was one randomized controlled trial, Gibson and Thomson from 2005 in *Foot & Ankle International*. So please make sure you consider this in your findings.

DR. SMITH: Dr. Gilbert.

DR. GILBERT: Yeah, so Jeremy Gilbert.

Just going back to sort of an earlier comment I made about some of the similarities of these devices and the materials to other total joint implants, I'm curious, from FDA, of the range of total joint arthroplasties that are on the market, how many of them are currently in Class III?

DR. LILLING: I don't know a complete total, but I do know that the small joints of the hands particularly are in Class III --

DR. GILBERT: Thank you.

DR. LILLING: Um-hum.

DR. SMITH: Dr. Finnegan.

DR. FINNEGAN: So basically comments. Stacey sort of left out the second part of

Class III, which is significant risk of injury and interfering with the general health of the patient. And when you can't walk on your foot comfortably, that is a problem.

And secondly, because the FDA doesn't regulate, these things can be used off label pretty easily and I don't get the feeling you have a good feel when they're used off label. So I am very concerned that there are no special controls that are going to keep this out of getting people into trouble.

DR. SMITH: Dr. Yang.

DR. YANG: It seems that Dr. Price and Dr. Finnegan have essentially said what I wanted to cover. But again, the last part of what Class III is defined as is about health, and if you can't walk, I think that is one of the significant aspects of health.

The other part is we keep talking about mitigation and we're talking about data. But frankly, even after listening to all of the data presented, I don't have a good grasp on what we're mitigating and that's the part that keeps me from going towards Class II, I think.

DR. SMITH: Dr. Pfeffer.

DR. PFEFFER: Let me just hold for a minute, I'm just looking up something and I think I'd like to just get a minute or two before I make a comment. Unless you're closing the session.

DR. SMITH: Mr. Owens, you have -- Mr. Owens?

MR. OWENS: Yeah, I just wanted to point out that -- to add on to what Dr. Lilling was saying about the hand joints, the other devices in joint arthroplasty are regulated through the Class II 510(k).

DR. SMITH: Yes, Dr. Pfeffer.

DR. PFEFFER: Okay, let me just read from the Gibson and Thomson article from 2005 published in the highest quality orthopedic foot and ankle journal area, is the American Orthopaedic foot and ankle journal, it's considered our premier journal. And in there what

you cited as a Level I study, it says -- it goes, "The cost ratio was 2:1 in favor of arthrodesis," and the conclusion is, "Outcomes after arthrodesis were better than those after arthroplasty. The results were partially attributable to an unacceptably high incidence of loosening of the toe components," -- phalangeal components -- "which resulted in removal of the implants. However, even when...the failures were excluded, arthrodesis was clearly preferred." So there's your Level I study. Thank you for mentioning that, it speaks against implants.

And in terms of the comments made by Stacey earlier, I get where you're coming from but I don't know if they are anymore, but there are lots of implants that are Class III by FDA. I mean, at least a few years ago breast implants were class level III, Class III. I don't know if they still are. So let's not anyone on the Panel think for a minute because it's an implant it shouldn't be Class III.

DR. SMITH: Dr. Finnegan.

DR. FINNEGAN: So just to address Dr. Gilbert, because a titanium highly cross-linked polyethylene works in the mechanical environment of a knee, it's totally different than the mechanical environment of your big toe. And so to say that because a knee with this material is a Class II does not translate to any -- actually any other joint.

DR. GILBERT: No, I agree. I agree entirely, the biomechanics are different and poorly understood, as has been discussed. You know, there's many facets to a device and the materials facet of this device is not dissimilar to the materials used in other applications. So yes, there's concern about mechanics and the overall performance of the device, but it's not as if it's a de novo device where we don't know about these other aspects of its behavior and performance in terms of the materials, per se.

DR. SMITH: Are there any other comments for the Panel deliberation before we proceed to the questions?

Dr. Pfeffer.

DR. PFEFFER: One quick question, I'm really sorry. So if we decide, whatever class we decide on, that's going to apply to all future similar devices that are brought onto the market. Is that correct, FDA? If you decide Class III, if a future device comes it would immediately require a PMA?

DR. LILLING: It would apply to all future devices, but we would also have to deal with the devices that are currently on the market.

DR. PFEFFER: Good, thank you.

DR. SMITH: Dr. Yang.

DR. YANG: Just a quick clarifying question. What's on the table today is to decide whether or not we agree with FDA's Class II, correct? It's not to -- for us to put it into any class or whatnot, it's simply the question of is this -- do we agree with Class II, is that correct?

DR. SMITH: Yes, that is correct. We have been asked, as a panel, to answer a specific set of questions of which is exactly what you stated.

Yes, Ms. Bonnell.

MS. BONNELL: Stacey Bonnell, Industry Rep.

Just a question maybe back to FDA, realizing that it's not a classification question, but for those subject devices which have been cleared, right, have been cleared through the 510(k) process, is there a safety concern based on what you've seen through the MAUDE database?

MR. OWENS: Dr. Lilling.

DR. LILLING: We obviously didn't have enough data through the MAUDE database. As you've seen, it was only 44 incidences. So as you can see, the MAUDE database is as complete as we can get as part of the regulations.

DR. PFEFFER: I would certainly caution industry to choose your battles or you'll be discredited completely. Watch out for patients, that's our goal here.

DR. SMITH: Yes, Dr. Ebramzadeh.

DR. EBRAMZADEH: So I'm still confused about the -- if we decide today that we don't agree to -- with the FDA to make this a Class II, then will it automatically become a Class III or will it still be unclassified until a later meeting?

DR. SMITH: The Panel deliberates and we give our -- the Panel will comment on the questions. The FDA will then use the Panel's comments on the questions in their own decision-making process then move forward.

Are there any additional comments? I believe earlier I saw a hand go up out of the corner of my eye, I don't want to miss anybody.

(No response.)

DR. SMITH: If there are no further comments or questions, then I'm going to proceed with addressing the questions we've been asked.

Question 1. I'm going to -- the text of the question is available to the public and available to each of you and I'm not going to reread all of the text, but may read just to go to the targeted portion of the question which is: Please comment on whether you agree with inclusion of all of the risks in the overall risk assessment of cemented total first MTP joint implants under product code "LZJ." In addition, please comment on whether you believe that any additional risks should be included in the overall risk assessment of these cemented total first MTP joint implants.

Dr. Gilbert.

DR. GILBERT: Well, I stated these earlier. Just to reiterate, I think some comment about corrosion, tribocorrosion, ought to be added as a risk. And perhaps some effort made to acknowledge the conjoint interactions that may arise. Multiple risks interacting.

DR. SMITH: Dr. Finnegan.

DR. FINNEGAN: I do not believe there's enough data available to make a decision about the risks.

DR. SMITH: Are there any other -- yes, Dr. Price.

DR. PRICE: I agree with Dr. Finnegan.

DR. SMITH: Are there any additional comments?

Dr. Ebramzadeh.

DR. EBRAMZADEH: I agree that there's not enough information to list all the risks.

DR. PFEFFER: And I don't remember the risk list you gave, but as long as the risks imply that the major risk is chronic pain, failure of the implant, potential infection or even in a worst case, amputation of the greater part of the foot. I think that's inclusive enough.

DR. SMITH: Dr. Blumenstein.

DR. BLUMENSTEIN: I've been listening to this and as someone who doesn't treat these kinds of patients, I'm struck by the absence of data on the benefit to the patients and so it's very difficult for me to make any kind of a weighing of risk versus benefit and so I cannot make a decision about how to respond to your question.

MR. OWENS: Excellent point.

DR. SMITH: Dr. Alander.

DR. ALANDER: Dirk Alander.

I think that the three slides that have the risks cover pretty much everything. I think expanding, like Glenn suggested, was multiple surgeries, device removal, possible amputation, should be added to that.

DR. SMITH: Dr. Lewis.

DR. LEWIS: This catalogue of risks, broadly interpreted, might be adequate to cover it, but what's lacking for me is any sort of degree of severity or likelihood of occurrence for

a patient reading this. So I don't know how that can be added, but what's lacking here is any reflection in these -- this laundry list of things of what the patient might actually expect in reality which, judging from the experts who have spoken, is actually quite high and somehow this list doesn't convey any of that and seems inadequate to the purposes of what it should be doing.

DR. SMITH: Are there any additional comments?

(No response.)

DR. SMITH: Dr. Peat, with regard to Question 1, the Panel had a degree of variance in their opinions. Three of the Panel members felt there is not enough data for them to respond to the question. There was a general consensus that additional complications should be included, specifically concerns regarding corrosion and conjoint interactions. There's also concerns regarding that -- from several panelists, that there are risks of amputation or other adverse effects. The ambulation of the foot should be specifically noted. And also a member of the Panel felt that there should be emphasis placed for the patients regarding the relative severity of complications and the respective likelihood of the incidence of those complications.

And excuse me, Dr. Ballman has -- I believe you have your hand raised.

DR. BALLMAN: Sorry. Yes, Carla Ballman.

If you are going to count the number of the panelists, I believe there's not enough information. I am also one of those, so that puts it up to four.

DR. SMITH: Thank you. And, Dr. Ballman, you made a good point. There were a few panelists who haven't weighed in, so I'm going to specifically ask them, with respect to that, if they have an opinion. Specifically, Dr. Harris, Dr. Elder, and Dr. Osborn.

DR. HARRIS: I'm happy to voice my opinion. I'm not an orthopedic surgeon, so I don't do these procedures, but I've been overwhelmingly convinced by those on the Panel

who do that we don't have enough information, I think, to provide the appropriate information for mitigating the use of these devices. And the question that comes to my mind is why these devices are actually on the market, why they just wouldn't be removed. There doesn't seem to be a very compelling case for their continued use.

DR. SMITH: Thank you, sir.

Dr. Elder.

DR. ELDER: Yeah, I'm not actually on this area either, but I agree with all the comments that have been put forward, especially by Dr. Finnegan and Dr. Pfeffer, that I don't think we have enough information to identify all the risks at this point.

DR. SMITH: Thank you, sir.

Dr. Osborn.

DR. OSBORN: I agree, not enough information. And if there is going to be a list of complications, I think the other one that's not on there is significant bone loss that complicates revisions and other procedures.

DR. SMITH: Thank you.

And, Dr. Gilbert, you raised your hand briefly.

DR. GILBERT: Yeah, I just want to be clear in my opinion here and that is, I think we have captured, if you read the question document FDA sent, of what the risks -- you know, an elucidation of what the risks are, I think, is there with the changes we've proposed. But I also agree that the amount of good, high-quality clinical data demonstrating efficacy of the device is lacking.

DR. SMITH: Thank you.

Captain Peat, with regard to Question 1, seven members of the Panel felt they do not have enough data to respond to the question. The remaining members, as we discussed earlier, felt that the complication list was generally inclusive but there needs to

be additional complications added, specifically corrosion, conjoint interactions, the significant risk of amputation, loss of function. A concern was raised regarding osteolysis and bone loss, and also a concern was raised regarding enumerating the severity and likelihood of these complications so the patients can make an adequate informed consent.

Captain Peat, is this adequate?

DR. PEAT: Yes, this is.

Thank you so much, panelists, for your recommendations. We'll take them under consideration.

DR. SMITH: We'll move on to Question 2. Again, there's extensive text within the panel packs and to the public. I'm going to read the bolded portion of the question.

Please discuss whether the identified potential controls for cemented total first MTP joint implants appropriately mitigate the identified risks to health and whether additional or different controls are recommended.

In addition, please discuss the following in relation to the mitigation of the identified risks:

i. The risks associated with multiple secondary surgeries are particularly significant and possibly long-lasting. Please discuss how the risk of multiple secondary surgeries should influence the selection of cemented total first MTP joint implant arthroplasty when considering the overall benefit and risk profile of the subject devices and comment on the recommended mitigations to address this risk.

ii. Given the apparently equivocal and low-quality data available in published literature, please comment on how the available evidence is used to determine the choice to use these devices in cemented total first MTP joint implant arthroplasty. As part of this discussion, please discuss the outcomes

that provide clinically meaningful benefit and what types of evidence (such as clinical evidence) would be helpful to support mitigation of the identified risks.

Dr. Gilbert.

DR. GILBERT: I'll try to start this off. So there's an asterisk in the table of identified risks and mitigation measures referring to the clinical information and it lists what that clinical information may consist of and I would suggest, and stated it just earlier, that without Level I clinical data on efficacy and frankly, safety, it's really hard to know. So I would encourage that if this were to be the direction FDA took it to a Class II device, that the clinical information would -- I would require it to be a prospective, randomized, blinded, controlled study of the device to assure safety and effectiveness, which is essentially Class III.

DR. SMITH: Dr. Blumenstein.

(No response.)

DR. BALLMAN: I think he was on mute.

DR. BLUMENSTEIN: I'd say I completely agree with Dr. Gilbert.

DR. SMITH: Dr. Ballman.

DR. BALLMAN: Yeah. I mean, I agree. I mean, as was pointed out, there was one randomized trial which was negative. And so in order for this to move forward, I would want to see some Level I data that shows there is benefit given all the risks that we have seen so far.

DR. SMITH: Dr. Price.

DR. PRICE: I agree with Dr. Gilbert and Dr. Ballman. I believe that with the gravity of the risks, we need Level I elements to make a decision and we need positive Level I elements. Otherwise we're putting the population at risk and we're not only putting them

at risk for toe, because once your foot goes and you can't mobilize as well, then there's risks to other parts of the body. So I think it's -- and also to mental health. So I think it's a risk all the way around.

DR. SMITH: Are there any other comments?

DR. PFEFFER: So what will you do, poll us on the specific questions? There was a lot there to answer, really.

DR. SMITH: There is. I was moving first for comments and it's a multipart nuanced question, but -- if no one has any further specific comments, then we can move through these in order.

DR. PFEFFER: Captain Peat, I just have a question for FDA and that is, I can see throughout our deliberations in the past 24 hours FDA has said repeatedly, and educationally for me, that there are many ways of looking at the safety and efficacy of a product other than a Level I study, and you've made that clear and I've learned from that. But I think all of FDA's comments, and everyone else's, still make it clear to me that a Class III study, or in the future a PMA, is more rigorous. Or else we don't ever need a PMA Class III level. Do away with it and just have everything Class II with special controls for the future. And since you're not going to do that because certain things deserve Class III, however that's done, any future product and any existing product like this deserves your highest level of scrutiny.

Today, someone's about to have an operation for one of these implants that will likely cause them problems the rest of their life and you can easily -- not easily, but you can help that issue, you can mitigate that issue with a Class III. I don't want to put words in your mouth, but that's what I take away from FDA. However you do it, Class III is still a more rigorous process than a Class II with special controls. Or else if they're the same, let's do away with Class III completely.

DR. PEAT: Yes. So I'll just proffer up a comment regarding that from Dr. Pfeffer. I can tell you that regardless of whether we look at this from a Class II or a Class III device, it is rigorous. Class III, by all means, is the most rigorous because we do have -- not focusing heavily on the clinical information, but we do have other aspects that we look at within the Class III realm, such as our manufacturing inspection as well as our clinical trials inspection that occur. Within Class II, when we're focusing on the clinical information -- or Class III, it's still the same clinical information that we would get, it doesn't necessarily mean that this would be a randomized controlled trial because it's a Class III.

DR. PFEFFER: Right, yes.

DR. PEAT: And I think, you know, that's a lesson learned for a lot of individuals when we speak about Class III as we move forward down the pathway.

DR. PFEFFER: That's very helpful, thank you.

DR. PEAT: Um-hum.

DR. SMITH: Mr. O'Brien, you had your hand up.

And then, Dr. Finnegan, you raised your hand.

MR. O'BRIEN: Yes. I hate to wax philosophically but, you know, as Hippocrates said, first, do no harm. And it appears to me -- I agree with Dr. Harris that FDA is required to look at risk versus benefit, and everything that I hear today and looked at and when I read the data that was going through, even as someone who is not -- who appreciates data but is looking from a patient perspective, it is pretty frightening as to what this particular device appears to be able to do, the harm that it can cause, and I think it does require the utmost scrutiny from FDA on behalf of patients.

DR. SMITH: Dr. Finnegan.

DR. FINNEGAN: This is Maureen Finnegan.

So my understanding of the FDA, for anything that it looks at, is that first of all it

needs to be safe and you have to prove the safety and then you have to prove the efficacy, and as far as I can see with this, they haven't proven either safety or efficacy. So that means that there's really no mitigation you can do because you don't have your basics.

DR. SMITH: I don't see any other hands raised, so I think we do have a responsibility -- I'm going to finish this one comment and then I'm going to call on Dr. Price. We do have a responsibility to do our best to answer these questions posed before us, so I'm going to continue -- go to Dr. Price's comment, any other comments, and then in the interest of moving through this question, I think we should then just address each portion and if need be, I guess I'll poll each member of the Committee.

Dr. Price.

DR. PRICE: I believe Stacey Bonnell mentioned yesterday that if we go with a Class III, that that makes it harder for innovators to build on the same predicate and I would suggest that we wouldn't want innovators to build on the same predicate because it's unsafe and it's not effective. So I would not -- I would just like to bring that forward, that maybe that's one of the ways that we can protect the public.

DR. SMITH: Yes, Dr. Lewis.

DR. LEWIS: Dr. Smith, in attempting to address your request to actually answer the questions, I would put forth the following suggestion. Question Number 1 is whether the identified potential controls for joint implants appropriately mitigate the identified risks to health. I think the answer to that is clearly no, the Panel clearly does not believe they do, and so the answer is additional controls of some type are definitely necessary.

Question 2 is whether the risks associated with multiple surgeries are adequately described and it appears the answer to that is also no. The severity of complications and the long-lasting and difficult way of resolving them, the inadequacy of secondary surgeries to actually correct the problem also indicates that the answer to that is no.

And the third is, given the equivocal and low-quality data commented on how the available evidence can determine the choice to use the devices, the answer to that seems to be inadequate data to really allow any choice among different devices and the basic question is whether any of them should be marketed or not. So that would be my answer to the three questions.

DR. SMITH: Thank you, Dr. Lewis.

What I'll do for purposes of the transcript is I will call on each Panel member and then I will also call on our three representatives for comments, as well.

Dr. Finnegan.

DR. FINNEGAN: I agree with Dr. Lewis' comments, I think it's no and no.

DR. SMITH: Dr. Gilbert.

DR. GILBERT: I agree with Dr. Lewis, I think that was very clearly stated.

DR. SMITH: Dr. Yang.

DR. YANG: I concur with the other panelists, no and no.

DR. SMITH: Dr. Elder.

DR. ELDER: I agree with the other panelists, no and no.

DR. SMITH: Dr. Blumenstein.

DR. BLUMENSTEIN: I agree, no and no.

DR. SMITH: Dr. Pfeffer.

DR. PFEFFER: I agree. Well said, Dr. Lewis. All noes.

DR. SMITH: Dr. Harris.

DR. HARRIS: I agree with Dr. Lewis, no and no.

DR. SMITH: Dr. Alander.

DR. ALANDER: Dirk Alander.

I agree with Dr. Lewis, no and no.

DR. SMITH: Dr. Ballman.

DR. BALLMAN: I agree with Dr. Lewis, no and no.

DR. SMITH: Dr. Ebramzadeh.

DR. EBRAMZADEH: I agree with Dr. Lewis.

DR. SMITH: Dr. Osborn.

DR. OSBORN: Agree, no and no.

DR. SMITH: Mr. O'Brien, do you have any comments?

MR. O'BRIEN: My comment is I also agree with Dr. Lewis, no and no.

DR. SMITH: Ms. Bonnell, do you have any comments?

MS. BONNELL: No additional comments. Just thank you to the panelists for weighing in and keeping the prioritization on the patient safety.

DR. SMITH: Dr. Price, do you have any additional comments?

DR. PRICE: I agree with Dr. Lewis and the fellow panelists, no and no. Thank you.

DR. SMITH: Thank you.

Captain Peat, with regard to Question 2, the Panel had a unanimous response that they voted no to all portions of the question, or discussed no. Their main concerns, they felt the risks were not well described, they were also very concerned that additional clinical information is needed. They request that either Level I data or if Level I data is not required and it's Class II, to require some sort of postmarket assessment and review. And with respect to the last and third item of the question there was unanimous consent amongst the Panel that there's inadequate data to address that question, that portion of the question.

Captain Peat, is this adequate?

DR. PEAT: Yes, this is adequate and thank you so much for your deliberation. We'll take your recommendations under advisement.

DR. SMITH: I'm going to progress to Question 3; however, Dr. Pfeffer has his hand up.

Dr. Pfeffer.

DR. PFEFFER: Very quick. Captain Peat, can you -- can we get your -- can your final deliberation be sent to us, and because I realize from my previous work on FDA panels that I don't find out until I read it about in the *New York Times* or some academic meeting, how you've decided and I must say that as I consider, maybe other panelists consider the time they put in with these panels or this Panel in particular, I'm sure we all hope that our voice has been heard and I'd like to hear what the wisdom of the FDA was in your final decision is. Is that a fair request that we be sent that or how is it done?

DR. PEAT: Yeah, I am actually asking our regulatory individuals whether or not this is a norm for us to send the decision before we actually provide this information externally. I would have to get back to you on that particular question but I can assure you, Dr. Pfeffer, the recommendations and comments that have been put forward by the Panel is really something that we weigh in with all of our other considerations. And I can tell you also, too, the fact that I wear the uniform for almost 30 years goes to show that I -- and have been at FDA for 20 of those years, goes to show that we have the best interests of patients at heart. So we will try our best to be as transparent as possible. I will have to get back to you as to how that transparency would occur before we make our final decision.

DR. PFEFFER: One, thank you for your service and I hope you keep up another 30 years. And two, maybe we can just be copied. You know, I'm not asking for anything privy, I'd just like to -- if it doesn't come across my computer, I often will miss it. I just heard that Kennedy was shot, for example. I'm joking. But please, if you can send us a copy. Thank you very much. Thank you. Sorry, Dr. Smith.

DR. SMITH: Yeah. There's one remaining question, Dr. Gilbert raised his hand, so

Dr. Gilbert, you have a comment to make before we go to the remaining portion of the question?

DR. GILBERT: Oh, I was just going to point out that I think that there's an additional question to it.

DR. SMITH: Yes. We're going to move to the final portion of the questions, which is Question 3: Based upon the information presented in the panel package and today's discussion, please discuss whether you agree with FDA's proposed classification of Class II with special controls for cemented total first MTP joint implants. If you do not agree with FDA's proposed classification, please provide your rationale for recommending a different classification.

In the interest of getting to tackling this efficiently, I would respectfully suggest that if anyone has comments, let's raise hands to do comments and then I will poll each member of the Panel for their respective responses.

Yes, Dr. Ebramzadeh.

DR. EBRAMZADEH: So are we being asked whether we recommend a different classification or whether we agree with Class II?

DR. SMITH: Yeah, the question asks that you state whether you agree with proposed classification of Class II with special controls for the device. And then if you do not agree, please provide your rationale for recommending a different classification. You don't necessarily, from my understanding of the question -- and please correct me, FDA, if I'm misunderstanding -- you do not necessarily need to suggest what that different classification would be, but your rationale for why it would be a different classification than Class II.

DR. EBRAMZADEH: Thank you. I just wanted to clarify.

DR. PEAT: That is correct.

DR. SMITH: If there are no further comments, I will go through each member of the Panel.

Dr. Finnegan.

DR. FINNEGAN: I do not agree it's Class II. If you look, it both impairs human health and is a device that presents potential unreasonable risk of illness or injury.

DR. SMITH: Dr. Gilbert.

DR. GILBERT: I don't believe it should be in Class II. I think, however, there is much information about these types of devices that is similar to this device, but what is lacking for me is a true demonstration of efficacy. And safety.

DR. SMITH: Dr. Yang.

DR. YANG: I agree with Dr. Finnegan, this is not Class II.

DR. SMITH: Dr. Elder.

DR. ELDER: I agree with Dr. Finnegan and Dr. Yang and the comments put forth by Dr. Finnegan of why this should not be in Class II.

DR. SMITH: Dr. Blumenstein.

DR. BLUMENSTEIN: I concur with Dr. Finnegan.

DR. SMITH: Dr. Pfeffer.

DR. PFEFFER: Not Class II even with the most stringent controls or special controls. Not Class II.

DR. SMITH: Dr. Harris.

DR. HARRIS: I agree with Dr. Finnegan, not Class II for the reasons she specified.

DR. SMITH: Dr. Lewis.

DR. LEWIS: I agree with Dr. Finnegan's opinion, this is not appropriate for Class II and the mitigation strategies do not adequately address the long-term risk and the severity of the complications for patients.

DR. SMITH: Dr. Alander.

DR. ALANDER: I disagree with the FDA proposal for Class II with special controls, the rationale being lack of information.

DR. SMITH: Dr. Ballman.

DR. BALLMAN: Yes, I disagree that this is Class II and I feel that there -- I agree with previous comments and I'm really concerned about lack of efficacy that balances the risks.

DR. SMITH: Dr. Ebramzadeh.

DR. EBRAMZADEH: I also disagree with Class II for this device for all the reasons discussed here.

DR. SMITH: Dr. Osborn.

DR. OSBORN: No, I agree with everybody else.

DR. SMITH: Thank you. I would like to ask our representatives if they have any comments.

Mr. O'Brien.

MR. O'BRIEN: On behalf of my big toe that may need it someday, I thank you very much and I also agree very much with Dr. Finnegan and the rest of the Panel.

DR. SMITH: Ms. Bonnell.

MS. BONNELL: I just thank the Panel for their comments and deliberation. It does appear that Class III is appropriate but due to insufficient information, that general and special controls are sufficient.

DR. SMITH: Dr. Price.

DR. PRICE: I concur with Dr. Finnegan and Dr. Alander and the rest of the Panel for the same reasons.

DR. SMITH: Captain Peat, with regard to Question 3, the Panel unanimously did not agree with the proposal to classify as Class II with special controls for cemented total first

MTP implants. The rationale was based primarily on what was the consensus of the lack of available data or available adequate data and also concerns about regarding potential harm to the patients, it was not appropriate for Class II.

Captain Peat, is this adequate?

DR. PEAT: Yes, this is adequate. Thank you so much for your feedback from the panelists.

To Dr. Pfeffer, regarding your previous request, I was informed that we were -- we will not be able to provide that information -- before the final decision to the Panel. That information, our final decision, will be put forward in an *FR* notice and it will be made general to the public all at the same time, to include the panelists. But nonetheless, I want to make sure that you all are aware that we are grateful for your feedback and we will take it under strong advisement.

DR. SMITH: We are ready to move on to the next session and due to a very good discussion, we are a little behind schedule. I did see a hand go up from Dr. Finnegan.

Dr. Finnegan, do you have a comment before we move forward?

DR. FINNEGAN: I just wondered if Dr. Peat could e-mail us that it was -- the decision was available in the *Federal Register* or wherever, so that we're not reading it in the *Wall Street Journal* or the *New York Times*.

DR. PEAT: I will put forward for that information to be done by the Advisory Committee staff to follow up with the Panel.

Sorry, James, more work for you.

DR. SMITH: We will now hear a presentation from the FDA concerning intracompartmental pressure monitors. I will now introduce the team.

Peter Allen obtained his M.S. in bioengineering from Clemson University and B.S. in ceramic engineering from Alfred University. He has been with the FDA for 25 years and is

currently the team leader for Knee Joint Arthroplasty Devices in the Office of Orthopedic Devices.

Neil Barkin, M.D., is an orthopedic surgeon who has been at FDA since 2013. He received a B.S. degree at Union College in Schenectady, New York. He attended Columbia University College of Physicians and Surgeons for his medical degree. Dr. Barkin spent his general surgical internship and residency at the University of Virginia and obtained his orthopedic education at the Harvard Combined Orthopaedic Residency Program in Boston. Following residency, he served as a division chief at the Peter Bent Brigham Hospital in Boston for 6 months. Dr. Barkin practiced general orthopedics initially in Gloucester, Massachusetts for 2 years, then in North Bethesda, Maryland for 35 years.

Peter Allen, you may begin.

MR. ALLEN: Good morning, my name is Peter Allen and I am a biomedical engineer and team leader in the Division of Arthroplasty Devices within the Office of Orthopedic Devices in CDRH's Office of Product Evaluation and Quality. Along with my colleague, Dr. Neil Barkin, we will be discussing today the classification of intracompartmental pressure monitor devices. These devices are currently unclassified and we are looking for your thoughts and recommendations on the appropriate regulatory classification for these devices.

Here is the outline for today's presentation. These are the items that we will be discussing.

Intracompartmental pressure monitoring devices are designed to monitor compartment pressures of an affected extremity. In situations in which accurate physical diagnosis is inconclusive or additional confirmation is desired, an objective method for measuring compartment pressure can aid in the diagnosis of compartment syndrome, a condition which Dr. Barkin will describe in a little more detail shortly.

These devices are listed under the FDA product code LXC, which is defined as monitor, pressure, intracompartmental. As mentioned above, these devices are unclassified, meaning there is no regulation associated with this product code. So the purpose of today's meeting is to get your feedback on FDA's proposed classification for this device type.

Cleared devices under this product code generally use one of two methods to measure pressure. The first method consists of a fluid-filled slit catheter inserted into the affected compartment and uses an arterial line transducer to measure pressure. The catheter may be indwelling and pressure monitoring may be continuous.

The second method employs a syringe-based manometer to measure the resistance present when a small volume of saline solution is injected into the compartment. This design is used for intermittent measurements.

Some catheter-based devices also include a vacuum pump that allows for the removal of fluid for analysis.

A typical indications for use is provided here. It is representative of devices cleared under this product code. Of note, and as will be emphasized throughout this presentation, these devices are primarily intended for use as an adjunct to clinical examination and a diagnosis of compartment syndrome. They are not intended to stand alone as the primary diagnostic tool.

To date, there have been eight intracompartmental pressure monitor devices cleared through the 510(k) pathway under the LXC product code, the first clearance occurring in 1985 and the last in 2014. As you can see here, the last four clearances going back 15 years are just iterations of the same system.

Intracompartmental pressure monitors are a preamendments unclassified device type. This means that this device type was marketed prior to the Medical Device

Amendments Act of 1976. It was not classified by the original classification panels. Currently, these devices are being regulated through the 510(k) pathway and are cleared for marketing if their intended use and technological characteristics are substantially equivalent to a legally marketed predicate device. Since these devices are unclassified, there is no regulation associated with the LXC product code.

I will now turn the presentation over to Dr. Neil Barkin, who is an orthopedic surgeon and medical officer here in the Office of Orthopedic Devices. Dr. Barkin will provide some background on compartment syndrome, which is a medical condition these devices are intended to assist in diagnosing. He'll also discuss the treatment options for compartment syndrome.

Neil, I'll turn it over to you.

DR. BARKIN: Thank you, Pete.

Compartment syndrome is a serious medical condition that is a consequence of excessive soft tissue pressure within an unyielding muscle compartment of an extremity or even the abdomen. It has the distinct potential to be limb and even life threatening. The most common etiology is severe trauma. A considerably less serious compartment syndrome is chronic, intermittent, and exertion induced.

Following significant extremity trauma, bleeding into a fascial compartment edema ensue. Since these compartments are contained by firm, inflexible fascia, pressure within this space can rapidly increase. As this proceeds, muscle is compressed, fascial structures can be occluded, and blood flow diminishes. This restriction of blood flow to the compartment's neuromuscular structures creates an additional insult besides the elevated pressure that may combine to be sufficient to induce extensive tissue necrosis.

If not properly treated surgically on an emergency basis, the potential consequences can be severe. The result could cause limited or nonexistent limb function, which can often

lead to amputation. The degradation products seen with profound muscle necrosis can cause irreversible renal damage threatening life itself.

As mentioned, trauma and in particular, long bone fractures are the most common etiology for compartment syndrome, being responsible for approximately three-quarters of all cases. Tibial fracture is the most frequent cause of the fracture.

Onset of compartment syndrome can be prompt, appearing soon after injury, or insidious, over hours or days. This requires careful surveillance of the patient in the post-trauma period. Additional factors that can result in compartment syndrome are external wraps and splints and casts applied too tightly; prolonged direct pressure against a firm surface as would be seen in a patient immobile and unconscious on a hard floor; and following extremity or abdominal surgery or as the result of vascular injuries, blood clots, or burns.

It cannot be stressed enough that clinical evaluation must be considered the first approach to reaching the diagnosis of compartment syndrome. In a patient complaining of increasing or severe pain, especially if out of proportion to the magnitude of the injury, compartment syndrome must be considered. A thorough physical examination must be performed looking for enlargement of the extremity, pain and firmness on the patient, increased pain produced by passively stretching the compartment contents, and reduced distal bulges, which may or may not be present. Of course, in the unresponsive patient, the value of the physical examination is markedly diminished. The intracompartmental pressure measuring devices are generally viewed as an adjunct to the clinical evaluation and the diagnosis of compartment syndrome.

Treatment consists of a nonsurgical and surgical effort to lower intracompartmental pressure. The nonsurgical modalities include releasing all tight external wraps and casts, lowering the limb to encourage blood flow or elevating the limb to reduce edema, nasal

oxygen administration, intravenous food replacement to prevent hypotension, and pain medication.

Unfortunately, these measures are rarely of value resulting in the need for a surgical solution. Surgery performed is a decompressive fasciotomy and most often includes the affected compartment as well as adjacent compartments. In my training, I was taught that just a suspicion that a compartment syndrome exists is more than sufficient to precipitate the performance of an emergency decompressive fasciotomy. In short, performing the surgery when it may not have been absolutely necessary is a far lesser mistake than not subjecting the patient to surgery with the ultimate consequence of limb or life loss.

Pete will now return to discuss the role of intracompartmental pressure measurement and the associated literature.

MR. ALLEN: Thank you, Dr. Barkin.

We conducted a literature review to identify any published information regarding the safety and effectiveness of intracompartmental pressure monitors. A total of eight articles were selected for review based on their relevance to the reported safety and/or effectiveness of these devices. I'll briefly summarize some of the main take-home points from each of these review articles.

The first article is actually a summary of the Clinical Practice Guideline on the Management of Acute Compartment Syndrome published by the American Academy of Orthopaedic Surgeons and the Major Extremity Trauma and Rehabilitation Consortium, with input from representatives from the Orthopaedic Trauma Association, the Society of Military Orthopaedic Surgeons, the San Antonio Military Health System, and the U.S. Air Force Critical Care Air Transport Team. This guideline was approved by the AAOS board of directors and has been officially endorsed by the American College of Surgeons and the American Orthopaedic Foot & Ankle Society.

To create the guideline, over 480 full-text articles were reviewed to develop 15 recommendations. The purpose of the guideline is to diagnose and treat acute compartment syndrome based on current best evidence. This summary notes that while physical examination and clinical findings are the primary method for diagnosing acute compartment syndrome, measurement of intracompartmental pressure is a well-established method for diagnosing acute compartment syndrome, and the best evidence available suggests repetitive compartment pressure monitoring as one of the most reliable adjuncts to diagnosis.

They further emphasize, however, that in alert and responsive patients, relying solely on pressure readings should be avoided and that clinical suspicion and clinical examination must factor into the diagnosis, as well.

In patients with a more depressed level of consciousness, they found that clinical examination alone was not sufficient and they recommended the use of intracompartmental monitoring devices for aiding in the diagnosis of acute compartment syndrome.

The consensus was that repeated or continued pressure-based methods of diagnosis should be used. Furthermore, the group found that in all studies where a differential pressure of 30 mm Hg was used as a cutoff, pressure monitoring showed good sensitivity and/or specificity, indicating that when combined with clinical symptoms, pressure monitoring can be useful in ruling out compartment syndrome.

McQueen et al. noted that pressure monitoring devices had high sensitivity and specificity for acute compartment syndrome following tibial diaphyseal fractures, and that continuous intracompartmental pressure monitoring should be considered for patients at risk for acute compartment syndrome.

In a study by Boody et al. they compared the reliability of three available pressure

monitoring systems. Two systems, the Stryker IC Pressure Monitor System and arterial line manometer devices are systems that have been cleared via the 510(k) pathway. Whereas the Whitesides apparatus is a simple and effective way of measuring tissue pressure and can be assembled within the materials easily available in any hospital ward or emergency room.

Conclusions from the study were that side-port needles and slit catheters are more accurate than straight needles at measuring tissue pressure. The arterial line manometer was the most accurate device and the Stryker device was also very accurate. The data for the Whitesides method had the highest standard errors showing clinically unacceptable scatter. It was concluded that the Whitesides apparatus lacks the precision needed for clinical use. The authors note that when physical examination findings are inconclusive, accurate measurement of compartment pressures can aid in timely management and can minimize patient morbidity, and that measurement should be done with the use of the most accurate technique available.

The objective of this article by Collinge et al. was to compare three commonly used methods and devices developed for the measurement of intracompartmental pressure in injured limbs. Analysis of compartment pressure data was collected using a solid-state transducer intracompartmental catheter, an electronic transducer-tipped catheter, and a modified Whitesides apparatus.

Intracompartmental pressure was measured by each method in 97 muscle compartments in 31 injured limbs of 26 trauma patients suspected to have a compartment syndrome.

The authors conclude that the methods were similar but not completely reliable for measuring intracompartmental pressure in trauma patients and that although all methods appeared useful as aids in diagnosis of compartment syndrome, intracompartmental

pressure data, especially single readings, must be interpreted in view of clinical findings.

A cadaver study by Large et al. attempted to evaluate physician performance in intracompartmental pressure measurement. Only 31% were found to use a correct technique. Accuracy decreased as technical errors increased. Proper use did improve accuracy but even with proper technique, 40% of the measurements were greater than 5 mm Hg from the actual pressure.

Study authors commented that variations in use of commercially available pressure monitors exist and errors are common. The study concluded that regular review and education in the use of the devices should be a routine requirement to eliminate learning curve effects.

Another article by McQueen notes that the general guideline taught to most surgeons is that if compartment syndrome is suspected, fasciotomies should be performed as soon as possible, and that awareness of the possibility of acute compartment syndrome among nursing and medical staff is the most important factor contributing to an early diagnosis.

The primary takeaway here is that intracompartmental pressure monitoring is considered an adjunct to diagnosing rather than the major determinant, and that clinical suspicion is the preeminent factor.

In a study by Al-Dadah of 109 tibial fracture patients, continuous compartment pressure monitoring was compared to clinical monitoring alone. Continuous pressure monitoring was found to provide no significant benefit over careful clinical monitoring in regard to both clinical outcomes and in the time delay from injury to fasciotomy Furthermore, continuous compartment pressure monitoring did not increase the rate of unnecessary fasciotomies.

A publication by Phareon et al. investigated management of low extremity trauma.

The authors suggest that extremity compartment syndrome should be suspected in all critically injured patients with or without fractures and that a low threshold for compartment syndrome measurements or fasciotomy be maintained.

While diagnosis can be made with physical exams alone when the patient is alert and responsive, Phareon further notes that a handheld device such as an intracompartmental pressure monitor can be a reliable aid when used appropriately.

Each year the FDA receives several hundred thousand medical device reports of suspected device-associated deaths, serious injuries, and malfunctions. Medical device reporting is one of the postmarket surveillance tools the FDA uses to monitor device performance, detect potential device-related safety issues that contribute to benefit-risk assessment of these devices.

The Manufacturer and User Facility Device Experience, or MAUDE, database houses medical device adverse event reports submitted to the FDA by mandatory reporters which include manufacturers, importers, and device user facilities, and voluntary reporters such as healthcare professionals, patients, and consumers.

The MAUDE database contains reports filed by manufacturers and importers from August of 1996 to present, all user facility reports from 1991 to present, and voluntary reports filed after June of 1993.

The major utility of MDRs, in general, is that they can provide a qualitative snapshot of a device's adverse event profile during real-world use. Review and analysis of MDRs may provide information on the types of events being seen, along with their severity, clinical consequences, and treatments needed to address these issues. Changing trends in these parameters over time may also be noted.

In addition, MDRs submitted by manufacturers also include their evaluation of the event, which at times may include assessment and testing of a returned product.

Although MDRs are a valuable source of information, this passive surveillance system has limitations. It is important to understand the limitations to this system in order to put the numbers and reports into perspective.

Among the limitations includes the submission of incomplete, inaccurate, untimely, unverified, or biased data. In addition, the incidence or prevalence of an event cannot be determined from this reporting system alone due to underreporting of events, inaccuracies in reports, lack of verification that the device caused the reported event, and lack of information about the frequency of device use. Because of this, MDRs comprise only one of FDA's several important postmarket surveillance data sources.

For the intracompartmental pressure monitor devices cleared under product code LXC, 16 MDRs were reported in the MAUDE database from 1987 to present. The majority of reports involved error messages or malfunctions of the probes to detect or correctly detect intracompartmental pressures.

In addition, six additional MDRs were reported from 1992 to 1996 for the LXC product code in the FDA's now obsolete Device Experience Network database. All six were for inaccurate readings reported for one firm's device. That firm initiated a recall based on findings of an air leak in one affected lot. It should be noted that this is the only known recall for this device type.

To determine the appropriate classification for intracompartmental pressure monitor devices, we have identified risks associated with these devices and possible mitigations for these risks. We will be asking the Panel for input on the list of risks and mitigations.

To identify the risks of these devices, we used FDA's MAUDE database to identify MDRs and the information available to FDA regarding cleared devices. We also conducted the previously discussed literature review.

Here are the five risk categories we've identified for intracompartmental pressure monitor devices. They include adverse tissue reaction to patient-contacting components of the device.

Device malfunction. This risk can result from mechanical, electrical, or software malfunctions or failure to adequately clean the probe or accurately place the device. This risk can lead to inaccurate diagnosis or delayed diagnosis, both of which could lead to a delay in treatment and a worsening of the condition. The risk could also lead to inappropriate therapy due to inaccurate measurement, for example, due to a false negative reading.

Electrical shock or burn. This risk could result from an electrical malfunction of the device that may result in electrical shock or burns to the patient or user.

Interference with other devices. This risk can cause the device or other electrical devices to perform incorrectly, which could lead to patient injury.

And lastly, infection. This risk can result from the use of a device whose sterility has been compromised. In addition, some components are provided non-sterile and/or are reusable, and failure to adequately clean and re-sterilize these components can also lead to infection.

This table further identifies the risks along with the proposed mitigation measures for these risks. These mitigation measures include:

- Biocompatibility evaluation;
- Nonclinical performance evaluations such as mechanical, software, and electrical testing;
- Sterilization, packaging, and cleaning validations; and
- Appropriate labeling related to the risks.

We propose that these mitigation measures can be implemented as special controls

as part of the device regulation process.

Here is our proposed classification regulation for intracompartmental pressure monitors. Part (a) of the regulation defines the device as follows: An intracompartmental pressure monitor is a device intended for the monitoring of compartment pressures to aid in the diagnosis of compartment syndrome. Devices may also include a vacuum pump to remove fluid for analysis.

Furthermore, we are proposing these devices continue to be reviewed under the 510(k) pathway as Class II devices.

Under part (b) of this regulation, we propose the following special controls which map to the mitigation measures for the identified risks:

1. To address the risk of adverse tissue reaction, patient-contacting components of the device must be demonstrated to be biocompatible.
2. To address the risk of device malfunction, nonclinical performance evaluation must demonstrate that the device performs as intended under anticipated conditions of use. The following must be conducted:
    - an assessment of the mechanical output specifications including testing to validate the accuracy of the probe pressure measurement
    - mechanical safety testing to validate safeguards related to the pressure aspects of the device, such as leak testing
    - software verification, validation, and hazard analysis must also be performed where applicable
    - for the risks of electrical shock or burn, and electrical interference with other devices, electrical safety, thermal safety, and electromagnetic compatibility testing of all electrical components of the device must be evaluated

3. For the risk of infection, validation testing must demonstrate the sterility of the final packaged sterile device.
4. Validation of reprocessing instructions must demonstrate that non-sterile and/or reusable devices can be adequately cleaned and re-sterilized.
5. The labeling for the device must include warnings or precautions advising on the
   - importance of cleaning probe tips and the accurate placement of the device in order to achieve proper device function
   - in addition, the labeling must include validated reprocessing instructions for the non-sterile and/or reusable devices
   - instructions for the proper handling of electrical components

This concludes our presentation. Thank you so much for your time and attention and your thoughtful feedback on the following panel questions.

DR. SMITH: I would like to thank the FDA experts for their very thorough presentation.

Do any Panel members have a question or comment for the FDA?

Dr. Finnegan.

DR. FINNEGAN: So the only thing I would add to your mitigation is user error. You mentioned in your talk about needing to be comfortable doing this on a regular basis and I think, especially in the cast, that's an issue.

DR. SMITH: Dr. Ebramzadeh.

(No response.)

DR. SMITH: Your microphone is muted, sir.

DR. EBRAMZADEH: I apologize. Under risks there's an item, an interference with other devices. Does that include implants, which types of implants, and some specifics? Describe about that just for clarity.

MR. ALLEN: Yeah. This is Pete Allen. Can you hear me?

DR. EBRAMZADEH: Yes.

MR. ALLEN: Okay. I'm not sure my video is on. But yeah, that actually has to do with electrical interference. With respect to the monitors and such, there's some of these devices that are attached to monitors and other electrical equipment and so that's what that's really referring to.

DR. SMITH: Dr. Price.

DR. PRICE: Hi. First of all, I'd like to compliment the FDA on the beautiful literature review because it really shows what can be done when there is literature and data available, and it was just so concisely and beautifully done with the points and I appreciate it.

The one comment I would make is in terms of labeling. This was classified as an adjunct device to clinical care, so I'm wondering if instructions for clinical care, along with the device, might be included so that providers or their designates would not depend too much on -- like on the machine without clinical care because -- and the other thing is that if there are errors going forward with the machine, the clinical observation and care could possibly mitigate any errors with the machine.

DR. BARKIN: Yeah, this is Neil Barkin.

It's always stressed that the diagnosis should be made based on clinical findings and this is simply an adjunct. Let me just comment on the rate of errors in the use of the device. The average orthopedist is probably not going to see a compartment syndrome more than a few times in his career, especially if he's not involved with trauma, so I'm not sure if it's a routine part of a training program and consequently, the clinician needs to probably learn how to use the device with each utilization, with each specific case presentation. So that's my impression. You know, in my career, I probably only saw two

compartment syndromes over that 35 years.

DR. PRICE: Yeah, thank you. That's why I was wondering, sometimes if you have a device and you have the instructions together then that can be really helpful, particularly if there's diagrams and it's not commonly seen. Thank you so much.

DR. SMITH: Mr. O'Brien.

MR. O'BRIEN: Just a follow-up to that. Then Dr. Barkin, if that's the case, I always question this -- it's not just here, but in all of the previous panels I've been on over the last 10 years and that is the adequacy of labeling, therefore, as a mitigating control. So if whether or not someone has only seen three in their lifetime, is the labeling going to help them to do that? We saw on Slide 17 with the Large report that, in fact, only 30% of the physicians knew how to correctly use it. And I guess I ask the FDA, is the current product, even though it is pre-certified, did that go out with a label, is it commercially sold with a label? I would assume so. And also with use. So it just makes me think, is labeling an adequate mitigating control?

DR. BARKIN: This is Neil Barkin.

I think it's very variable. I think someone who's planning on putting a total knee replacement in, who's done hundreds previously, is probably not going to scrutinize the labeling because he or she is familiar with the procedure. With something like this, however, where it's unlikely you've done many of them over your career, I think labeling is important. And I could see where somebody pulling out this device to use on a patient would want to have a good labeling explanation of how it functions.

MR. O'BRIEN: So as a follow-up, would you say when Large did his study that, in fact, they were using devices that didn't have any type of labeling?

DR. BARKIN: I can't say that, but I suspect there was labeling.

(Crosstalk.)

MR. O'BRIEN: Oh, I'm sorry. Sorry. Another question and this, I guess, is for Captain Peal (sic) perhaps more than anything else and that -- because in the presentation again, on Slide 23 I think it is, we list all of the limitations of MAUDE. I understand why MAUDE's there but in all the panels I've been on, including this one, MAUDE seems to be useless and it doesn't really tell us the adverse events, it's not reflecting all reporting, we have to go to patient-reported outcomes, etc., because the reality of whether it's error of use or whether it's the device, it doesn't get through, that's not what is translating to what's happening clinically there.

So I mean, is the FDA looking to enhance MAUDE or to do something that requires a better utilization so we get better reporting of actually what the adverse events out there are that patients are having?

DR. PEAT: Yes, I'll take that question. This is Captain Peat.

We know that this system, our MAUDE system, is not an absolute system and we are working to address that in our future iterations as we move forward with our IT team. So that is something that is under discussion and we will go from there. But as far as reporting is concerned, that's the information that we currently have regarding the adverse events for these particular devices and so we're utilizing them here today.

DR. SMITH: Dr. Ebramzadeh.

DR. EBRAMZADEH: Thank you. Is there any risks from damage to tissues from the probe itself, and is that variable among the different types of designs?

MR. ALLEN: I mean, the designs of most of these devices, they're like a needle or catheter that's inserted. Some of them are indwelling for a longer period of time. Others are relatively momentarily. So we haven't seen much as far as what's reported in the literature about tissue damage.

I don't know, Neil, if you have any other comments on the effect that that might

create using one of these devices.

DR. BARKIN: Well, effectively, it's simply a needle. I assume, since the compartment syndrome does distort the anatomy, that there's always the potential to damage a vessel or a nerve when inserting it, but everything is relative and a compartment syndrome is much worse than probably any damage a small needle could produce.

DR. SMITH: Are there any other comments for the -- or questions to direct to the FDA?

(No response.)

DR. SMITH: At this time I want to open the Panel up to deliberations. Do any panelists have any questions they want to pose to the rest of this Committee?

(No response.)

DR. SMITH: At this time let us focus our discussion on the FDA questions. I will now read Question 1:

Please comment on whether you agree with inclusion of all of the risks in the overall risk assessment of the intracompartmental pressure monitors under product code "LXC".

In addition, please comment on whether you believe that any additional risks should be included in the overall risk assessment of these intracompartmental pressure monitors.

And as the prior questions, we'll start with any comments and then I will poll each member.

Dr. Alander.

DR. ALANDER: Yes, I just want to clarify, when you talk about labeling, that that -- if we said improve the labeling, that would include instructions for the use of these, because I do think that in the average orthopedist's practice they're not going to see a whole lot of these. However, having been at Level I trauma centers for a vast -- all my career, I've seen quite a few and so it's easier for me, but it does -- I still will pull out the instructions just to

give myself a so-called recurrency training ,and I think that's important. So if the labeling included some very specific instructions and references, I think that's important for the labeling to mitigate operator error.

MR. ALLEN: This is Pete Allen.

Yeah, so labeling can include like the surgical technique brochure as well as just the product insert with information on the device itself as far as contraindications, you know, what the device is made of and things like that. But yeah, surgical technique would absolutely be part of the labeling.

DR. ALANDER: Okay, thank you.

DR. SMITH: Dr. Harris, you raised your hand.

DR. HARRIS: Just a quick comment, and this probably reflects an earlier comment by one of our panelists, that it strikes me that I can't conduct a clinical trial on patients where we draw blood and not speak to the risk of bruising and pain associated with the use of a needle. It just seems to me that something along the lines of that sort of potential injury and/or complication should be included and is perhaps more likely than the patient being electrocuted or burned from such a device.

MR. ALLEN: Yeah. You know, absolutely, that could be considered. I mean, I think with these patients, you know, they're usually trauma patients that are in a pretty bad way and they've got a lot going on with the affected limb. So in the big scheme of things, as I think Dr. Barkin mentioned earlier, kind of relative to the patient's condition additional pain or tissue damage that might occur.

Neil, do you have any other comment?

DR. BARKIN: Yeah. Neil Barkin.

There are basically two presentations with compartment syndrome. One is severe pain. So I don't suspect that the needle going in is going to exacerbate that very much. The

other is no pain, little or no pain, and that's usually due to nerve injury in the compartment syndrome. So in either case, I don't think pain from the needle is a major consideration.

DR. SMITH: Dr. Lewis.

DR. LEWIS: I'm a little surprised in many ways that these things are even being discussed as a standalone device because what most people use in these is just a simple catheter that you can insert and setting up some sort of a pressure transducer to monitor it. By and large, there's no electrical connection to the patient in any way. The only electrical connection is to the pressure transducer that the catheter's connected to. So there would seem to be virtually no hazard to the patient and I'm a little surprised to see that included.

There is a class of patients that hasn't been mentioned here that actually very frequently have compartment syndromes, and those are older vascular patients who have had multiple causes for occlusion to the arteries to the legs and a period of ischemia which results then in subsequent swelling in the calf and the calf is particularly vulnerable to that. Most of the difficulties in use of these is simply because of failure to appreciate the anatomy. There are four different compartments in the leg that need to be measured and knowing how to place the needle or the catheter so that you're into the specific compartment you're worried about is an issue of knowing the anatomy and knowing how to do so.

I don't think many people would ever use these devices that hadn't really been instructed to do so during a residency in which they were trained and obviously, orthopedists, trauma surgeons, and vascular surgeons are the three groups of people who primarily encounter this. Among most other doctors, I would think it's a rarely seen complication because it's a very specific thing to these conditions. But to label this as a device which in itself has great hazards, I think, is a mistake.

The technique is demanding in terms of knowing where to place the needle and the

real difficulty is that when a catheter is placed in one of the muscle compartments, the muscles themselves are solid structures and not a liquid, so a simple catheter may not reflect the pressure adequately. And the entire difficulty is in knowing how to flush the catheter slightly so that the pressure is measured accurately and is not subject to artifacts, making sure the transducer is calibrated correctly, etc. But those are all adjuncts and not part of the device itself.

So the technique is complex and it's important to do it in a very precise way and to check your results. It's an extremely valuable technique. The clinical indications, as Dr. Barkin has stressed, are primary. But the severity of the condition and the need for a fasciotomy is a nuanced question and from a clinical basis, it's often hard to tell the difference between a pressure of 20 and a pressure of 30 or a pressure of 35. So the value of the catheter is, in fact, being able to measure that more precisely and make a determination in borderline cases of when a fasciotomy is necessary. But the actual hazards to the device here, I would say, are minimal if nonexistent. It's basically a placement of the needle and the catheter in the compartment and not much else.

DR. BARKIN: This is Neil Barkin.

I would agree, I've never seen one with an electrical component. The other thing is the actual cutoff in terms of millimeters of mercury pressure is somewhat controversial since various compartments have normal variations in pressure. There's some evidence that measuring perfusion pressure is a better measure than just measuring intracompartmental pressure, in other words, putting in a needle and seeing that it's 30 mm of mercury or higher might not be quite as reliable as looking at the diastolic pressure and the difference between the diastolic pressure and the intracompartmental pressure and if I get too close, then usually it's around 30 mm of mercury. That seems to be a more reliable diagnostic measure.

MR. ALLEN: This is Pete Allen again.

I just wanted to comment on Dr. Lewis' comment regarding the electrical components and the risk of a burn or electrical issues. That risk was identified through some of the predicate submissions that had been submitted where companies, they did have electrical components. Usually it was related to a monitor that the device was attached to. But they did do a full, you know, electrical workup of the device and the interaction between the device and how they interacted. And so that was identified in multiple predicates as a potential risk that needed to be tested. Anything with electrical circuitry or components we always have companies provide that type of testing, so that's just where that came from.

DR. SMITH: If there are no other comments, I'm going to poll each member of the Panel with respect to Question 1.

Dr. Finnegan.

DR. FINNEGAN: So I agree. I would add user error for people who don't use it a lot. Otherwise I think these are adequate.

DR. SMITH: Dr. Yang.

DR. YANG: I don't have anything to add to what has already been said. Thank you.

DR. SMITH: Dr. Yang, would you concur with Dr. Finnegan, then?

DR. YANG: Yes.

DR. SMITH: Thank you.

Dr. Ballman.

DR. BALLMAN: Yes, I concur with Dr. Finnegan. Nothing else to add.

DR. SMITH: Dr. Ebramzadeh.

DR. EBRAMZADEH: I agree and I don't have anything to add.

DR. SMITH: Dr. Harris.

DR. HARRIS: I actually find that the list of potential risks is perhaps excessive, I see no reason to talk about electrocution and burning of patients. I'm actually confused as to how this is going to interfere with other devices. And so to me, the list seems a bit excessive.

DR. SMITH: Dr. Alander.

DR. ALANDER: Yeah, I concur, I agree with Maureen's assessment.

DR. SMITH: Dr. Blumenstein.

DR. BLUMENSTEIN: Yes, the only thing I would add to it is the possibility that the medical person using this might record the results in Roman numerals. That's a joke. I don't feel competent to comment on this.

DR. SMITH: So, Dr. Blumenstein, just so we represent your opinion, is your response that you don't -- you abstain or do you concur with Dr. Finnegan?

DR. BLUMENSTEIN: Yes, I abstain. I don't treat these patients and it's hard for me to know what to add to the list.

DR. SMITH: Thank you, sir.

Dr. Pfeffer.

DR. PFEFFER: I agree with Maureen.

DR. SMITH: Dr. Elder.

DR. ELDER: I agree with Dr. Finnegan's assessment.

DR. SMITH: Dr. Lewis.

(Audio feedback.)

DR. SMITH: Excuse me, Dr. Lewis. Did others have difficulty with the audio?

DR. BALLMAN: Yes.

DR. SMITH: Dr. Lewis, it appeared that your microphone was turning on and off repeatedly. Could you try the audio again or if it's not working, if you could please type

your answer into the channel?

DR. LEWIS: I'll try the audio again. Is that better?

DR. SMITH: Yes, much better, thank you.

DR. LEWIS: Different method. I was just saying that I agree with Dr. Harris, I think the identified risks are excessive. Adverse tissue reaction, I think, is not a problem because these are catheters which are marketed for intravascular and other uses routinely, it's not any sort of a unique material or a unique device. Electrical shock or burns perhaps is considered by the manufacturers. I would question that it's ever occurred because there's no electrical conductor between the pressure transducer and the patient. Interference with other devices is, I think, quite unlikely because these are not radiofrequency devices, they're simple DC current devices and usually at low voltage. So I really don't think there's much of a hazard with this, except in the actual implementation of the usage.

DR. SMITH: Dr. Gilbert.

DR. GILBERT: Well, I'm going to go with Dr. Harris, as well. I think there might just be an overstating of the risks here. Although I think raising some risks, as Dr. Finnegan did, makes sense. So I'm going to be Solomon and split the baby.

DR. SMITH: Thank you.

Dr. Osborn had to leave. Prior to leaving, he did communicate to me that he agreed with the classification as proposed. He did note he would like to stress that acute compartment syndrome and the clinical diagnosis must maintain a high index of suspicion.

Captain Peat, with respect to Question 1, the Panel generally agrees. One Panel member abstained. Two Panel members felt that the risks stated were excessive, particularly with respect to device interferences and the risk of electrical shock or burn. And also comments were made by several members of the Panel regarding that the significant risk may be user error, and specific mention was made by the Panel of the

attention to detail regarding all four -- anatomy of all four of the compartments of the lower extremity when measuring pressures.

Captain Peat, is this adequate?

DR. PEAT: Yes, this is Captain Peat, the information as presented is adequate. We'll take the recommendations as provided under consideration.

DR. SMITH: We'll now move to Question 2. Risk mitigation recommendations for intracompartmental pressure monitors under product code LXC.

Please discuss whether the identified special controls for intracompartmental pressure monitors appropriately mitigate the identified risks to health and whether additional or different special controls are recommended.

Dr. Alander.

DR. ALANDER: I'd just like to reiterate that under labeling, that there should be instructions for proper operator instructions included.

DR. SMITH: Are there any other comments?

DR. BALLMAN: I agree with the instructions for labeling.

DR. SMITH: Dr. Harris.

DR. HARRIS: It seems to me that the labeling is not that people are requesting, which I agree with regarding instructing use of the device, is not really addressing any of the risks that are elicited. So we'd have to add, I would think, to that list of risks a user error and then the labeling be addressing that user error with the appropriate instructions because that's not a device malfunction, it's a user error.

DR. ALANDER: I'd agree with that.

DR. SMITH: Are there any other comments?

(No response.)

DR. SMITH: I will -- Dr. Ebramzadeh.

DR. EBRAMZADEH: Thank you, sorry. Should there be some compartment-specific instructions rather than just generic device specific?

DR. BARKIN: This is Neil Barkin.

I'm sorry, could you please repeat that? Should some compartments be treated differently than other compartments, is that basically what you're asking?

DR. EBRAMZADEH: Or instructions with each device relates to different types of compartments rather than a generic set of instructions for the device.

DR. BARKIN: I would say no, but not with certainty.

DR. SMITH: If I may make a comment with respect to Dr. Ebramzadeh's comment, and please correct me if I'm wrong, sir, but I believe the question was the different components and different anatomic structures at risk, specifically a risk to the superficial peroneal nerve based on where you went in a lateral compartment. There's also other compartments with venous and arterial structures, and I believe Dr. Ebramzadeh was questioning if the labeling should include compartment-specific structures at risk if they are unique to that compartment.

DR. EBRAMZADEH: Yes, that's the point. Thank you.

DR. SMITH: If there are no other comments, then I will poll each member for the transcript and then also, after that, I will poll our representatives and I'd like to know -- I neglected to poll the representatives at the end of the prior question, so if you would like to comment on that, as well, please do so.

Dr. Finnegan.

DR. FINNEGAN: So I agree that they're adequate if they add Dr. Alander and Dr. Harris' comments about user and labeling.

DR. SMITH: Dr. Yang.

DR. YANG: I concur with Dr. Finnegan. Nothing to add.

DR. SMITH: Dr. Ballman.

DR. BALLMAN: Yeah, I concur with the previous two. Nothing to add.

DR. SMITH: Dr. Ebramzadeh.

DR. EBRAMZADEH: I agree, they're generally adequate.

DR. SMITH: Dr. Harris.

DR. HARRIS: I agree with Dr. Finnegan's summary.

DR. SMITH: Dr. Alander.

DR. ALANDER: I agree with Question 2 with the addition of labeling for potential user error, as described by Dr. Finnegan.

DR. SMITH: Dr. Blumenstein.

DR. BLUMENSTEIN: I abstain.

DR. SMITH: Dr. Pfeffer.

DR. PFEFFER: Maureen, we agree a lot today. I agree with her.

DR. SMITH: Dr. Elder.

DR. ELDER: I agree with Dr. Finnegan.

DR. SMITH: Dr. Lewis.

DR. LEWIS: Agree. I think the current specifications are, if anything, excessive. It possibly could even be a Class I device.

DR. SMITH: Dr. Gilbert.

DR. GILBERT: I concur with Dr. Finnegan.

DR. SMITH: I would like to ask our representatives for comments, both on this question and the prior question.

Mr. O'Brien.

MR. O'BRIEN: I agree with Dr. Finnegan both on the previous question and this question and I understand -- I just want to make a comment, but I do understand and

appreciate Dr. Harris' comment about it and thankfully, the patients aren't reading this because we usually get 10 pages of stuff that we wouldn't do anything if that was case. But in sake of potentially new devices coming down the road that may have that potential, I think it's important to be there.

DR. SMITH: Dr. Price.

DR. PRICE: I agree with Dr. O'Brien (sic).

DR. SMITH: Ms. Bonnell.

MS. BONNELL: Stacey Bonnell.

I am aligned with the comments from the panelists and the discussion to date, and I think the recommendations for adequate instructions for use is spot on.

DR. SMITH: Captain Peat, regarding Question 2, one member of the Panel abstained. The remaining panelists were unanimously in agreement with some qualifying comments, specifically regarding comments to add the risk of user error to the device labeling. Some comments were made regarding concerns about the anatomy of different compartments, that that should be noted as a risk. Also, a comment was made that while one member of the Panel or two members of the Panel did agree, unanimously they also suggested that they felt the risks were perhaps labeled as excessive. And one member of the Panel suggested that they agreed, but they went further and felt it would also be appropriate as a Class I device.

Captain Peat, is this adequate?

DR. PEAT: All comments -- and the information that's provided is adequate and we'll review accordingly.

DR. SMITH: We will now hear a presentation concerning intra-abdominal pressure monitoring devices from FDA, presented by Dr. Cal Rabang. Cal Rabang obtained his Ph.D. from Purdue University and B.S. from the University of Maryland, Baltimore County. Cal has

been with the FDA for 4 years and is currently a reviewer in the Non-Light Based Energy Devices Team of the Office of Surgery and Infection Control Devices.

Dr. Rabang, you may begin.

DR. RABANG: Good afternoon, my name is Cal Rabang. I'm a biomedical engineer in the Division of General Surgical Devices in OHT4: Office of Surgery and Infection Control Devices in CDRH's Office of Product Evaluation and Quality.

Today I'll be presenting information regarding the effort to classify devices currently within CDRH product codes which have not yet been categorized as Class I or II or III. These devices are considered preamendment devices as they were first marketed in the United States prior to the Medical Device Amendments Act of 1976. I will first discuss the classification of intra-abdominal pressure monitoring devices under product code PHU.

Intra-abdominal pressure monitoring devices are intended for monitoring of pressure in the abdominal compartment to aid in the diagnosis of abdominal compartment syndrome. These devices are regulated under produce code PHU as intra-abdominal pressure monitoring devices. Since it is unclassified, there is no regulation associated with the product code. There have been two clearances for intra-abdominal pressure monitoring devices via the 510(k) process.

The two clearances under this product code have the following indications for use statements. They are representative of the devices cleared under this product code.

These devices are intended for the monitoring of intra-abdominal pressure via a Foley urinary catheter. The measured pressures can be used as an aid in the diagnosis of intra-abdominal hypertension (IAH) and the associated clinical syndrome of abdominal compartment syndrome (ACS).

To determine the appropriate classification for intra-abdominal pressure monitoring devices, we identified the risks associated with these devices and possible mitigations for

these risks. We will be asking the Panel's input on the list of risks and mitigations. To identify the risk of these devices, we used the FDA's MAUDE database, information available to FDA regarding cleared devices, and conducted a literature review on PubMed.

A systematic literature review was conducted in an effort to gather any published information regarding the safety and effectiveness of intra-abdominal pressure monitors under product code PHU. The search was conducted using the terms intra-abdominal pressure monitor, intra-abdominal pressure device, and IAP monitor.

Literature searches were conducted to identify any relevant articles published up to and including October 31st, 2019. Searches were limited to publications in English and excluded conference proceedings and abstracts.

However, based upon a review of the published literature, we could not identify any reports describing complications with use of an intra-abdominal pressure monitor under product code PHU.

Searches of the MAUDE databases returned the following reported adverse events. These events fall primarily into the following categories:

- Malfunction
- Death

Please note that multiple adverse events may be reported in a single MDR. Five MDRs listed as death were linked to the same event in which the patient had ACS and likely died because of it. These five reports had no additional evidence as to complaint or report was unable or unwilling to provide any patient, product, or procedural details to the manufacturer. As such, insufficient data exists to suggest that the cause of death was device related.

Based on the searches, we identified these risks for the device under this product code. For each of these risks, FDA is recommending specific mitigation measures, which will

be shown on the following slide.

- Adverse tissue reaction to patient-contacting components of the device
- Infection which can result from compromised sterile packaging or failure to clean and re-sterilize non-sterile and/or reusable components
- Local tissue injury due to incorrect placement, breakage, or excessive suction
- Incorrect patient diagnosis due to errors in reading pressure measurements

We have recommended the following mitigation measures based upon the identified risks:

- For adverse tissue reaction, the recommended mitigation measure is biocompatibility testing.
- For infection, the mitigation measures are sterilization validation, shelf-life testing, and labeling.
- For local tissue injury, the measures are labeling and bench performance testing.
- For incorrect patient diagnosis, the measures are labeling and bench performance testing.

Proposed that these mitigations can be implemented as special controls as part of the device regulation process, we identified the device as follows: An intra-abdominal pressure monitoring device is a prescription device that monitors pressure in the abdominal compartment to aid in the diagnosis of abdominal compartment syndrome.

Based on the information presented, the FDA is proposing Class II with special controls for intra-abdominal pressure monitoring devices. We propose the following special controls for these devices:

- Nonclinical performance testing data must demonstrate that the device performs as intended under anticipated conditions of use. The following

performance characteristics must be tested:

- Mechanical bench testing of material strength must demonstrate the device will withstand forces encountered during use and maintain device integrity upon repeated actuation and measurement.
- Performance testing should validate clinically relevant pressure range and ensure the pressure ranges used do not cause inadvertent damage to underlying tissue.
- Performance testing must demonstrate proper function and accurate pressure measurement.

- The device must be demonstrated to be biocompatible.
- Validation testing must demonstrate the sterility of the device.
- Performance data must support the shelf life of the device by demonstrating continued sterility, package integrity, and device functionality over the identified shelf life.
- The labeling must include all adequate warnings/precautions and instructions regarding the proper placement and use of the device.

This concludes our presentation. The Panel will now be asked to discuss the following questions for product code PHU. Thank you.

DR. SMITH: I would like to thank Dr. Rabang for his very thorough presentation.

Prior to moving forward, for the purpose of the transcript, I'd like to circle back to the last questions. We addressed Question 2. Many of us addressed Question 3, as well, but for formality, I would like to formally poll every member of the Panel specifically with Question 3.

Please discuss whether you agree with FDA's proposed classification of Class II with special controls for intracompartmental pressure monitors. If you do not agree with the

FDA's proposed classification, please provide your rationale for recommending a different classification.

And we're doing this, although this was discussed, we need to separately delineate each question formally for the transcript.

Dr. Harris.

DR. HARRIS: I vote yes.

DR. SMITH: Dr. Finnegan.

DR. FINNEGAN: I vote yes.

DR. SMITH: Dr. Ebramzadeh.

DR. EBRAMZADEH: I agree with Class II classification.

DR. SMITH: Dr. Yang.

DR. YANG: Yes, I agree with Class II.

DR. SMITH: Dr. Alander.

DR. ALANDER: Dirk Alander.

I agree with Class II with special conditions.

DR. SMITH: Dr. Gilbert.

DR. GILBERT: I agree with a Class II designation.

DR. SMITH: Dr. Pfeffer.

DR. PFEFFER: Agree.

DR. SMITH: Dr. Blumenstein.

DR. BLUMENSTEIN: I abstain.

DR. SMITH: Dr. Elder.

DR. ELDER: I agree with Class II.

DR. SMITH: Dr. Ballman.

DR. BALLMAN: I agree with Class II.

DR. SMITH: Dr. Lewis.

DR. LEWIS: Class II is adequate. I think it could be Class I, as well.

DR. SMITH: Dr. Osborn is no longer with us. He did communicate prior that he agreed with classification as Class II.

Do any of our -- I will now ask each of our representatives if they have any comments.

Mr. O'Brien.

MR. O'BRIEN: My only comment is, is that I understand Dr. Lewis except for the fact that user error seemed to be important and with Dr. Finnegan's recommendation and Dr. Alander's regarding the labeling and instructions, I think therefore it would be under III.

DR. SMITH: Dr. Price.

MR. O'BRIEN: Two. I mean two, two, not three. Two.

DR. SMITH: Dr. Price.

DR. PRICE: I was going to agree with Dr. O'Brien until he said III, but when he said II, I'm good. So II is great.

DR. SMITH: Ms. Bonnell.

(No response.)

DR. SMITH: Captain Peat, with respect to Question 3, one member of the Panel abstained. The remaining members of the Panel all agreed with classification as Class II. One member of the Panel agreed with Class II but also felt that Class I would be appropriate.

Captain Peat, is this sufficient?

DR. PEAT: This is adequate, thank you very much.

DR. SMITH: I would again like to thank Dr. Rabang for his very thorough presentation.

Do any Panel members have a question or a comment for the FDA?

DR. LEWIS: Dr. Smith.

DR. SMITH: Yes, sir. Yes, Dr. Lewis.

DR. LEWIS: It's Frank Lewis.

My question for the FDA is since the only aspect of this device which contacts the patient is the Foley catheter, everything else is an external pressure measuring system. It's unclear to me why they're treating this as a separate device and not simply considering it the same as a Foley catheter since its use involves simply insertion into the bladder, but no other particulars.

DR. SMITH: Would any members from the FDA care to respond to Dr. Lewis?

DR. RABANG: Hi, this is Cal Rabang. Yes, I acknowledge your question. The Foley catheter, as part of the tubing set, is part of a complete system and the device is considered as part of the Foley catheter as one device.

DR. SMITH: There are two, Dr. Ebramzadeh and then Dr. Finnegan.

DR. EBRAMZADEH: Yes, thank you. The nonclinical performance testing that's listed, my question is who's responsible for establishing the protocols for the different aspects for mechanical testing or accuracy validation and so forth?

DR. RABANG: Just to clarify, are you asking who designs the protocols for the testing?

DR. EBRAMZADEH: Yes.

DR. RABANG: That would be up to the manufacturer.

DR. EBRAMZADEH: So then, would it be -- my question to FDA, then, is would it be appropriate for this Committee to ask for specific requirements on those testing criteria or is that not part of the responsibility here?

DR. RABANG: You're welcome to provide the suggestions.

DR. SMITH: Dr. Finnegan and then Dr. Harris.

DR. FINNEGAN: So Dr. Rabang, my question is the 51 or however many malfunctions there were, how many of them were related to the actual Foley catheter, which can malfunction, and how many of them were related to actually intra-abdominal pressure not getting registered properly?

DR. RABANG: In regards to the malfunctions, we do not have complete data to fully answer that question.

DR. SMITH: Dr. Harris.

DR. HARRIS: Thank you. I'm wondering, is it possible for FDA to give us a bit of a description of the different devices under discussion? I think part of the issue that perhaps Dr. Lewis was addressing, one could obviously use a standard Foley catheter that can be transduced and you can infer an abdominal compartment pressure from that.

But then I also know there are other devices that are continuously irrigating or have other electrical components in the catheter, I believe, to help that assessment of intra-abdominal pressure and therefore I think the risk associated with these devices could differ. So is anyone able to give just a summary of the devices that fall within this category and how they work?

DR. RABANG: So thank you for your question. So the device under this product code is, as Dr. Lewis has described, it is a Foley catheter connected to tubing and would provide displacement for the purpose of pressure measurement.

DR. HARRIS: So there are no other integrated parts with that Foley catheter, it's simply a standard Foley catheter attached to some pressure monitoring device?

DR. RABANG: That's correct.

DR. HARRIS: Thank you.

DR. SMITH: Are there any other questions for the FDA, questions or comments?

Yes, Mr. O'Brien. Mr. O'Brien, your microphone --

MR. O'BRIEN: I'm sorry. Yes, sorry. Thank you, I just got it. I was pressing the wrong one. So my question with that regarding a simple Foley catheter, but that catheter is being connected to something to monitor the pressure so it may not be one of safety but for efficacy that may affect how it's monitored, is that correct, Dr. Rabang?

DR. RABANG: Yes, that would be correct.

DR. SMITH: Dr. Yang.

DR. YANG: Either I'm confused or just obtuse, but this device is the Foley catheter and, as others have said, it's hooked up to something that transduces the pressure. So why is this a separate category altogether and not just a Class II Foley catheter?

DR. RABANG: As described from the device description, the Foley catheter is connected to a -- to several components of tubing and stop cocks and it is marketed by the manufacturer at the time of its clearance to be sold as a system combined with the Foley catheter.

DR. TRUMBORE: This is Mark Trumbore from OHT4. The main thing is, is that the manufacturer has a different intended use for this device, so a Foley catheter is not intended to measure intra-abdominal pressure and the manufacturer of this device basically is taking a Foley catheter, putting the pressure monitor on it, and now is saying the intended use of this device is to measure intra-abdominal pressure which makes it a new device which is independent of the Foley catheter.

DR. YANG: Thank you.

DR. SMITH: At this time I want to open the Panel to deliberations. Do any panelists have any questions they want to pose to the rest of this Committee?

Dr. Gilbert.

DR. GILBERT: Maybe it's because we're looking at two pressure monitoring devices

back to back, but I'm wondering if any of the comments from the prior discussion would relate to this device.

DR. SMITH: Dr. Alander.

DR. ALANDER: Yes, I would echo that. I'm not familiar with this, so I guess -- I'm assuming that you're going to inflate the Foley catheter one degree or another and have the transducer in there. Are you going to inflate the balloon to 10 cc or are you going to do larger -- you know, how is that functioning within the bladder? That's what I don't understand here. I'm ignorant of that, those kind of -- that kind of information, so I'd like to know a little bit more about that because I think if you have -- you know, you consider rupturing the bladder, is that going to be a factor if you're increasing the intra-bladder pressure? I'm just kind of -- I'm not educated on this enough at this point.

DR. SMITH: Dr. Harris.

DR. HARRIS: Well, just I guess in response to Dr. Alander and I will, of course, defer to Dr. Lewis, but it's my understanding that when we measure bladder pressures we instill usually a hundred to a hundred and fifty milliliters of saline into an otherwise empty, intact bladder and then transduce the pressure through the lumen of the catheter, not the balloon that's on the tip of a Foley catheter. And so in answer to the earlier question about similarities between this pressure monitoring device and the earlier discussed one, I think there are issues around making sure that you are properly standardizing your pressure measurement in terms of the level of the transducer relative to the point at which you're measuring the pressure. So there can be issues around user error.

And then, of course, I think once again this is an adjunct. You know, I can probably say Dr. Lewis trained me to make sure that you examine the patient and that their physical examination was consistent with an abdominal compartment syndrome and not be deducing that diagnosis solely to the pressures being transduced. And then the last analogy

is it can be something that is measured repeatedly, looking for trends in pressures as you can do with measuring compartment syndromes or compartment pressures in extremities.

DR. SMITH: Are there any additional comments?

Yes, Dr. Lewis.

DR. LEWIS: In answer to the question of similarities between intra-abdominal and intracompartmental pressure, the answer is yes, there are many similarities and as Dr. Harris has just elucidated, the issues of calibration are the most important, what's the baseline, what's the zero reference point, how sure are you about the calibration scale on the measuring device and so forth.

Intra-abdominal pressure, though, is actually more accurate and more easily obtained because, as he noted, you instill 100 cc or so into the bladder, which means that the pressure monitoring is measuring from a fluid compartment and it doesn't have the same problems as intracompartmental measuring devices which are measuring within solid tissue and it's hard to know, there's no liquid there and it's hard to know exactly what the pressure is, you have to induce that in some way by small infusions. So the answer is there are many similarities and there are many sources of error that relate to user practice and as with the previous device, the issues of user familiarity and user practice are paramount in this, not the device itself. The device itself is, as noted already, quite simple and there's not much to it.

DR. SMITH: If there are no other comments at this time, let us focus on our discussion on the FDA questions. I will now read Question Number 1:

Please comment on whether you agree with inclusion of all of the risks in the overall risk assessment of -- excuse me, risk assessment for intra-abdominal pressure monitoring devices under product code "PHU".

In addition, please comment on whether you believe that any additional risks should

be included in the overall risk assessment of these intra-abdominal pressure monitoring devices. If anyone has a specific comment before I poll each member of the Panel, please raise your hands now. If there are no other comments, I will just move directly to polling each member of the Panel.

(No response.)

DR. SMITH: Dr. Harris.

DR. HARRIS: I agree.

DR. SMITH: Excuse me, Dr. Harris, do you feel that there is a need for any additional risks to be included in the overall assessment?

DR. HARRIS: No, I do not.

DR. SMITH: Thank you.

Dr. Finnegan.

DR. FINNEGAN: I agree, but I would add user error as was done previously.

DR. SMITH: Dr. Ebramzadeh.

DR. EBRAMZADEH: The listed risks are adequate in my opinion.

DR. SMITH: Dr. Yang.

DR. YANG: The listed risks are adequate.

DR. SMITH: Dr. Alander.

DR. ALANDER: The listed risks are adequate with the addition of potential user error.

DR. SMITH: Dr. Gilbert.

DR. GILBERT: Yeah, I'll concur with Dr. Finnegan, as well.

DR. SMITH: Dr. Pfeffer.

DR. PFEFFER: Agreed, adequate.

DR. SMITH: Dr. Blumenstein.

DR. BLUMENSTEIN: I abstain.

DR. SMITH: Dr. Elder.

DR. ELDER: I agree with the risks and the addition of user error.

DR. SMITH: Dr. Ballman.

DR. BALLMAN: I agree with the risks as listed.

DR. SMITH: Dr. Lewis.

DR. LEWIS: Agree that the risks are adequate.

DR. SMITH: With respect to our representatives for a comment, Mr. O'Brien, do you have any comments?

MR. O'BRIEN: I would agree they're adequate and just, Dr. Finnegan and Dr. Alander's. The only thing I see different than the previous one about instructions is that we had a very robust study that indicated that there was a high rate of user error with that particular device and I didn't see the same data for this one.

DR. SMITH: Ms. Bonnell.

MS. BONNELL: No additional substantive comments, I'm aligned with the Panel and the discussion thus far.

DR. SMITH: Dr. Price.

DR. PRICE: I agree with Dr. Finnegan and Dr. Elder, they're adequate with user instructions. User error.

DR. SMITH: Thank you.

Captain Peat, regarding Question 1, the Panel generally agreed. However, a significant subset of the Panel did note that they would also like to add an additional risk of user error. Also one member of the Panel abstained.

Captain Peat, is this adequate?

DR. PEAT: Dr. Smith, this is Captain Peat. The information as provided is adequate

and we'll take this recommendation under advisement. Thank you.

DR. SMITH: Thank you.

We'll now move on to Question 2. Again, I'll read the bolded portion and the question is in the packets. Risk mitigation recommendations for intra-abdominal pressure monitoring devices under produce code PHU. And in the question there is a table of identified risks and recommended mitigation measures.

Please discuss whether the identified special controls for intra-abdominal pressure monitoring devices appropriately mitigate the identified risks to health and whether additional or different special controls are recommended.

Again, I think we'll first open up the Panel to comments and then if there are no -- when there are no further comments, I'll poll each member of the Panel.

(No response.)

DR. SMITH: If there are no general comments, I'll poll each member of the Panel.

Dr. Ebramzadeh.

DR. EBRAMZADEH: Yes. Under the nonclinical performance testing there is -- it says performance data must support the shelf life and the device functionality over the identified shelf life, but what is the shelf life and should the manufacturer be obligated to specify that?

DR. SMITH: Are there any other comments?

And also with respect to Dr. Ebramzadeh's comment, would any members of the FDA be able to clarify that question?

DR. RABANG: Hi, this is Cal Rabang. Yes, the companies should identify a shelf life and be able to substantiate that with the proper testing to show that the device performance will not be degraded as a result of being on the shelf.

DR. EBRAMZADEH: So the labeling may include that. I think that might be a good

idea.

DR. RABANG: Yes, the shelf life would be a part of the device labeling.

DR. EBRAMZADEH: Thank you.

DR. SMITH: If there are no other comments or questions, I will move with polling each member of the Panel.

Dr. Harris.

DR. HARRIS: I believe these special controls are adequate with the exception of if we're going to list as a risk that of user error, then there needs to be the appropriate labeling to instruct the user how to employ the device.

DR. SMITH: Dr. Finnegan.

DR. FINNEGAN: I agree with Dr. Harris.

DR. SMITH: Dr. Ebramzadeh.

DR. EBRAMZADEH: Their list is adequate.

DR. SMITH: Dr. Yang.

DR. YANG: The list is adequate.

DR. SMITH: Dr. Alander.

DR. ALANDER: The risks are adequate with the addition of Dr. Harris' comments.

DR. SMITH: Dr. Gilbert.

DR. GILBERT: I concur with Dr. Harris.

DR. SMITH: Dr. Pfeffer.

DR. PFEFFER: Agree with Dr. Harris.

DR. SMITH: Dr. Blumenstein.

DR. BLUMENSTEIN: I abstain.

DR. SMITH: Dr. Elder.

DR. ELDER: I agree with Dr. Harris' comments.

DR. SMITH: Dr. Ballman.

DR. BALLMAN: I agree with Dr. Harris.

DR. SMITH: Dr. Lewis.

DR. LEWIS: Agree with Dr. Harris.

DR. SMITH: I'll now ask our representatives if they have any comments.

Mr. O'Brien.

MR. O'BRIEN: I agree with Dr. Harris, but in deference to the FDA I would just say, in Slide 18, the last point actually does include instructions for the use of the device.

DR. SMITH: Ms. Bonnell.

MS. BONNELL: I don't have substantive comments, just that adequate instructions for use are part of general controls for all classifications of devices.

DR. SMITH: Dr. Price.

DR. PRICE: The same, I agree.

DR. SMITH: Captain Peat, regarding Question 2, the Panel unanimously agreed. A significant portion of the Panel also added an additional qualifier of concern regarding discussing user error. Also, a point was raised regarding shelf life. A number of Panel members also discussed the need for instructional labeling and it was then discussed within the Panel that that instructional labeling is generally included with all of these devices. One member of the Panel abstained.

Captain Peat, is this adequate?

DR. PEAT: Dr. Smith, this is Captain Peat. This information is adequate and we'll take the recommendations as provided under consideration.

DR. SMITH: We will now move forward to Question 3.

Please discuss whether you agree with FDA's proposed classification of Class II with special controls for intra-abdominal pressure monitoring devices. If you do not agree with

FDA's proposed classification, please provide your rationale for recommending a different classification.

Are there any comments or questions before we poll the Panel members?

Dr. Gilbert.

DR. GILBERT: To be clear, I think Dr. Yang said that the Foley catheter is itself considered a Class II device, is that correct?

DR. SMITH: Yes, Dr. Yang did state that when we were discussing Question 1, I believe.

Dr. Yang, do you have any comments on that?

DR. YANG: That's to my knowledge, but we have FDA representatives here that could confirm or deny that.

DR. SMITH: Are there any comments from our FDA members?

DR. RABANG: I have not specifically checked on the Foley catheter as to its classification. I'll be sure to look and get back to you, if I can get you that information.

DR. GILBERT: Well, my point in raising it is simply I would be hard pressed to move this to a Class I if the Foley catheter itself is a Class II, but otherwise Dr. Lewis earlier had indicated potentially going to Class I for the intracompartmental pressure monitor and this one may be similarly relaxed to a Class I, but not if the Foley catheter is a Class II. I would then not be interested in that.

DR. SMITH: Dr. Harris.

DR. HARRIS: I just have a question for the FDA. Is my understanding correct that if the device is going to be used to make a diagnosis, it is at least a Class II device?

DR. SMITH: Dr. Trumbore.

DR. TRUMBORE: Yes, we have an answer for the Foley catheter classification. Foley catheters are Class II.

DR. SMITH: And Dr. Harris posed a question regarding if intended use for diagnostic purposes inherently necessitates a Class II classification.

DR. TRUMBORE: No, it does not. It will really depend on the -- what is being diagnosed and what are the risks associated with that device and the diagnosis. So it's not automatically, but it would be part of the consideration.

DR. SMITH: Are there any additional comments or questions before I move to the polling?

(No response.)

DR. SMITH: I would like to ask a question of the FDA members before we move to the polling, if I may, just for clarification. With respect to the Foley catheter being labeled Class II, but then the response to Dr. Harris -- the answer to Dr. Harris that diagnostic intent is not necessarily classified as a Class II, is a Foley catheter classified as Class II because it's indwelling? And if these devices are not intended to be indwelling for a single use and removal, would that affect the classification?

DR. TRUMBORE: So the device classification is based on the risks which have been identified for those devices and so it's not necessarily, you know, strictly if it's indwelling or not or how long the tissue -- it would be in contact with tissue, it is also what are the risks associated with the use of that. And so with a Foley catheter like with this device, it is placed into the bladder. There is some technique associated with insertion of the catheter. Getting it wrong, doing that incorrectly, you do run risks of potentially serious complications. And so just the transient nature of -- potential transient nature of the use of this device would not necessarily change those considerations associated with the Foley catheter itself.

And the other thing to note is this device could be used longer term for a patient who is nonresponsive and therefore you cannot get a -- ask them about discomfort or

pressure in their abdomen. These devices are frequently used in those situations where the physical diagnosis could potentially be difficult or you can't interact with the patient in a normal manner.

DR. SMITH: Thank you for that clarification.

If there are no other comments or questions, I will now proceed with polling the Panel members.

Dr. Harris.

DR. HARRIS: Yes, I agree with categorizing this as a Class II device.

DR. SMITH: Dr. Finnegan.

DR. FINNEGAN: I agree.

DR. SMITH: Dr. Ebramzadeh.

DR. EBRAMZADEH: Class II is appropriate.

DR. SMITH: Dr. Yang.

DR. YANG: Agree with Class II.

DR. SMITH: Dr. Alander.

DR. ALANDER: I agree with Class II classification with special controls.

DR. SMITH: Dr. Gilbert.

DR. GILBERT: I agree with Class II.

DR. SMITH: Dr. Pfeffer.

DR. PFEFFER: Agree, II.

DR. SMITH: Dr. Blumenstein.

DR. BLUMENSTEIN: Abstain.

DR. SMITH: Dr. Elder.

DR. ELDER: I agree with Class II.

DR. SMITH: Dr. Ballman.

DR. BALLMAN: I agree with Class II.

DR. SMITH: Dr. Lewis.

DR. LEWIS: I agree with Class II.

DR. SMITH: I'll now ask our representatives if they have any comments.

Mr. O'Brien.

MR. O'BRIEN: I agree with the Panel.

DR. SMITH: Ms. Bonnell.

MS. BONNELL: I also agree on the lines of the discussion.

DR. SMITH: Dr. Price.

DR. PRICE: Agree, Class II (special controls).

DR. SMITH: Captain Peat, regarding Question 3, the Panel had one member abstain. The remaining members unanimously agree to the classification as Class II with special controls for intra-abdominal pressure monitoring devices.

Captain Peat, is this adequate?

DR. PEAT: This is Captain Peat, can you hear me clearly?

DR. SMITH: Yes, ma'am.

DR. PEAT: Okay, great. Yes, this information is adequate. We will take all of the recommendations that you've put forward under consideration, thank you.

DR. SMITH: I would like to thank the Panel and the FDA for their contributions to today's panel meeting.

Captain Peat, do you have any final remarks for the FDA summation?

DR. PEAT: Well, what I would say is that we were a little bit over-zealous this morning by having a full-packed agenda without any break and for that I do offer my apologies to the entire Panel and audience.

Another thing that I wanted to really put forward is you've heard about and

considered information regarding the proposed classification of preamendments for semi-constrained toe joint prosthesis device as well as intracompartmental pressure monitoring devices and intra-abdominal pressure monitoring devices. FDA has requested the Panel's input on our proposals to regulate these three preamendment devices as Class II with special controls and we take your recommendations under consideration for next steps.

In sum and on behalf of all the FDA, we thank you, our Chair, Dr. Smith, and other members of the Panel, presenters and participants, for your time during this unique period in our history as we respond as a nation to the COVID-19 pandemic with this first virtual two-day panel meeting of this type within our office. I want to say, as well, I hope everyone stays healthy and safe and an abundance of thanks for all.

DR. SMITH: Thank you.

I now pronounce the September 9th session of the Orthopaedic Devices Panel for the Medical Devices Advisory Committee adjourned.

LCDR MILLER: Good afternoon, everyone. My name is Lieutenant Commander Randoshia Miller, and on behalf of the Office of Health and Technology Division 6, we would like to again thank you for joining our Orthopaedic and Rehabilitation Devices Panel meeting where we discussed the reclassification and classification of medical devices related to bone growth stimulator, facet screws, toe prosthesis, intracompartmental pressure monitor, and intra-abdominal pressure monitoring devices.

A sincere thank you to all Panel members, presenters, FDA staff, and sponsor contributors that worked so hard to implement the second day of the Orthopaedic Panel meeting, all while being 100% virtual. Thank you for joining us and have a great rest of the day.

(Whereupon, at 11:51 a.m., the meeting was adjourned.)

C E R T I F I C A T E

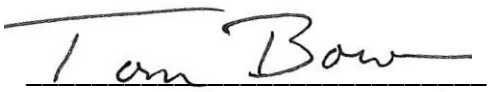
This is to certify that the attached proceedings in the matter of:

ORTHOPAEDIC AND REHABILITATION DEVICES PANEL

September 9, 2020

Via Webcast

were held as herein appears, and that this is the original transcription thereof for the files of the Food and Drug Administration, Center for Devices and Radiological Health, Medical Devices Advisory Committee.



TOM BOWMAN

Official Reporter

Free State Reporting, Inc.
1378 Cape Saint Claire Road
Annapolis, MD 21409
(410) 974-0947