Now I would like to turn it over to our speaker, Doctor Jason De Luigi.

Hello, can everybody hear me?

Yes sir.

Wonderful. Thank you everyone for joining me today. To discuss regenerative medicine. Sometimes it’s challenging to do a full workshop and comparably to what you be doing if you are in person. Where you may be able to have some hands-on demonstrations, but that's challenging to do such. We will providing some of the videos that going through here later through to talk.

So we have a couple of polls here that I had put an ad to get an idea of what [Indiscernible] will be here. So this will be shared here by Carla, and so we were kind of looking to see how many of you are currently performing or assisting in the performance of regenerative medicine your current clinical setting?

All right, great. And so you have once a specifically from PRP. So again how many of you are currently performing or assisting in platelet rich plasma procedures?

All right, and then we have an additional question. If every has a chance to answer this for the first two. Is anybody here are currently performing or assisting in bone marrow aspirate concentrate procedures?

And lastly, many people may or may not consider this part of regenerative medicine because how many of you are currently performin or assisting in phototherapy procedures?

All right, wonderful. While it looks like we have a good number of you that are performing these procedures. In addition to it looks like more of you are performing and or assisting in the platelet rich plasma or plasma therapy less of the Romero concentrate. So wonderful.

So that way we can get an idea of what audience we have and everything as we kind of move through this. So I will start here and move through the slides. We do not have any disclosures here and either I or my spouse have any financial relationships or gifting kind of the industry. And that is relevant to subject matter and visitation.

So this is a required disclaimer that I am to read the certified piece the views expressed in the presentation of those of the author and do not reflect the official policy of the Department of the Army, Navy, Air Force, Department of Defense or US government.

So today’s talk is on regenerative medicine workshop. Obviously workshop in person, we would be able to open up equipment, perhaps [Indiscernible] and look at how it will be done to the steps. Will try to go through it as best as we can. But many of you are already acquainted with this as well. Setting going through this as a full spectrum of the course.

So again my slides here. I do not have any relative financial disclosures. No relevant financial relationships and no specific off label use here.

The overall course description here is going to be a review the regenerative medicine option. Specifically for muscular skeletal conditions and which may generate some pain. As we're going through here. And affecting the joints, tendons, ligaments and muscles. We will get medicine movies and many other skills for transplants and regeneration of other tissue. At may be surgically planted, those are all outside the scope of what I practice here. In a musculoskeletal practice overall in which is the goal here of the entire piece. With a training session.

So just kind of touching on learning objectives. You have become familiar slightly rich plasma. And its application with the medicine. Become familiar with bone marrow aspirate concentrate which is also known as BMAC its application in MSK and become familiar with the other emerging [Indiscernible]is an options that will be discussed here. As many people probably already have questions or maybe already familiar with the different levels, these are the things like placental, amniotic, Koranic membrane. [Indiscernible] tissue, as we kind of go through [Indiscernible] and the like as we migrate through.

Here’s just a brief overview of where we are with anticipated goals. We will have a break midway through here around 1500 of your time. I am a few hours behind here on the West Coast. So these re all set your time there. On the East Coast.

So to begin with, we use these terms regenerative medicine, but there are many other terms that are being used. One is that it's frequently used is Orto Biologics when we’re talking about muscular skeletal medicine. You also hear people use the term [Indiscernible]. Overall there's more controversy over using the term stem cell. So it's not used is more readily and just to discuss my here in a coming slides.

So regenerative medicine, looking back at history. Was first coined by William Heseltine which is the founder of the human genome sciences, and in 1992 there's an article that was written by on an administrator by leaving Kaiser in the use the term regenerative medicine. There is a series of short paragraphs on which technology they are anticipating the impact the hospitals that are coming through. And overall most of his new branch of medicine that will help develop and change the course the chronic diseases, and in many instances with will regenerate [Indiscernible] so you have persons at that are trying to regenerate one tissue, some surgically implanted in some other solid organs as well. In addition to the overall transplant of other currently consolidated [Indiscernible] are coming from donors.

Again outside the scope of the musculoskeletal pain practice.

So what is regenerative medicine X which I think about where it’s at and what it means overall in the general spectrum for the full spectrum compared to the focus spectrum of pain. It's a goal of replacing a regenerating the cells, tissues or organs to restore or establish

multiple function. There's whole [Indiscernible] effort to generated damage tissue, the body, replacing generative tissue and stimulated by his own repair mechanisms to heal previously in parable tissues or organs. It is a lot more emphasis to be placed on the last portion, particularly what we are talking about. And really what is the regeneration of tissue and implants? So if we get a paper cut, using this analyses our analogy with many the patient so many times the paper cuts involves sutures. Many times it doesn't need a Band-Aid it. But our bodies, lead on the scaffolding and able to track and bring other defectors. The growth factors, vascular growth factor. Neurogenic or nerve growth factor, and depending on the other tissues and cartilage are ligaments tissues.

And eventually it heals on its own. But it's that regeneration of tissue or that healing. Obviously created skin tissue and soft tissue and blood vessels so it's basically her body regenerating tissue on its own. So the many people to think of it that way. So that's where, that would be that were partially heals something that was damaged.

So with regenerative medicine, and it's a group medical approaches. In clinical therapies, which quote unquote may use the term stem cell. And I use this because it's where a lot of people talk injection of stem cells are pro-generative scales cells which will be regenerative therapy and that's why we're looking at a musculoskeletal if you theology, pain, orthopedic aspect of it.

Unit is also potential where you can have induction of regeneration by biologically active molecule. In either administered alone or ice and so. I'm not aware of any of those types of therapies that are being done in that modulation therapy realm. That would fit musculoskeletal and pain. Transplantation of in vitro grown organs and tissues which would just be known as tissue engineering. Again as far as I'm aware, we're not doing that currently in any of our overall rounds. It does not mean that that's not going to be something that we keep looking at for growing new disc tissue that can be implanted or injected into the desk. To the various means of entry or other portions of that for other musculoskeletal conditions so whether there be ligaments or tendons or muscle tissue. Or nerve. For that matter.

But at present we are mostly focused here on the injection side of the spectrum here.

So what is the physiological [Indiscernible] portion of this? Again you inject PLP or stem cells are [Indiscernible] therapy, and [Indiscernible] healing cells that come our prolific mediator which will stimulate and attract additional healing cells and you can enhance the blood supply or the injury through direct [Indiscernible]. So what is that mean? Many times there will be some needle demonstrations that will be there. At the site that you would be injecting. Some of it is done just by the needle placement itself, and sometimes it is further enhanced by additional metering in that area. Many of you I'm sure are aware of things such as trigger points, as well as other administrations with the needle, tribulation of cartilage in surgical techniques with a shave down the car naturalist defect and they chuff and eight to that cartridge into the

bone marrow. And help set it will bring it into that area and to provide a hearing feel with some cartilage tissue. Think it does help correct the growth factors of supply and demand and regenerative process. So you're getting a better environment. So centers the inject date and the environment there. So overall, the whole process just leads to better environment.

So what are the Orto Biologics used? So and I use the term that we originally used and I mentioned to that number four. So one of the most commonly initial terms we purred up is mesenchymal stem cell. This is quite by Doctor Andrew Kaplan. And that's where lot of [Indiscernible] so I've had the luxury pre-COVID to hear Doctor Kaplan speak and in sports medicine conference, in which it was they had an entire [Indiscernible] solely on the medicine and he was the keynote speaker. And so one of the things that I took from there said that he regrettably use the term mesenchymal stem cells in this much controversy over stem cells what does it mean, people are actually using and actually qualify as a stem cell from the standpoint. What he did say, was he's not, I can lead to other portions. So he said he will still use the acronym MSC that you now call it additional or medicinal signaling cells. He take whatever issue going to use and injected into that site medicinally, they will signal other cells that will help with the human process. And so that comes back to that whole initiation of inflammatory cascade that will [Indiscernible low volume]. So other terms or abbreviations people use throughout this selector with the ADSC which is adipose derived stem cell, BMSC which is bone marrow derived stem cell. BMAC is bone marrow aspirate concentrate which is the actual get aspirate the bone marrow and get it down and you get a concentration of the aspirated bone marrow. There is hammertoe periodic stem cell him a poetic stem cell the spec agency and there's some I controversies over this with obtaining a stromal vascular fraction and which is dehydrated amnion chorionic membrane.

So what type of procedures will people do from this? So there's the PRP with the platelet rich plasma and the bone marrow concentrate, which is the bone marrow. There's platelet lysate. Or the overall focus of today's talk. We will be utilizing discussing on the most readily available. And still probably the most common to be used which is the PRP [Indiscernible low volume].

So kind of looking more, here you have the different various portions in this one has all the little pop-ups. No backup, that there is one more pop up.

I'm sure there was one for [Indiscernible low volume] but I thought it I went past it. So prolotherapy, many of you are familiar with this already, it's been around for nearly hundred years now. The early pioneers had continued to work on it. The overall amount of volume and the type of inject date and the mixtures of the inject date significantly. Practitioners in literature and research. I anticipate that heterogeneity of the actual inject date is possibly one of the reasons why is not readily available to the company. So if you so study on prolotherapy [Indiscernible] the number of injections, interval of injections. The amount of the inject date into that is there's needle demonstration that will be occurring with or without it. Many of them

show that is effective but is not in one straight forward like if he is 40 milligrams of Humalog, you're using 40 milligrams of how log. So for this some people mix dextrose with lysate. And say Lehman some people at goes on. So they call it protozoan. There so many different conscience when you do something like a systematic review, there's too much heterogeneity and some it once, something do weekly, so people do weekly for three weeks, some people do it every other week. So there is significant variability from that.

Had a post arrive, obviously be taken from liposuction and obviously takes it up to a level of performance to harvest it and beyond just the acupuncture that you get with PRP are just to even a bone marrow app. So PRP again is the most likely use for before people were doing having to such a fuse, they never had different [Indiscernible] he projecting [Indiscernible] in the different platelet and [Indiscernible low volume] bone marrow concentrate and that would be harvesting from the bone marrow itself. Usually if done on the [Indiscernible]. I've never harvested [Indiscernible] shown us a drawing, but its there. They can be taken from there as well as with areas as weekly.

Macroglobulin is another when using a talk about the amniotic membrane placenta and cord blood. One of the biggest challenges of that is compared to all the rest of these for prolotherapy is that for the most part we don't have amniotic fluid, and we don't have a placenta or an umbilical cord to [Indiscernible] so anytime you're using this products, you would be using something that would be external to your own self. So we type in across the screen people for blood, we check for transplant rejections. Will this be a necessary portion added to that to make sure you're not going to have a rejection or transfusion match or transparent reaction from these tissue types [Indiscernible low volume].

Going to the next slide here. So kinda breaking it down here on how you tend to use it. So these will be things that are frequently used for soft tissue. So [Indiscernible] will start with bone marrow aspirate concentrate. Soft tissue. Is that there are theoretic tissue repair. Theoretical tissue repair. You human studies. It's invasive. Every injection is invasive. The harvesting of material at different levels of. You have to access bone marrow. You have it's a bit more expensive because you need to access the bone marrow with specialized devices. Some people at drills to get into it. Other people at hammers and get it through that hard outer cortex and others can still do that but the equipment is more extensive.

And you hear people talking in there like when will this be approved by the FDA? So the FDA does not have regulation over your own blood. So but if you manipulate it, if you do more than minimal manipulate, and the patient you may be making [Indiscernible] and that's a lot of portions of people ask you and you draw my blood now or harvest my bone marrow and keep it? And culture it. Cultured stem cells quote unquote, right, are more than minimally manipulated, and that's for the FDA gets involved. Some of you may be aware of commercially available companies that perform this quite readily. They don't in the United States, they have clinics in the United States, but the culture the stem cells outside of the United States.

So they will be using safe haven such as the Cayman Islands. The only place that you're only seeing cultured stem cells in the United States would be if there are research studies that are being done and is part of the IRB protocol and have IRB approved think and how long you culture them for that will be potentially longer time.

So moving on this Mac prolotherapy, again less expensive. Because almost nothing relatively. You don't have to drink blood, you don't have to get bone marrow. You don't have to do IPO accurate. Or liposuction. Many times its regional treatment. Sometimes it is on point that many times it's regional. I heard there's an increased volume of fluid there, fluid you can use it in tendons, and you can use it in joints. There's a lot of discussion in literature under these types of abilities but potential particularly at the sacroiliac very typically when I talk to patients and say is probably ever going to be FDA Argenta Drupal for prolotherapy or give an indication am I would say it's probably [Indiscernible] you probably and have the most literature on it and it's been pretty much the most consistent on that. But there are many great case reports. His me grace [Indiscernible] this last randomized placebo-controlled studies and those are some are coming out it's being done. So there's some upcoming prolotherapy for osteoarthritis. Randomized clinical trials so overall more research is needed. And the technique is [Indiscernible] if you treat tendon or ligament you may need to do [Indiscernible] but less filtered within the insurance.

PRP. More data for jet intra-articular and [Indiscernible] application. There's been a lot of studies particularly with good follow-up. One, two and five year follow-up studies. There have been is think it volume for the collateral ligaments or Tommy John ligaments for partial pairs or [Indiscernible] in tracking pictures, both at the high school [Indiscernible] and professional rank for amateur and professional. So relatively small volume needs to be taken out by give us either significant variance in the amount of blood that needs to be taken between the different products and companies. Overall quantum quote it is expensive. It's not really that expensive. It's much less expensive than just a supplement side. So yourself to put in the company you're using, the tip may range anywhere from 100 plus two 300 plus two sometimes 500 plus from that standpoint. And often times their costs are in there. Injection itself is going to be the same cost regardless. The procedure placing the needle at the location always been same building code if you're doing it without your peer bone marrow. So that may not very all that much. Maybe primary again you may need to do some demonstration there of stimulus and local bleeding supplemented by adding it to the rich plasma area.

And lastly, pardon me, so many times, and I mentioned it was grafted. So in grafting this is where it gets quote unquote [Indiscernible]. So in burn patients, nobody really gets much concern for people using adipose and doing the whole process in the right stem shell and rejecting it or graphing it for this being done and paid for with plastic surgeons all over the country. So previously I have prior institution, I had partnered with a plastic surgeon that was there and we [Indiscernible]. And he was doing all the adipose harvesting, and I was an injection. And I've been

doing this for decades, so this is the same thing I do for patients every day, and it's paid for. So he's not doing anything different as far as harvesting and preparation to reject or to graph into that area where they have to [Indiscernible low volume]. So it's definitely more expensive. The question is if the FDA complain or not. The one thing that he was doing back then, with they were using the gastric enzyme. To help denature that. Again it is allowed. It is loud to do for burn patients, but now that we have more than minimal manipulation [Indiscernible] so that standard preparation no longer is utilized for knowledge different ones using [Indiscernible] and put it in a canister and are you doing [Indiscernible] compared to camp you manipulate the. Mechanically it's theoretically, is not a man patient at that point.

So now we can have an idea of what we're talking about with the Biologics and what are the terms that we all have as opposed to stem cells with a mental core blood and all these things. But how and why so popular. Obviously all those tissue plates have been around the history of man individual using that. So what has changed? And why does everyone get it now?

And realistically, it mostly came from Hines Ward. Other players and people had it before Triamcinolone Hines Ward. But he's in the national headlight. He was the MVP in his meeting with even the team is going to the Super Bowl. However he had a great [Indiscernible] Karen Neely had two weeks to get better for the Super Bowl are there MVP will wipe receiver. [Indiscernible] is not going to be available for the Super Bowl. So he had to come he had the PRP and went to the positions that were covering the team he played the passes for 43 yards and they won the Super Bowl. So everybody was wondering what he had behind the play with the have. I want that. Other athletes wanted that. So when the buzz for this treatment was fast. But the evidence was from what most people knew is it made Hines Ward better so it's going to make them better and [Indiscernible] is not evident. Even if you have, if the anecdotal evidence, does it make a study of just people. Just make the case very potentially. So randomized controlled study, where you're comparing it to something else. Or you not standardizing a cohort where you give the same measurements throughout. Where everybody enrolls like [Indiscernible] if you lump together 50 patients that you have treated, if you don't find 15 persons prospective cohort. But the buzz travels much faster than can ever be generated read anybody his involved in research, researchers not easy to do and not easy get paid for definitely not easy to get approved. So I would say I have published, I have published a prospective cohort theory on regenerative medicine technique for musculoskeletal conditions, and we submitted the IRB he goes back to the scientific review board and an SRV first before the IRB is even looked at trade so once we had to make the revision for the SRV got approved and back to the IRB. So apply for grant funding is challenging. So for quota quite experiments. Quote unquote experimental procedures, but we do different drugs and everything else and that's a point of experiment.

To see if it works.

So and again there costly. So these either cashiering procedures couple other [Indiscernible] for the house. And we got to wave off the fee for

the injection and what therapies you are paying for what imaging are you going to use before or after, with a study be a to pay for an MRI before and after all the different imaging. What outcome measures we have.

So but again the public didn't want to wait for all of that. So everybody was [Indiscernible] the treatment.

And so and the buzz is factored after that. So Tiger Woods had it for a number of times and in fact the one digits afterwards. Roger better had it for [Indiscernible] and Roge Vidal and Rafael Deville had bring a number different [Indiscernible] Kobe Bryant had it and unfortunately, Kobe Bryant had prolong his career, and so in these are all other champions. So they are like the reason they are winning and performing thighs levels because they're getting the TRP. So everybody wanted it.

And the list continue to grow. Tiger Woods had in 2009. Kobe Bryant had it for his knee, true Paula Mollo had for his knee. Alex Rodriguez had it for his knee and shoulder. [Indiscernible] that's a different lecture different time. Rafael the doll. Adrian Peterson, everybody wondered how he came back so fast and answered that nobody had come back that inequitable time. And agency but I did an ACL repair I had the added ACL repair so he'll faster and he was able to start his rehab faster and he got back on the field faster.

Ray Lewis had it for his triceps and Bryce Harper had for his knee. Athletes in a particular sport. Of course the laypersons good one because it's good to make them as good as Alex Rodriguez or Tiger Woods. Some again the evidence was [Indiscernible].

And you also going to that, depends on which realm that you practice in. I say there's more of it on the sports medicine side and less so on the pain site. I use corticosteroid for many injections a time. And [Indiscernible] all the time but asset use regenerative medicine. But you have other people for family medicine training. And sports medicine and trying to treat this, and this anti-steroids across the board, some of them. And so there's other publications like this one that came out in [Indiscernible] that shows Triamcinolone and basically the patient's with tears of interest to come to yours of steroid injections compared to just eight.

You like the cartilage and that makes a difference in the pain. So when of the problems of the study is that the injected steroid loan, they were also injected alone. And particularly these lawn acting anesthetics. And some show the meeting [Indiscernible] and the like are toxic as well. So it may not have all been the steroid and we know it's definitely [Indiscernible] the cause that lost but what is the steroid for the ceiling. The ceiling did not have the long-acting anesthetic in a prodigious had [Indiscernible] so there is some discrepancy of what other conclusions. And I would say. But the point it's made and taken so now this is what you see in the Reader's Digest and on Fox News, where they put the highlight, [Indiscernible] leisure cartilage and all your patients say every day. I heard steroids make you lose cartridge and you have to go to the whole thing find them so this is the overall spectrum. You know I don't think that is much when I do a spine injection. It says

it is going to make me lose my cartilage back, and but it's there. We use Percocet at times and sacroiliac joints, but you know this is based on in the arthritis.

So with that, thankfully over time people started putting together right it's so a lot of them initially going to be reviewed. Sometimes they were a supplement to a journal which is fully dedicated and eight try to seek experts across the different come across the country who treat different aspects of different body parts.

To write review articles that they would have in here, others came up with textbooks that would come up showing you how to do this.

When somebody goes to conference their like a lot of times they will say can show me how I do this so I can find it in our practice. And that's part of the business of the site medicine too. But it's out there. And I anticipate it will grow.

I'm not sure what is happening right now in DOD, but in the civilian world right now, you will be surprised let's in the treatment in general.

So you have natural path, you have chiropractic's practice. You have physician's assistants that are doing this as well. So you have a full-spectrum, it's not seen in practitioner. He can go on social and find them by a peer P [Indiscernible] and you can go look at the websites and there's not a single medical doctor it's in that, it's in the practice. But really is a discount on the peer P stuff. [Indiscernible].
Sets out there. People are making money on it.
People using it with various levels of training. So that is being said.

So now we will start focusing here on PRP's.

So what is peer P. We started talking with that earlier. And much more involved than just taking blood. And getting two more fundamental aspects of it. So which aspect or peer P. So these are, these are one own body blood plasma that is enriched with platelets. No platelets are being added to it. So sometimes you say in which [Indiscernible]. So I say concentrate on platelets I guess, may have to get better change its light. But again, which is the next slide, next bullet here is it provides a concentrated storage [Indiscernible]. So most importantly I think because it's in pains and releases, and granulation, several other different Pro factors. So again this is that higher cascade.

That will initiate. In our body initiates that at the same time we get a paper cut or anything else on those lines. But we are using [Indiscernible] for to enhance that and insinuated. And have a faster more complete. So as we go through this would be, we'll talk more about that, there's different growth factors.

So what is the pathophysiology of how and is Key works. Again we have this make any specific anatomic area. There are different, their different levels of blood flows through different structures. Said is definitely tissue that would be more vascular online. You have portions of [Indiscernible]. Where you have that radio rim vascular inner circle

of vascular accessibility to that tissue at the core. So if you get a tear in there that has a core blood or poor blood supply will be harder for that

So minimal but our blood flow to an area can be problematic, and same with low cellular [Indiscernible - low volume].

So which ones qualify for the most? Spaces, ligaments and cartilage . Again have minimal blood flow.

Muscle and tenants commonly have more low but they may have decreased blood flow to that area following injury. So what concur, this imbalance to growth factors in supply and demand? And that hinders our body's own regenerative or clinical healing process. That's really what it is doing. With injections and supplementation with Amos, this is something that your body is trying to do on its own. We are not taking or giving anything specifically to do that, our bodies working and that's what trying to do. Trying to heal itself.

Tries to maintain that basis and that balance. So what is rationale of using PRP for treatment here in a musculoskeletal injury?

Again muscular skeletal can be broad. For many different tissue types. They will have bones, cartilage, ligaments, tendons, muscle, nerve, I was there not all the same type of tissue so that might be a slight variation. With theology and the mechanisms of action and how they work. But in general, it's kind of just summarize the global view of how to potentially work.

The plate rich a platelet rich plasma and of course the other therapy, they allow for the opportunity for the body to use its own some song growth factors to improve the quality of injury improve the quality and speed up recovery from injury. It provides a higher concentration of our own colleges healing and growth factors. If there's an area with [Indiscernible] and you take it from a puncture we placed there, we now created an environment in the area of the pathology is going to have a much higher total volume and total number of the healing cells and growth factors.

And then the ultimate row or goal is to supplement with the bodies trying to do its own already.

So being in the military sometimes you know within your Army or Navy and Marines or Air Force, the different terms. You say yeah, sometimes you can get done with the regular Marine Corps, sometimes you can get done with the Army. Soldiers that are on the ground and sometimes you need Navy SEALs or you need the Delta force are special ops arrangers to come in and help do that. That's kind of what we're talking about. We have specially trained soldiers and all these different fields that are more equipped than the everyday good welfare of the country. Soldiers. But again they also help stimulate bone and other soft connective tissue. So what is that mechanism for injury? And subsequent repair.

So there's different phases of repair, so obviously the entry there. It's either torn or strained or there's a defect. So that's in the bone cartilage. Ligaments, tendons, muscle [Indiscernible]. So oftentimes we say and it starts with the formulation of a blood clot. So as a key granulation of you have bleeding and clots in that area. So many times, sometimes with a paper cup a paper cut is no bleeding but the healing process will begin there. So what you have everything again doing the peer P. And doing administration, your reading [Indiscernible] there and getting ready to inject into that area that you just stimulated local bleeding. The high concentration of the factor. But normally with the PRP added. So you create that clot and granulate the platelets and the plate list and the growth factor and hopefully at that site, click what quote this is the additional signaling so that Doctor Kaplan had talked about. And now creates a new microenvironment here in that area, and microenvironment then proceeds to the chemotaxis of other resells and that process will then activate and proliferate other local progenitor cells. So kind of the through from bleeding to inflammation, from inflammation you will start to proliferate other cells. And then those cells has proliferate will start to remodel.

And so that's kind of the whole cascade. Many patients are saying how fast does this work? How fast is this take [Indiscernible]. Takes weeks and months. Depending on the level of injury trauma.

So typically always say important where you are from 60 weeks an hour too much when hour to three months from now, and any time point in between, everybody has a different extent of injury, trauma, or damage and wear and tear and the generation as we go through, you try to set up some realistic expectations of what to go through as you're migrating down this process.

So the platelets are not just for clotting anymore. So all the first else to arrive at the site of injury. They are responsible for the initiation of the human cascade. Do stimulate Alpha granules and other manuals. So can you kind of looking through that whole portion of coagulation or clotting comes after the bleeding? Then you have inflammatory phase over the six weeks or [Indiscernible] and have a proliferative phase which could be over the first few days and then the proliferative date can be from days to weeks and Molly can be weeks and months from that standpoint as recorded migrating through that.

So again, how does it work? Erratically you discussed a couple different slides and pictures and graphs and I particularly help with tissues and care and stimulate enter release growth factors that are known to help with the healing process. And by adding these additional concentrations of blood that has been harvested [Indiscernible] and spun down separated from the content and then added to the area. Just add more growth factors and a higher concentration. And it will become a [Indiscernible] environment. So the plate collected in the PRP. I can be activated through additional [Indiscernible] are hi Jim chloride or calcium chloride or thrombin and what you put in there and it's already bleeding it will be some localized natural stimulation of this cell.

Again it induces the release of other growth factors [Audio fading in and out].

So I hear you kind of look at how the PRP stimulates both synthetic and decorative processes in Moscow's got later in musculoskeletal tissues. And check with the matrix and generation there. What type of site formation that occurs and whether it's a high-power hyper metabolic portion and then you have a whole list of all these different areas drug factors that come through in the entire cascade and overall process of the PRP development.

So into the hearing on that tissue is damaged.

So what are some of these key growth factors? Platelet derived growth factors, transforming growth factor beta. She has fibroblast growth factor. Insulin like growth factor. IGF one into. Vascular endothelial growth factor, epidermal growth factor, interleukin eight, keratinocyte growth factor, connected tissue growth factor many that are listed here.

So kind of breaking down into the different aspects of these growth factors. You know looking at the, going from the top will go around to the image here. Clockwise. You have platelet derived growth factors and they're all been released by platelet to the growth factors here. That helps the cellular growth, new generation and prepare blood and collagen. , EGF data or beta growth in the near Genesis of epithelial cells and vascular and filial cells and promotion of wound healing. The growth factor again, angiogenesis and promotion of [Indiscernible] and Este’s fiber growth factor tissue repair collagen prepare for [Indiscernible] acid.

Again a wide variety of different aspects that go into the full healing of the tissue. The new tissue and [Indiscernible] cell will need that he vascular to maintain give it nutrients and keep healthy. Need nerve endings or fibers innovation area s it's not unexpected that you would have all these different types of cells coming in there.

So now that you kind of have no idea of how it works and we talk about who use it [Audio fading in and out] so how does it rate from other options? We talk to patients and [Indiscernible] they have to know, you have to and for them, if he is peer [Indiscernible] they don't use PRP and what's out there what the risk is and benefit for each of them.

So some of the overall advantages is a tall just donation. So it's your own blood and overall he has a slow down side. So when I'm talking through a cascade of different options for a needle based treatment to a tissue type of damage. I will say for the most part, every single one of them is going to be taken a needle, and it will peer sure skin and slowly advance to the tissue pathology. So every time when using a syringe, it will all be the same after that point. So you will clean them off [Indiscernible] and increase the risk of infection still makes a break in the skin so there's always a risk of infection, but use the techniques that are decreased. So the needle itself. Cut, you may have some localized bleeding. So we always look to if you're using imaging which many people are now, there still some people that are in the general

population that are patient based. Are just yesterday I actually saw a patient to had intra-articular hip injection complication based, I cannot fathom how people are still do not practice, but I had a patient had that happened.

And so that was this year. So pretty amazing, but it did happen. So for the most part missing large blood vessels. Typically a miss the artery and [Indiscernible] and everything and they went in there. Who knows if actually hit the target or not. They didn't [Indiscernible]. It anything that cost them significant trauma, but that being said, I divert. So anyhow.

So all of this is the same and you're using your own, using your own blood. So you not, if you are allergic to your own blood, you might have a lot more problems and whenever back jointer knee pain or whatever amount you're having. And we would have done this many times before. And most times we're all using lidocaine or others, [Indiscernible]. So again, before you inject they have an allergic reaction to that is pretty much [Indiscernible] so there's not much variance or risk of it. In general compared to the other pain relieving [Indiscernible]. So what are the disadvantages? What is expensive? Unless something changes in the military setting here are the VA setting. Most of those treatments are not going to be at a cost to the individual receiving them. But in the civilian world, it is, overall. Have not had a specific, I've not had a specific insurance company that is commercial approved peer be. So I have had workers comp [Indiscernible] and have had occupational health is covered for employees and injuries. But not the commercial insurance itself.

So it is a direct cost to patients. It's more expensive than to get a steroid and maybe pay a tobacco pay. Depending on where you are at in which the regional portion. For pain thousand dollars a couple thousand dollars or couple hundred dollars and you might just variation, but it's also directory from the patient. There's no insurance coverage.

So the other potential disadvantage there is some variance in standardization of both technique and qualities, quality sweat quality/want to. So each of our bodies rely are our life different chemical come position. Realistically. If we took everybody on here and we took lapse on them and we looked at the CMP, you’re CDC. We look at your urinary need these things. It's all going to be different. I will guarantee you that there's not going to be two people that we task or will have the exact same article out to say the exact same number for two lab results added that whole spectrum. A lab let alone everyone. So then saying well if that's what your body's level is, actually bodies working on, so what is standard for your body may not be standard for everybody else's body scale. So the question becomes this, standardize the patients or standardized to the center of the [Indiscernible]. Do we need to have very specific, it has to fall a very small range of platelets and growth factors that you need to have to be successful. Or is it going to be successful based on your own body needs to make it successful.

I would venture it's probably the latter. We all have different blood pressures, we all have different body types, metabolism, and weight. Your

chemical composition. When we are assessing you with lapse, it will be greatly different. Or the [Indiscernible] levels will be different. So in a meadow what you task it will be different. So the question is does it need to be sent to you or to be mask, the mask people?

So is there evidence to support the use of PRP, it's coming, there is numerous surgeries that are done that have no evidence ever. Say you take something like a [Indiscernible] it's covered by every insurance company never heard one insurance company ever denying it. In Mumford smart article from the 18 nineties was a one-page thing that was published in JB. And everybody does it, there's never been a randomized placebo-controlled study that that's not the way Mumford should be done or not.

If you get a clock and report you probably have one case study. And that is what it is. But the Cochrane reports here are talking about is insufficient evidence to support the use and a say that pretty much about everything. People look at the clock part in treating that back pain. It is not a single thing work.

Therapy doesn't work, putting [Indiscernible]. to work, back braces don't work, steroid injections don't work. Says nothing works. So the other day the Cochrane review says just say a patient nothing works and just tell him to suck it up, right? That's not really standard of care. That's of the Cochrane report says. So I have criticisms of the portions.

And also says [Indiscernible low volume]. So what are the differences between the various PRP options? Now that you decided you want to do to European your patients are appropriate.

And you talking about brands or which company. And they're all over the place. So 70 have to draw 100 milliliters or just try 10 millimeters. They all have their own kids that you're getting. May have heard terms and that's what I'm talking about. [Indiscernible].
So we talk about kids. They will be company specific. Volumes will be kit specific. They may very base on company. Does your company's machine allow adjustability? As different settings you can use. Concentration. Can you change the concentration by the different setting? And concentrations, our WBC count. Is it leukocyte rich versus leukocyte poor? Inactivation. And suggesting.

And again a sampling of a few different companies kit city kind of happier. For the most part using acupuncture test tubes a sometimes transport that into another receptacle, and others displace the test to the ancient straight into the state into this interviews. So there's definitely some variability.

Such as a matter which company they are have. It is my which finally draw, doesn't matter how much volume he use. Does it matter what the concentration is in the produced sample. To these questions change based on what you're treating comedies and it is patients and questions change based on the types that you're treating, is it a tear versus [Indiscernible] is it knee cartilage or [Indiscernible] the tendon there [Indiscernible] and again is a patient specific most important. So your body is on its own, no matter what your platelet count is in the portions

or if you're really malnourished and you have immunocompromised, we have a lot of patients who are in hospitals that have trouble hearing.

So we will kind of go through all this as best we can.

So preparation. So now that you are drawing the blood, and you're going to prepare it to make PRP guys are different between the various companies' machines?

I would say absolutely. So there's lots of differences. But it does make a difference. That's a follow question to that.

So every company has its own kit that they make and use, and their kids with the centrifuge. Sometimes they can, you can negotiate if you find of kits and you get [Indiscernible] for free or you have the essential piece in the kit and they make money on both. They don't much easier the company center fees, they want you to use theirs. In the coming together they want you to use the old companies, kit. They want you to buy theirs. So there is a business at the end of the day. By the company. And is there one that better than another. Why would you choose one over the other? As many different reasons for choice. Being in the military and have to go to that. You say all right, we want the advice and do the investigation where you get several different companies and they look at the pros and cons and the prices in [Indiscernible] and that's what we got. Other times you may have an individual localized despicably on your own process or your practice, if you go how that you go based on your research. They like this [Indiscernible] and it will work well. And they can call on the graph if they have any issues for his it has a lot of different reasons. And when we talk about scientific reasons, that's what we will go over. And why would you choose one of the other, does it matter what you're treating, if you buy some of each only one. And what does that mean, if you use this kit that's more leukocyte Richard this kit if its leukocyte poor and use this kit if you have any concentration and the other kids it's more expensive. And that question doesn't matter. Using a company that has two different kits or something like [Indiscernible]. Arthur F Angel system in PCP. So PRP. They don't even call ACP PRP, they call it [Indiscernible] in plasma. So that being said there are three different kits and is great differences the amount of blood that you draw it is great differences in the center fees and great differences in the concentration kit back. But instead of trying 180 milliliters like you want to do for Angel and you try 10 with ACP. Is less costly, and if it's your company or business or hospital system charges the same for PRP regardless of the companies do. All of a sudden they are right where switching companies. And not necessarily switching price. And are you giving the patient the option. You have three for machines and if you want to reach out to labs USA or bio lab PS3. And most hospitals will buy multiple machines. [Indiscernible]

And if he use the same centrifuge from a different company? That are some compatibilities, but for the most part, no. They are not balanced correctly to have the other test two. So I may have had, I have had clinical situations where there in the transition for the different ones. And they want to buy the kit in the center fees and are trying to the kit, the test tubes in the other center fees and it wasn't balance right,

it wasn't making the PRP rate. And it was separating. So they try to have a financial shortcut, but had a negative clinical impact. So for the most part there is limited compatibility.

So how do you get PRP?

So have all practice were performed punctures in the past. It would be cute little [Indiscernible] so you use a tourniquet and clean the area. You palpate for the vessel. He start the needle and try not to blow the veined and get the blood. Again, if you're trying 180 milliliters versus 10, I'm using those as the two spectrums said there's some larger variances. That's a big difference. If you have a 90-year-old patient and try to get 180 millimeters out of a common it's a lot of blood to take. And if you do enough for just one joint and you to do that these are you really going to take 360 milliliters of blood out of them. You take less to get left, does this increase the efficacy are well the concentration still be the same. Like total volume versus concentration. The ratio is a total volume. So it doesn't matter. And we kind of go through it. So if you draw the blood in the test tube and such a fuse. Once you have that you have a different layers and get separated out. It will be that. That layer in between the core plasma red blood cells where you have the platelet cells in the white cells. So those are different ways you can change the amount of weight blood cells that makes in his get separated more. And the platelet and suffered

And overall center difficult process. The hardest part of the process, your blood dry can take three minutes or take 30. May have to try and try again. And something else in the back of hand and they can get it and [Indiscernible] to come down. So sometimes you plot ultrasound and the acquisition ultrasound and you can go in and [Indiscernible].

So there's all different ways they can kind of do it but the most of us it's a difficult process. Is difficult process but you can do it.

But overall this to methods of preparation. This is where the FDA does get involved. So not in the else but oftentimes it's the way the machine will get the FDA approval.

So the process of collecting whole blood again is approved here, so getting through it and use the regular normal coagulant for the body. You put into the centrifuge that you received the peer P. Between that PRP and the PPP. Red blood cells.

So in general average baseline platelet count is 100,000 per microliter. Therapeutic concentration of platelet and many of these different companies say they increased it by fivefold.

And that also gets constant. The thirtyfold and really get two or three because anything more to add and chose that has potential privacy. So it is better, or is the old [Indiscernible], just right, and we don't have that information yet completely across the spectrum two. As you kind of mount of so many things you can kind of see where it's easier for the insurance company that we don't have enough evidence. You don't have to tell me too much you don't tell me the concentration, you don't have to

tell me which type of think it was with which body part, but the evidence is growing.

People have worked and are working on standardizing peer P.

So rid of the bat, something ever base that is different. Every preparation is different from every different company that you can potentially use. There's been too much variance and results perhaps because the patient selection. Everyone is still different.

I don't how many of you do a routine CBC before we do the PRP. But that's not usually what most people do.

I have had patients who have had previously [Indiscernible] and I have always told them I would prefer you do that if there in the normal range and done order to platelet as part of a CSE for them. But without that history I don't think we can do it.

Should be done? If you going to take it, how much you send to the lab to investigate, and this is where gets more tricky. So if you are doing a procedure for PRP and you say let's see what the plates, with the concentration is. And he can do you can do [Indiscernible] and put in samples and sent down for evaluation. And then you put those test tubes in. You cannot spin them down to get the TRP and save about four milliliters maybe six, depending on how much [Indiscernible] and now you would take one of those milliliters and send it to the lab again for evaluation. But you charging the patient [Indiscernible] and since is a catch base procedure, will the patient ensure for two PRP's, one on [Indiscernible] and that they are not paying for it [Indiscernible low volume] [Audio fading in and out] and the lab is not going to keep the cost is district the department would do it or you will find charge the patient cash too. More cash to the blood plate so these are some ethical dilemmas as well. So if you research [Indiscernible] but when you an extra plates the practice, that's when the guitar.

But should we be doing that? You don't routinely, we don't routinely check and see how much medicine is that each pill and is probably variations for the exact amount. It's probably all Park milligrams but it might be a little less or a bit more. Even when you are drawing out of a file. And there's always [Indiscernible] any try think of the meat on the needle or the assistance and medical students try to get this other drop there. Instead of being 40 milligrams of [Indiscernible] or it's really 38. 39 point five grade so there's definitely some variation. And so Vic get lost with the two being an extension to being flush it and all getting in there. So it's all the different aspects. So overall the characteristic this is necessary to have more fully understanding.
And a perfect setting, right? We would have something that you would be able to analyze within the test tubes that are there. For the analyzer. People do finger sticks for blood sugar control. We can get it drop of the PRP rather than having higher milliliter from whatever their lap need to minimum volumes, and that would be great. These are all things that need to be created in advance and determined, validated as we go through. But probably easier for the insurance companies say hey, you guys don't know what you're doing yet? Makes it easier for us not to pay for.

Come up with these different classifications. Here's an example from one that came out from Mishra L all. And they type it into what was the white blood cells that were activated or not. Pretty basic. Type one and the increase white blood cells over platelets so therefore there is that not activated. And or images increase over baseline, but it was activated. And lower, not a white blood cell but it was activated or not, but you can say poor, yes or no, so one, two, three or four. And then there was a B which could have been [Indiscernible] the percentage of concentration at the platelets. And then there was another when they came out later and they try to come up with a PR LA and it's like count and [Indiscernible] white blood cell count and activated to other [Indiscernible] and activation in the Platonist and [Indiscernible]. So little more complicated but again, it's nice if you Jennifer research. If it's been pay for the research grant but if it's not, his pain for an is a patient going to be happy that you took that one milliliter of the PRP and they're not getting [Indiscernible]

That's why they paid themselves.

And you have the results until after you're done. So what if you have lower concentration? From the patients my back? Because your blood wasn't at the minimum rate, and we have already done the entire procedure and injected you got the lab results back after you were done. Then we will refund your money.

And you can come back when you can get a better sell your counter will do it again. Or set up refund your money, just say [Indiscernible] I don't know many hospitals administrators that would really like that either. So this is the ethical dilemma that we are having with that comes it's great to come up with [Indiscernible] but until then we need to have, we need have it immediate, we need to have it right time, we need to have the specific threshold that we should be able to use, so there's too much more to be done on the standardization portion.

So concentration. It was a poster presentation that was also in a lecture that I've been trying to find and I cannot find it anywhere. There was one I was internally at Mayo Clinic in Rochester, and they had taken the number of the different commercially available [Indiscernible] and they drew blood on patients and they sent them all in and they compared it and it was purely like internal like not even necessarily treated, just say what the concentration would be. And they are saying compared to the G series kits, typically has the most platelets on here the most, white blood cells in the most blood soaked counts in all the different things. So on, thank you was a fellow at the time and have fellowship there he had put that together and at least he started the project [Indiscernible] and it's not in the literature, are the published literature, that's we can find it. And I can't get back to the poster he had to keep trying to do a search on it so hopefully one day it will pop up online and I can reference it. But if a pain is that the references, please feel free to share. But with a publication that of, but I really like that one, I thought it was really [Indiscernible] and put together and compared a different one simultaneously and there's been a number of other studies so what is the mean platelet count in general, it's about 742, plus or

minus 463. Times 10 to the third power per [Indiscernible] so again that's increase, right, but if you look at different companies, so you have companies like subfield have only 88. And insight has 1543. That's a huge difference between two different products. Are they even the same thing, 88 compared to 1600? So there's a wide variety between good [Indiscernible] and the question then becomes so that much more platelets. So does that correlate, the second of developing? If you look at as good or better where is to be doing as well within siding that has that many platelets per you would think my platelets, the more platelets the better. That is the assumption so you say maybe should use inside [Indiscernible] but maybe there is [Indiscernible] there's definitely people do well with some reason the products. And they do well are going to be on the market.

But is wide variability and a change anywhere from point five fold to tenfold.

So fake variables.

Yes 20 times different. And so the mean peer people I am was about five point two plus or minus three millimeters. That's a huge difference. It sums like the double to nothing also from that standpoint. So it ranges from after you do all this, zero point three four milliliters. So what I was saying like if you want to get a list of that, if you had sent that lab and in the got point three milliliters on your patient and you're going to take some of that and send it to the lab, drop in peer P and then every just to the degree we can over 10 over 10 and a half milliliters if you use a certain protocol or wood company called [Indiscernible]. 10 needed leaders to inject an area and attended are when you inject in a tendon and ligament. There's not many tenants and secondhand on the 10 millimeter. That's two point four so you actually have somebody to uncertainty milliliters to use. I don't know many body parts you can inject 30 milliliters and pretty comfortably. That protocol together.

And so far, in that study, looking at it, there is no correlation with any company that they reviewed here. Between peer P volumes concentration. So it wasn’t saying what we consistently would be able to get those in answering the question that just popped up.

So I think it's a great question there. Again with the standardization I hope we can get this right because of the can get a more formal standardization, then we get more consistent answers to insurance companies, and perhaps they will start be reimbursed for with the fall in the standard. So that would be great way to do it. So in the civilian world, they pay the cash in submit for an APN at into [Indiscernible] notice and is different ways the boxes on their. I know it's fashioned by the Saints insurance company the beautiful anyhow, and it's of the things that please send it to the insurance company to pay for any get reimbursed.

So the check that the last trying to me on his rounds insurance is I will pay for that one. And reimburse the patient. The question is what they say doesn't. And since it then on your practice to reimburse at patient,

or to get the next for free. The next also doesn't [Indiscernible] you can be free once you get to give? And that's the question. That's the dilemma. Hopefully you can come up with something.

So then we are looking at it's all based on the lifecycle, what is the difference. It doesn't matter. It's either better, maybe better for different types, if there's different efficacies based on [Indiscernible] in so far some of lists appear to be supporting us and I almost have to ask machine because if you have one machine that makes it looser site which, Luke Kyte, [Indiscernible] leukocyte, wheeze different need of steroids based on [Indiscernible] versus doing it transept or a doing [Indiscernible]. So why would we think we same kit and product for everything, right? For regenerative medicine. So I think that would be a way of looking at it also. At smart cost. So there's one done by Brian: he's an orthopedic surgeon in Chicago. I know he has team physician or team exertion among other teams there in that area, but he looked at the effect of leukocyte concentration and looked at the company that had reported that they have eight four product and what has a leukocyte which product. And he said that leukocyte products were better and better than [Indiscernible] acid.

And in that site.

So in the case, so perhaps for joint talk your, leukocyte for may be superior.

Are leukocyte poor? So as a superior and ligament are superior muscle tears are tendon tears or other portions and [Indiscernible so there’s different variations. So these are the questions.

So what are some of the companies that do that? So leukocyte rich product to check region PCP PRP. Biomass comedies produce PRP's with higher proportions of red bliss, white blood cells and other than other products that are leukocyte poor. Can produce a whole lot from the concentration but also [Indiscernible] perhaps the knee arthritis, having less platelets would be better. So Ms. companies perhaps. So PRP is the bottom end of the system. So they didn't call PRP. There's nowhere in the market they call it PRP they call it [Indiscernible] concentrated platelets.

And so again there's some produce in laboratory range and when this study here was a difference from the last one in history so there's a high platelets and [Indiscernible] factor than any other product. For different protocols. Between them didn't show any differences and activated proteins. There was a positive correlation here. And all growth factors. If you had more platelets you had more growth factors. We had less platelets he had left growth the second you have less growth factors.

There were specific factors that were committee had more white blood cells are more growth factors and vice versa.

And efforts, are they detrimental, because the leukocyte is poor and it's less correlation if you had less than you have less of the growth factors.

So maybe it's not specifically what growth factors were getting, you may not actually be the white blood cells are the platelets, and their medicinal we talk about that.

So based on other sites extrapolations not to keep it on the wormhole is a lot of other studies here that are pointing towards. That thought tissue such as ligaments or tendons are more likely to respond to ones that have higher looser site rich. So we're typing in other studies they have more white blood cells and they have more [Indiscernible] and more ETF and but these are soft tissues. Its ligament tendons. So we want more vascular entity of growth. Want more blood vessels there.

However the leukocyte poor ones were doing better with some of the [Indiscernible]. So I think there's definitely a lot more to come back here. But now you start to see some positive trends I can help you out. And then it really is pointing to maybe we too need to have more than one machine.

So that's always a question to comment can you get to machines built? And should you be setting different prices. So if you get this one here we don't get as much. You may not have to treat as much or treat the same because of the technique, your technique is the same but your tips cost different. Centuries is different. A lot of that process in the put up quite business side of medicine. So venous access. How much blood to draw? I have an idea which company you may or may not use, how much blood you draw? And is it the same across the spectrum? And the answer to that is no, it is not.

Is dry more blood provide more volume of PRP? Destroying more invite a greater concentration of PRP? And does volume or concentration provide any clinical importance? Well we will see.

So companies paid so this is what you draw for the various companies. Based on manufacturer's recommendations. Our arthritic's Angel is 180 milliliters. And I realize [Indiscernible] Arthrex ACP. It's 10 to 15, not 10 to 1515. Biomet has 54 milliliters and they had the highest amount of business services both drop off 54. So and then region lab was one of those that only have 10. Between the different companies, so despite having different volumes drawn, they have different results or platelet concentration growth factors.

So then what is a science behind the development of their equipment? So you look at these little tubes read some of them are just a plain test you. And of the woods have like internal wiring inside the test tube. So perhaps or something physics it's happening in separate the differences.

On it too. And now we are really [Indiscernible] so you don't how much blood to draw, we do what we will get back. Was the patients pre-existing platelet count to begin with. Whatever we dealing with, what specifics behind the company's test tube? So we never thought were going to get that a pre-but realistically that's what is pointing towards, there's a lot of variation. So when you put it in, how long does it stand? What is

a spin rate, what is the spend time and what type of test tube and how much you get back.

So approximately even though you have blood drawn, that's a lot to take for a little [Indiscernible]. Comparatively same company difference, you get a different kit. You get more bang for your buck and if you don't have to sit there draw 18 times more blood, you only get to my milliliters that's a lot different.

So Biomet, you draw 54 to get the same as Arthrex Angel. If that have higher concentrations or platelet concentration. But just remember from the other studies, and Arthrex Angel , Utah commercially the highly touted by one of the brands. But when you break down different studies comparatively thinking, and you're looking at it. And the RegenLab, you can do tend to get the exact same as Arthrex Angel or you can do 10 of this other brand and get a half or two thirds. But for the most part it's really amazing how much PRP can still be produced. Instead of its volume. And with the concentration. Is RegenLab in the lab and what does have to see there?

One of those benefits of China 11 and have used it and is quoted what does your quote unquote using something else so you can change the stem right and change the portions versus whether your current to do plates are tendons versus it takes about 20 to 30 minutes, but you're still after 180 milliliters. Your platelet increase varies between four and 18 depending on where you dial it in the white blood cells go from 2 to 6 depending on how you dial in. You still are getting about six feet away. And it takes about half an hour. So again, labor-intensive. They had to draw 180 milliliters and a half hour so this is a much longer appointment for the patient and the patient is like oh my goodness it's a of blood.

Comparatively is a products, ACP, only produces one three times. So it's almost 18 times, like 15 times less at the high-end of three times less on the low end. And he has one point four percent white blood cell on baseline. Compared to 2 to 6 times. Again he gives you 3 to 4, but your 3 to 4 is it as concentrated with platelets. So it only took five minutes to spend. So the question is, can you get efficacy at of trying to milliliters and spending it for five minutes, and getting 3 to 4 as you can taking 180 milliliters and spending it for half an hour and getting six. And that's the question. And that's the same company and [Indiscernible]. And is a table where you by both based on tissue type you can use one for one and one for the other.

So it's interesting.

So the jury is still out in general.

So now you take in some of those other companies here, Biomet and RegenLab to know start on the bottom. Same spectrum. Tickets 5 to 6 of from RegenLab. He has more platelets than ACP. One point six two two, still lower than the other. It has much lower white blood cell counts, so we're talking about [Indiscernible] Italy has zero point two. As to stream a low for white blood cells. So theoretically this may be beneficial for properties, five six milliliters a joint tank at 5 to 6

and had to stand for 10 minutes. It's good for arthritis or [Indiscernible] arthritis maybe that's a reasonable product to use for this template. Comparatively again seven times platelets. With Emcyte. He gets seven times platelet, fortes white blood cell increase, six milliliters of PRP in five minutes of the diffuse process. So platelets are easel are equal because remember the angel spectrum between was between four and 18, right in the middle an endless in the middle but still not middle, that middle third.

And the white blood cells, you get Biomet and have a bit more plate light concentration then Emcyte and these are both going to be leukocyte rich. Again more likely to help with the tendons and ligaments. Perhaps if you take a different studies and extrapolating them together, that such attractive science. We had the study that shows this in the study that shows that. You have any study that shows all three of the things that were looking at together, and take the once a look at the same thing, and say I think this would be the best course of action.

So again, a little more spin time, you start to draw 54 and then you compare Biomet to the Edison bucket six milliliters back. And one takes five versus the other and having 15 minutes.

So the limiting 60 Minutes is little more white let cells in the little bit more platelets.

So maybe a little more than a little more platelets, it's a little more white blood cells. So the question then is does the extra platelets and white blood cells make a clinical difference? Is there clinical difference between those, these are things you can look at.

Sign a heard me talk for nearly 2 hours, and I'm about 10 minutes early for where break was. I will Carla, do we have a 10 or 15 minute break?

And does the group want to just take the 10 or 15 minute break and then restart early or do you want to take a longer break?

We can get a 10 minute break,.

10 minute break? Is you get 10 minute break is just fine. So have to be back [Indiscernible].

All right. [Indiscernible multiple speakers]'s. So be back at the top of the hour. [Event on 10-minute break. Will reconvene at 3:00 PM EST. Captioner standing by.]

[Captioner standing by]

Everybody please answer the poll that is on the screen to make sure that we have everybody back in the room. You can also reply in the chat box. [Indiscernible].

Great. Thank you everybody. I hope you enjoyed your break. Here in Arizona it is now the beginning of lunchtime here so you're nearly the end of your day. I still have a long day too after this. I see you had a

question here about adding lidocaine plus arm minus [Indiscernible] mixed in with the PRP. I definitely use those all the time for local anesthetic. There is the, some discussion that perhaps those [Indiscernible] could [Indiscernible] the playlist. If they do is a positive or negative if you mix them together? And would that be more than minimum manipulation. I don't routinely mix them together. That means that you hear of people all the time , meaning all the time, if you ever picked up a sports page Wilson to ESPN, he is the, everybody that is heard in sports they go to James Andrew Forward second opinion. He routinely does steroid injections for PRP and makes after, no sense to me but he mixes [Indiscernible] simultaneously. No reason why he would do that, it doesn't make sense. But he does it. So people do it. We talk about platelet lysate if you wanted the lysate and like the places it may help it more but theoretically, use it for local and don't mix it together. I will go in if I'm doing a need I will numb up the area, denies switch off the syringe. If I'm getting into the joint itself it does some of the lidocaine to get in there. I'm trying to numb it up and enter into that joint capsule. Some probably did leak in. It is not like I mix get-together. I'm happy to share without trying to have any commercial by in. What I have used over the years. The good part is I use many different ones and from this standpoint, it is not like I'm talking about one company. I'm talking about several. When I first left the military and went to Georgetown and the national, we had [Indiscernible] and if you look at what we're doing from that sent point we had a two site which product which had lots of growth factors. And we do a lot of blood, 54 mL and it is fun for the good of the time, 50 minutes, for the most part outside of the patella tendon I would say that most people tolerate fairly well. For whatever reason it always aggregated the patella of front. 6 to 8 weeks later it was fine but they had more discomfort the first day. From there when I first got the mail in Arizona they were using ACP so quite interesting. To say the lease. That is definitely almost the end of the spectrum. On the lower end, the manufactured doesn't even classify it [Indiscernible]. That was determined by the orthopedic surgeons that were in the area but that is what they wanted, that had joined in sports before I get to go so there was one that did PRP and one that would researching PRP and he is the one that they did survey of the local area about what the normal products were and what the prices were that they said. They picked ACT and picked hello really low price and when I got here there's a lot of great providers in Mayo. Many of them have moved on to different positions. I have known all of them for years and I asked them what they're using but that is when Jacob shared that they had switched to [Indiscernible] based on their internal study that he presented at the AMS and his conferences before. And posterior Anna talk. And they were charging $1000 and we were charging 600 for using ACP and then [Indiscernible] to align with Rochester which change. At that time Jim was still there but he has moved on.

They asked if I can get Arizona to change the angel as well and that we would charge the same price so there will be no internal shopping because if there was a patient that goes to Mayo, if they were slide to Rochester or Jacksonville and they will pay for $1000 they didn't want to have any internal competition thing we are going to fly to Arizona if you will only charge of $600. It took a lot of negotiation with Orto and when, I

bought the machine because I was going to do it for PML anyhow. Ortho is still using ACP. I have no idea why. What they're treating athletes with ACP. There charging them $1000 now signed charging $1000, were charging $1000 for Angel and they were charging for ACP. I don't know if any of you use an angel or not but earlier in COVID-19 for five months Angel was off the market. They never said why. They just recalled all of their kids because we sent them emails and they have not gotten back to us. With anybody knows why they come off the market this is the second time in the last four years that they have done this. And in such time we had to find another system. I didn't want to use ACP because is the same company and thereby disclosing what was wrong with Angel I was in word with that. And then we had a couple different companies doing our paint department, Rochester said they were going to use two kits per patient and we started using regen because had two different kits , what is a leukocyte and when is a leukocyte rich kid. So we added in our Tempe location of ReGen kits. This is what you can get it. This is all the same price because there is only one billing code. And is all mapped the same. If you go to paint and get you’re getting [Indiscernible] and if you're going to PMR you will get Angel or you will get Regent lab to a safe. I'm still very, I am not restarting using because I would be emailing them twice and I need to hear the call before I order from them. With that we have, if you count ReGen as one depending on which clinic you walk into your getting five different PRP's which is not our goal. Thank you for adding that to be. I've asked and is to email them back to the rep and they were not replying back to her so I started email and they haven't gotten back to me either

Not disclosing leaves concern. And that is what I've been hoping on that. Will get back over to the topic. These are great questions and I'm glad to be able to answer them. Keep them coming and I will answer in the flow in the top if I can. I will be monitoring it before I skip over the slide.

The PRP is ready and how is it delivered? Read two different videos here. Showing the differences between, they're not very long about two minutes, 26 15. I was going to show how the manufacturer talk about the process between these two different ones here as a comparison. If I click on it to pop up for everybody to see. I can't remember how it was working.

Let me try to share my screen. I do have the sound. You don't had to hear them. I was talking about this as we are trying to go through. This is using usual regular lock trying to get the butterfly to draw the blood. Pretty easy. Quite user-friendly. It goes right to the portion you just plug in right to that end across the blood. 8 mL. You can get up to 10 but for the most part all you need is eight. Both the kits are the same thing all you have to do is prep it to use the portion of the bottom of the two. You turn it upside down five times and slide the lock back over the butterfly and dispose of it. You place it in the centrifuge. It spends for nine minutes and the patient's is pretty much ready to go. You can go at any different time but if you do it at 3400 you can go five minutes and spin it a little bit longer. That is the PCT kit and this is their ARP kit. What is leukocyte rich and the other is leukocyte work. From the point but you can get that separation. You can do that five up-

and-down and you get approximately 4 to 5 mL of concentrating PRT in the kit. And then you drive back out. That is a fairly large fire.

That was the one that is currently switch over to whether it is temporarily or not. It, the patients have been very, compared to the ones that are getting injured this is so much easier that I don't have to give so much blood and it is so much faster. Because we don't have to wait a half hour and if you click on [Indiscernible]

Give me one second I will have it ready the artworks Angel, one of the benefits, and delete this we talked about it. You can still use the same kit and syringe, the same machine for bone marrow and PRP. Also from that standpoint you had that ability to change, you have more flexibility of what you can do by modifying the setting. It is a lot more complicated so inserting that little into the canister. All you had to insert the tubing there and drape several different wires over the portion but definitely takes more training for your nursing and other allied health staff that it is set up correctly. Your time in it and put it in the syringe. It has a touchscreen. This is where you can do with the different settings so you can change what the default volume would be and what you want to set the hematocrit. Based on what Dr. Smith had gotten we set a standard what would change the protocol if you're doing a tendon and a ligament versus a joint from the standpoint. There's some variation that we would do. So you would put it in there with this and then he was set up the centrifuge with the whole blood with the ratio. You can take that syringe with the whole blood. Lot more volume. That is a huge amount of value compared to just giving a test tube up eight to 10. Then you eject that into the tubing. Once the machine will get turned on and momentarily you will see how that goes. Obviously test it. Does centrifuge the spending. Instead of having a test tubes is spinning through that so this is where you had the different settings. Return that dial. To get through the different centers. You go from the car team to the slide image. UCA is spinning in the canister. You can stop it there. It looks like it flows anywhere that was the entire intent of what we wanted to see their anyhow. You get that amount of PRP out. Approximately 6 mL. Even though you took 180 mL of fluid through your venipuncture of blood you only get six back can get about 4 to 5 most times. I have gotten six at the Regent lab. Is been good comparison the sample. Avidly the study will say different. At some point if I can get grant funding it would be great to do a prospective randomized and get randomized into the two different groups. Or if nothing else I can do a retrospective in looking at what this outcome is since the recall. And compare them with the ones free recall. A lot of variations.

The PRP is ready and how do you deliver it? Get it out and it depends on what setting you are in. But what you're trying to inject. It can be in the clinic, office, procedure room, it can also be an operating or surgery center. [Indiscernible. audio cutting out] are outside of the scope for the most part. I will touch on it. When I was doing some PRP I was doing that and the surgery center. [Indiscernible. audio cutting out] bit is because of the cash paid procedure. [Indiscernible. audio cutting out].

[Indiscernible. audio cutting out].

There some people doing the palpation pays. They're not trained and if it is not already the standard. Again the injection and palpation-based or landmark based for not using any imaging. There hoping that the body and Anna be is textbook and the needle would get right in there. No risk of exposure or radiation to yourself or the patient. It is portable you can get it covered to place over that to Kreis risk of infection. You have direct [Indiscernible] and you stop moving the needle and chased the program until you can see the needle tips so you get to the target. You can see life from the separate so the benefit of that. It is floral guarded [Audio disconnected please stand by while reconnecting]

Again I have used, placed the celiac joining. Two different images that I have so this is actually reference to myself. This is a publication. These are images from a publication that I had on compared the accuracy of also signed and needle placement that was confirmed the Roscoe P. Similar to a set I had now for the study. I placed the needle into the joint using ultrasound and we took the floral but did not show that the needle was in the joint had to move the when you kneel at all, both can be easily done. I do both all the time. And both are there. Most important thing is that whatever imaging that you use for imaging you feel most comfortable with. The ultimate goal is the appropriate delivery. What is considerations do you have. Advantages. It is not a lot of advantages so I will not spend a lot of time there. Ultrasound-guided you have [Indiscernible] you can see the joint but are you can see the muscle and limits it limits that you are passing. You can see the joint extremely well. It is harder the soft-tissue. I still will do, if ordered and done, I will do some [Indiscernible]. From that standpoint over all [Indiscernible] is hard to get the angle in the cleft of the gluteal lot with a soft tissue to get that really good visualization of the bursae. It can be really easy there. You don't have some [Indiscernible] but if you're used for doing 30 floral cases a week and you don't do as much ultrasound your visualization on fluoroscopy is superior at that point. It is whatever best for you to hit the target. What is the target?

We try joint, tendon, muscle, cartilage and berries on what we use. For the most part if it is a joint we can palpate to get in the joint fairly easy. It is a trigger finger and we do a lot of PRP for trigger figures but you can probably feel that palpable nodule pretty easily. Palpation's is pretty old tape for those. Ultrasound and fluoro for cartilage, you could use help patient for it. Ultrasound and fluoro and you see the joint and where the college would be in relation to the joint. You can see that differentiated for the cartilage and the bone. I would only use fluoro right now for disk. I use them for FI and for some [Indiscernible] particularly if it's going to be on the PRP site again otherwise I always use fluoro. Muscle, palpation and ultrasound. You cannot eat muscle while with fluoro. You know where the muscle would be but you don't exactly what part of the muscle you are in. Where the pathologies are treating the cotenants are the same for the most part. If you're at the tendon and you cannot see the needle is in the pathology or adjacent to the pathology or shallow same with the ligaments. W's for some of those. Looking at it from a different image for different body parts. And Achilles tendon and this is also an ankle joint. It could be a tailor joint. The Achilles is down at the bottom. If using ultrasound to look at the different aspects of getting the needle to the side of the pathology.

Prose procedural counseling. To meet this is when the most important things. Really telling your patient what they're reluctant right boundary should be. What to expect. Most of the time you're expecting it to be an immediate medical what they walk out and they are going to start playing professional football or tennis or become a marathon champion from the standpoint. You have to tell him that is going to be a long call process and it is going to take a little bit of time and I'm not focus on how fast you get better but more complete improvement from the standpoint. I advised for no I.C.E. I saved within the first two weeks I don't heavy direct studies showing that. You can probably save the platelet effect especially in the initial two weeks where you get that flowing. It will basil constrict and decrease blood flow. Up to two weeks probably not. I always tell, if you have discovered Tylenol. It doesn't have any antiplatelet effect. I tell them that activity modification or taking it easy. I keep it pretty specific as I can. At the same time I keep it fairly vague. Because everybody is different. I see people who, they are simply honest and if you tell that they cannot run for six to eight weeks they will not come back and see you ever again. Because they will say he has no idea what I do and it cannot stopped run it for six to eight weeks. I asked them what is your normal day or normal week for running. Let's negotiate. What you will be willing to go back down to and you are not giving it full rest. It might take longer. I know that your passion and money if that is what you have to do, they just go and walk the dog. I will say how long do you walk the dog? It might be one-mile or so that I walk and I think maybe instead of doing three one-mile walk maybe you can do a couple of 1/2 mile walks and see how you're doing and maybe at another one or two half mile walks with the dog. If your schedule allows them. It is like less is more type of ring. I would say if you need to go to the grocery store instead of being one out walking go and get the few things that you need. I don't really put any and braces are anything mobilizes. I don't put lower extremities of critters. The only one I really do would be bracing would be for Achilles tendon. Obviously if I am kneeling that area and it is already weekend the pathology I do put them in a walking. But no crutches or anything like that. Some people will give those crutches and put them in the immobilizer and go from there. I haven't seen any changes in outcome by doing that and all you can do is muscle atrophy. If they have a sleep I want to put it on they can. It is mostly a physical reminder that you have something done and it is a physical reminder to other people around you that you have something done or something is wrong with you. Also it traps heat. Heat will increase blood flow and [Indiscernible]. They don't have to go on by one but if they have one and they want to use it they can. If not an absolute requirement.

Activity, don't overdo it. You can do for slide stretching or formal therapy for two weeks. Not because they're better patients. All of my patients, are old, they have at least 10 to [Indiscernible]. If there something not going in the right direction somebody will call you back and say, I see you doing this. Should we stop or hold? I will took a look at them and they will let me know. That is why give them a little bit more of a green slide early because they are our professional patient and getting paid to be a patient to get better. And the team wants them to

get better ASAP. But it is usually 6 to 8 weeks of typical time frame for the most part. You can see that with a number of different studies.
In civilian practice and people have to pay a co-pay every time there are very few people that I tell them to start therapy. ICs don't start therapy for two week and if you want to need to or want to just send me a message and will check it out through the messaging system if we can. But negotiate what, if they want to get going and asked them to try to do this first and see how it goes. If that is okay you can take the next step and go from there.

Summary of PRP before we go on to bone marrow concentrate. PRP increases the proliferation of tendons, bone, muscle and cartilage and cells. The search is improving. I don't it is lacking. It is improving. There are still limitations of research. Initially they, clinical trials are increasing. There usually small sample sizes but now larger and longer studies are increasing. This is still a challenge but I think it is improving. There's no definition of what it standard preparation is what is being looked at. And there still has been up [Indiscernible] randomized controlled study. That is changing. I think we're moving in the right direction and I still encourage everybody who has interest in this field is to try to research it and that way we can get it offered for more of our patients now and in the future.

Moving onto bone marrow aspirate concentrate. Just like PRP it is meant for the same indication. This is where some people say that PRP is not released themselves and other people say that none of this is themselves. I include this slide with bone marrow because with people in their mind consider what a stem cell might be it makes more sense it is coming from bone marrow which is the, they are cells that have not decided what they do want to do in life yet. Whereas once you get them the perfect blood they're already out red or why blood cell or the.
They get to decide what they want to do when they grow up. They reduce inflammation. Our body helps us feel all the time with all of this with other injuries but whatever injury were treating now is not in the right cellular frame or by a mechanical advantage. The progenitor cells will be focused here on Romero but they could come from adipose and they can [Indiscernible] it just is. Embryonic stem cells is outside of the scope of what we will talk about today. It is still very controversial. There is one company that was supposed to have it two year [Indiscernible] FDA approval. It was dehydrated chorionic membrane. That two year has come and passed. And not heard anything specifically. Obviously COVID-19 has happened in the middle of all of that. I don't know if they have gotten an extension or if that turned into information or the FDA is still reviewing it. I have not heard it was pulled off the market so but I had not heard that it is been approved.

That is where that stands.

There is even more versatility for embryonic cells and bone marrow cells because it is earlier. Adult cells are more available and avoid the ethical and political issues associated with the embryonic cells. It is all stem cells, any parts of the body. We use for PRP, for regenerative medicine outside of PRP would be fat and bone marrow. I told you that there is a lot of challenges with that in many different places. If you

can get contingent to do your own life section you are in good shape. From the standpoint. I have not seen anybody use epithelial cells. They would be easier to harvest but I've never seen a study specifically looking at epithelial themselves. They are out there. I'm sure they can be done and harvested but I am not aware of it. Mostly there is much greater scrutiny at present. More controversy over them. There are a lot of places where the plastic surgeons don't want any non-surgeons to do up [Indiscernible]. Others willingly trained them so they say I don't want to do it and I think this is a good idea but I would rather use my time for something else. They will train somebody. And the amniotic fluid commercially available. There's one that was temporarily available and the question is how much does it work? And should, will we test people to see if they will respond based on, we don't know whose amniotic fluid it is, what disease process is the mother, child had or will have. And those are different things, it is not autonomous anymore. Is a different thing to do that? At a pious, adipose, you harvested it from the patient and typically cite would be the abdomen and flank via liposuction. You can develop that portion you break it up with that cells and get them out. It can be conformed, performed in conjunction to the rustic surgeon depending on your location and the certification. Some locations had been using enzymes as I told you before. And when they were doing cells with a warm and minimum manipulation and are they continuing or using a canister device that was shaken and break it down. Once it is broken down it will wreck through a center view’s and inject it. The biggest difference between all of these at the way you harvested it. Now the big line is the bone marrow. Typical sites you can do other sites but that is still the typical site. You still prep the bone marrow and use the centrifuge and you inject the site of injury. Not a lot of differences between that one and other ones we just talked about. The biggest difference was [Indiscernible]. Is harvesting. [Indiscernible] we have to get into the bone. And getting into bone is the heart of the cortex is more challenging. It is not just a venipuncture. When I do this I used to take out my ultrasound. I mark the boundaries of this area. I would mark and anesthetize over the PSI and I use a shooting needle. I don't use a mallet. I have not had to use a mallet. I have used it in [Indiscernible] just to practice it. I have never used a power drill. Have used in courses and watch other people use it. But usually the needle, you put a good bit of force down as you do a little bit of back-and-forth twist and turn clockwise and counterclockwise until you engage into the cortex. You do that little bit more and the feel the soft push through. That is what the cheating mules like. Some people will put in and was in and gauge it into the cortex they would tap into the top of that until it go in. It is like hitting a hammer on the nail. If you don't hit it flush and if you are angling it you can fracture the iliac. Actually. And the power drill, obviously a lot more, probably faster. If you had that in the wrong angle from the standpoint it could cause other problems. BMAC reparation and from here. After this one will pull up the video on that you to portion from it after this portion of the talk. BMAC preparation you get about 60 to 100 and milliliters. You use very large syringes and you’re aspirated out. It depends on how, if you’re treating a body part you are doing and going from there. The tips are company specific and the centrifuge this company specific. The one thing I mentioned earlier as I'm aware it is not the [Indiscernible] company doing. Our system does permit PRP and bone marrow with the same centrifuge. That does add that you don't have

to type two different such abuses but still by two different kits. If the company is giving you a centrifuge for free then it doesn't really matter if you use two different centrifuges. That is one of those different portions. This came out much smaller than when I come a lease from the screen I'm looking at.

We're looking at a statistical analysis of bone marrow through the different companies. And we are doing that you look at how many red blood cells, why blood cells, neutrophils, platelets and other factors that are in there. Most are looking at Angel. The different volumes and there is also smart prep as you go through there. I wanted to, pull the video for Carla. [Indiscernible]

We're looking here at the skeleton, he is indicating the approximately [Indiscernible] through PAL patients. You're going to be feeling the post iliac spine. I like getting out the ultrasound and measuring the boundaries. All you had to do a get a small mark pin and you fall off the edge and I try to stay right in the midline is much as I can and also give you the angel of where you're going so for the most part we risk , the spine looks like the skeleton in the textbook. You can get to see the celibate better once you start to visualize it before. Is absolutely necessary? No. Especially if you don't feel comfortable with ultrasound but for me it makes it a lot more, is already a procedure that the portion of the procedure that the patient is scared about. If you're able to mark the boundaries and you know that your unit and you are not spending extra time when they are already uncomfortable. It saves a lot of time and it gives the patient a lot more feeling of comfort. Here they will be showing it, how they will be doing it. It is similar to what we're talking about. Can see the PSI on the screen. That you see the spine process and they're going back and forth and get the SI joint. They can see that right PSI. If not showing it in a moment then I will use the marking pen and Mark on each side of the altar sign probe. By showing where the mark would be. If you're doing while you are like you can see a marking pen pushed down on the soft tissue. Now they are palpating it. The site have already skipped the marking portion. He is going to numb up over the area so he is palpating. I'd had to put my pen and fingers there. I put them off to the side. I numb. Writer with that. I them on numbing medicine because I know I cannot numb up the bone marrow and I know I cannot numb of the cortex of the bone. I want to numb up all of the soft tissue over there. I want to make it as comfortable as possible for them as they're going through this. [Indiscernible] Is a trenches in. You make a small incision. Mostly because you can [Indiscernible] and is serviced more slowly. You can make it cleaner incision right through there. He has some gauze in his hand and there's a little bit of leading. Once you contact the bone as he it down then you would put pressure in a downward angle towards the patient's anterior portion. Going from posterior to anterior. I do a little bit of a spinning clockwise and counterclockwise. Once I have engaged the cortex. You will fill it pop to that cortex and get into that soft area of the bone marrow. And you aspirate. From there you would insert it again to a different machine. This is Angel so they will use the same centrifuge. With a different tubing and the spin dial you can set up the text screen and going to the canister. You can stop the video here.

Thank you so much.

The worst fairly well with that but there different concentrations. Now that you have gotten it we don't have as much study like that nitty-gritty cellular components that you saw with the PRP. We don't have as many commercially available companies in terms of bone marrow comparatively. It is quite interesting that that they use the same one for both times. Same as we talked about before. Not much different. Placing a needle in the same spot and this is what I will talk about this for credentialing. If you are doing it injection and you use [Indiscernible] or corticosteroids or PRP as a procedural list they are exactly the same. It doesn't matter what and dictate is at that point. We're getting to other portions like injecting muscle or ligament and you're going to try to do some needling in that area then the type of pathology that you have and the tissue type that you have will significantly vary. That might be a different approach so if you are doing what tissue type and what pathology you're doing, palpation based is still possible. Always possible. I would infer that whenever possible if it is a more difficult target to always use imaging. But nobody would fault you if you did help patients for and it is relatively healthy individual who is getting right into the. You have easy landmarks that you should not be missing that. But nobody was also both you if you saw an ultrasound or some people there [Indiscernible]. I have been ordered that before so I have done them as well. You go from there. Ultrasound, use direct visualization and no radiation, it is portable, fluoro, it is that is your imaging of choice and you feel extremely comfortable with it and you are still trying to get that better understanding of also sign I would much rather fluoro. I would prefer that you use imaging guidance that you feel most comfortable with to hit the target. A little better radiation but for most things were not talking anything extreme. When you consider it in the spectrum of how many floor procedures we all do or are in the room four. Doing it for one of these is not going to be something that is going to make a significant change with radiation. Is always spit best to hit the target. Going by the different body parts any of the three options depending on the joint I still don't think you should ever be doing palpation base for hip. For the most part you could possibly [Indiscernible] but I don't advocate for that. [Indiscernible] is the same thing. I don't advocate more for [Indiscernible] but you could doper patient. I would rather do with ultrasound or fluoro. I do lots of ultrasonic but I would not ever try to get [Indiscernible] with an ultrasound. I would have to do a lot more before I get to that point. Muscle, palpation or muscle. I typically don't use it for muscle. I used to do it a lot with performance. Use the neuro stimulator and landmarks some point you took the fluoro and you went there in the area and you inject it and some contrast to see if you’re intramuscular. It can be done. I just don't as much anymore personally. There is still a lot of people that feel comfortable doing that. You keep doing what you are trained with and you’re most comfortable with two if you want to add more skills down the road just keep training for the other imaging guidance’s. Tenants usually do extremely well with ultrasound. There some tenant you can palpate. Incompatible with attending will be but you cannot palpate with the pathology. If I can see the Neil I feel much more comfortable on delivering it to the site that the patient needs it and the same with the ligament.

A couple of different images. Some of them seller or slightly different. And floor for body parts and overall there's a summary of the stem cells they can help with healing by differentiating the different cell sites. Right here this is the big talk that I normally have for people. Every single day I [Indiscernible]. And one of our two doctors that do regen. We have one that, he would rather do more on the spine side but also has an advance that is much. He doesn't feel as comfortable with the peripheral stuff so we get a lot more of the consult that is counter. Feel. I typically say that right now there hasn't been great had to head comparisons between PRP and bone marrow. Up until recently I said I would never aware of any. It is my understanding there was one that was referenced and I read part of the full article. I read the summary. Basically there was a slide difference on the positive side of bone marrow but it wasn't particularly significant. The conclusion was they were equally efficacious and superior to other patients. For the most part there are a lot more comfortable. I will tell a patient and it is more expensive. We charge $4500 of that. Compared to $1000. You can almost get [Indiscernible] that you can get four for the price of one. When I tell people is from the scientific standpoint if you think about it just think about the anticipated pathophysiology of how it may work. What is wrong and how this may work from a physiology standpoint to correct it. There undifferentiated cells. They don't know what they want to be when they grow up and they will be trained in that environment and it becomes the cells that they need to be. For me that is the one thing that keeps this as an option but until there has been more clear-cut clinical superior I think more people are still going to aim for PRP because it is less of a hit to the pocket.

I wrote on here tendon as a potential area. There are people that do tendons. It may work that way. There, because they are in different it sells I always will say particularly with people already have cell specific tendinitis, that from thought process I have never seen it actually reported specifically. I thought process if I'm putting bone marrow into attendant that we had to just remove calcium from a tendon and we out there undifferentiated cells I am always, saying that there's always a chance that we can get re-calcified in the area. I have no studies to back that on but if I'm taking bone marrow and putting it into attendant that already had calcium deposit there before I think the likelihood of more calcium either from what I've done or not and research into the area. I will usually tell people I would not advocate for the road for muscle or tenant because we know HON MO, and myositis happen all the time. I don't want it to be a complication from the doing bone morrow that someone paid $4500 for. I usually try to talk them out of it and it they are adamant about it I would rather than get it for me that somebody else that isn't going to think about that. And talk it out with them. That way at least I felt like I have prepared them for it. So if they leave and say he said, he will not give me what I wanted and I will go somewhere else. The other person may not have thought that or are looking for it. It doesn't mean it is wrong but that is my philosophy on it. I feel like I'm helping the patient more on that front. If they really wanted I would rather make sure they get it the right way.

That was a lot of the references that I have. We went a little bit fast. I, we didn't get to pull the one NVidia. It does give us a bit of time to have some questions and discussions.

What many of you have typed in some great questions at the bottom earlier and I will stay as long as we have questions I am happy to answer them. The first one has popped up.

A combination of ERP and amniotic.

I think it can work without a doubt I think individually whatever studies have already been done most of the amniotic fluid has been done by Alfred [Indiscernible]. A lot of the studies, he has several. The amniotic fluid has been shown to be effective in each of the studies that I have read that he has done. I have not aware of anybody combining temps of the system. It doesn't mean that it will not be done. My only thought is, if we're doing a blood transfusion or an organ transplant or giving you anything else from somebody else's body we always do a type of screen or any testing to see if you will have a rejection. I don't believe anybody is doing that for amniotic tissue. That is only think that is no longer [Indiscernible]. And I don't want to do any harm to the patient. I had to apply for grant that we did not get, I was going to study the amniotic fluid for your arthritis. One guided and one headed for something else. We did not get the grant and I decided to rewrite a different ground. We did not get it. And it COVID-19 happen. I plan on cementing the grant again at some point unless the FDA already takes it off the market before then. It hasn't yet so I'm hoping to do that study so people want to do a multicenter study and joint with me I would be happy to consider that too. It looks like hopefully I've answered your question. I think it would be reasonable to do it. A human host type.

I think it would be reasonable to do. If you are in a system that has it available and it is at no cost and you probably the patient I think it would be good. I think there are definitely some potential and APHIS for doing it together but- that is why we try to do things. If you're doing and it works for people you can write your case series. You can do three arms, PRP arm, amniotic fluid ARM and [Indiscernible].
Thanks for asking that.
RB and FDA pushback. Wondering if you run into any problems in the mail system. I haven't tried BMAC. Our ping line isn't doing any of the intricate studies right now. The people that we have in pain I am the one who was done [Indiscernible] out of the whole group. They were not too ready to jump forward with that more at this time. It doesn't mean it won't happen but they have not been BMAC. I would be interested in hearing what they were saying what was bad about it. It is a confined environment. My only concern would be BMAC would be falsified. [Indiscernible]. And never heard, [Indiscernible], along those lines but they are not into disco. I would not see anything wrong with it. I would be surprised that they are giving you respect. We have been using it for that. The only three of us that do that. Was safe between the two of us I am probably doing more than he
And probably more talking into PRP [Indiscernible. audio cutting out] who want to do BMAC.

That is a great question. What I usually tell the people is that I would always say I think they're both great. I've had good success with each. I would say the majority of the people, many people do well with PRP alone. However the majority of the people who went to BMAC had tried PRP. It may be felt a little bit better but they were not getting the results that they wanted to get so they wanted to go to BMAC. They're very few pages that go BMAC primary and mostly because of the cost. I was and I had three ReGen councils yesterday and all three of them said, date talk about [Indiscernible] and this is what we trade for [Indiscernible] but we usually had to do more of them. Where is there's been enough literature on PRP and BMAC they do well with the single injection. PRP is venipuncture. Is not hard to harvest. It is lower-cost and the BMAC is harder to harvest. A little bit more uncomfortable and it has a heftier price tag from that standpoint. I always used to say and say this now, I always use to say that I'm not aware of any study that shows 45 times better to justify the increase in price. It makes sense to use earlier cells. You are thinking of the philosophy that early and undifferentiated is better that will give me the best chance to heal than I would go into BMAC. If you're saying that they both work pretty well and I want to see how the blood work before I go to the more expensive option I would probably have, right before COVID-19 I had five or six people straight to Boehner. FSS some confessional athletes go to Boehner because they said I know so-and-so and he had three bone marrow injections into his AC joint. I want three of them for [Indiscernible]. That is not based on science but antidote of medicine. I had people come in and they say I know somebody who had prolotherapy and I will talk to them about everybody and they still say they want [Indiscernible] and they all had the MAC and they're doing great. I want BMAC and I talk to them about everything and is a great. I still want BMAC and that is what we do. Some people have already made the decision that they know what is going to be best for them to get treated. And I am not going to sway them and if I tell him I don't think they should get the MAC it will go to somebody else. I could, I feel more comfortable that I'm giving them the proper counseling and I can help guide them as best I can. I would say yes, it is usually PRP but I always tell the patient it is ultimately a call. I will never talk you into anything. I also say we're at Mayo and we are salaried. I told him that whether you decide to do this or not I am not going to get paid anything different. You guys had that in the military too. I said I don't care if you get PRP here are a few go back to Kansas and get it from your local provider. If you get it there instead of coming out to see me I am not offended. I'm glad you're getting it there because you will not have to fly back for therapy. I always say most important thing is you feel comfortable with the choice and you're not going to clearly make a decision that is going to be harmful for you.
If you're in the military system and it is no cost to the patient and you think that BMAC would be better I would definitely, their patients that it could be better for. Unfortunately I have to ask people for $4500.

A quick question about the therapy provided spend as much time on this mostly because I wanted to make sure, some consider it ReGen medicine. I don't go into much detail for. I usually used use [Indiscernible]. The volume would depend on the area and how this is the area is involved. If I'm doing sacroiliac joint usually the ratio is about the same. And using a 50 remix. I don't add [Indiscernible] but I know people who do. Other

people who use different than a 50-50 mix. Lipase and on different studies that I read earlier in my career and I thought it was excessive but those were consistent over a couple of different studies. I started using that and I was finding the most excessive. I continue with that mixture.
Anything else you want me to add on before I respond to Dr. Chang other question? Where is that good? I use 50% straight [Indiscernible]. There are times where I do another, I will mixed at 50% with either saline or lidocaine. What I do another 50%. If I sometimes I will get syringe and five but dextrose and five of 50% and 50 slide of slide owe.
For [Indiscernible] I would use the Sailing if I need to. I will use local anesthetic. Yes I have. I have only because I was part of a decision team for professional athletes. And one of the orthopedic surgeons who was a second, third or fourth opinion for the pro athlete set that is what he would do. That caught traction with the agent of that athlete and he convinced athlete that that is what they wanted to do. I said in general that it was a one-shot supplement instead of series of three. If you look at the literature there is a high risk of the [Indiscernible] if you use a company like [Indiscernible]. They have a higher incidence of [Indiscernible] in the one-shot compared to the three shot. That you are adding PRP which is a core inflammatory. The combination of the two quickly to, you would have a higher risk of reactive synovitis and I wouldn't necessarily do that and I cannot support it. On the conference call, I was told they did it to hundreds of people and [Indiscernible.] [Audio cutting out] and I said no. It would be great if you publish that and if we could have literature to support it. He said they would work on it. Is a preeminent orthopedic center in California? I will leave it at that. This athlete was a Washington. I drove in on a Saturday and did that. People were texting me because they would Artie relief, already released to the press and I said take news because I was driving in to do it so I had not been done yet. Low and behold just like I warned he had a reactive cenobite is and his swelled up significantly. We had to drain it and we went back and redid the PRP without the disc supplement. He is only when I did and the number one thing I complimented him on happen. And so on, I tell people that I prefer not to do it and realistically it gets complicated but none had to charge one for the insurance and one not for the insurance. Got to do two different procedure notes with two different business theoretically. What is covered and what is not covered. You, we 60 mL of fluid and reactive tendinitis and send it to lab. It was just inflammatory.
If you have any other questions that are in the chat box?
Thank you so much for your clarification.

Thank you everybody and I greatly appreciate being a part of this.

Thank you so much for attending. [Indiscernible]. Return it to us so you can get credit for the presentation today.
Thank you so much Dr. De Luigi.

Thank you, have a good day.

Goodbye.