

FDA CASE STUDY

→ A hip implant company uses regulatory pathways to speed to market

AN INNOVATIVE “ME-TOO” IDEA: PREMARKET NOTIFICATION—510(K) MEDICAL DEVICE SUBMISSIONS

THIS FICTIONALIZED CASE STUDY IS THE FOURTH IN AN EDUCATIONAL SERIES PUBLISHED BY THE U.S. FOOD AND DRUG ADMINISTRATION.

It was Thursday, and Dr. Paul D. Develop couldn't wait for Tuesday to come around again. The Vice President of Product Development at MSO, Inc., a medium-sized orthopedic company, had just gotten off the phone with his counterpart in Regulatory Affairs, Dr. Stan Laws.

“Stan!” Dr. Develop had rushed soon after Dr. Laws had answered the phone. “Do you recall our previous discussion about a new line of hip implants? Well, I have a couple of new “Me-Too” product ideas I think will increase our market share in the hip implant business. My team has gathered sufficient market data to support my ideas, and we’re ready to work with your team immediately on preparing those 510(k)s—the premarket notification submissions—for the Food and Drug Administration (FDA).”

“Really?” Dr. Laws responded, surprised at his colleague’s swiftness. “Your team was able to gather all of the information we talked about? A rationale as to why these products are substantially equivalent, including a clear

description of their intended use; indication for use statements; and device description (technological characteristics) comparisons to predicate devices?”

“Yes, yes,” Dr. Develop responded hurriedly. “We have all of that information prepared for your review.”

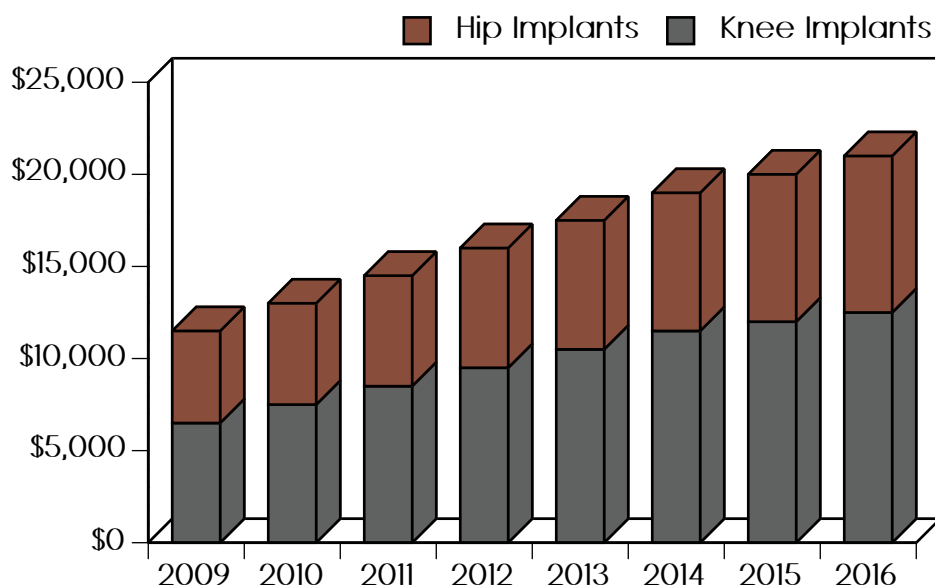
“Well, okay then!” Dr. Laws smiled. “Let’s set up a meeting to discuss the details of how we can obtain clearance through the 510(k) process before marketing a new medical device. I can’t wait to hear more about your ideas! How about we all meet next Tuesday afternoon?”

“Great! Let’s do it,” Dr. Develop confirmed.

The Meeting

On Tuesday, Dr. Develop’s Research and Development (R&D) team and Dr. Laws’ Regulatory staff gathered in the company conference room.

GLOBAL HIP AND KNEE IMPLANT MARKETS, (\$M), 2009–2016



Source: GlobalData. (August 2010) “Hip and Knee Implants—Global Pipeline Analysis, Opportunity Assessment, and Market Forecasts to 2016.”

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“As you all know,” Dr. Develp began, “MSO has been looking for a way to compete with the dominant leaders in the hip implant industry. A 2010 Global Data research report estimated the global hip and knee implant market would grow at an 8 percent Compound Annual Growth Rate to reach almost \$22 billion by 2016. The hip implants market was forecasted to grow at 6 percent to attain \$8.7 billion in 2016 (see graph above).

“To be successful in this market, MSO needs to have a breakthrough in product development and a speedy market penetration. To that end, today I’d like to discuss some new product ideas my team and I have come up with, as well as ways we can further develop the two-prong strategy I believe is necessary to make these products commercially successful: product differentiation and speed-to-market.

Dr. Develp turned to Dr. Laws. “Where I will need your help and the expertise of your regulatory team, Dr. Laws, is in determining a **regulatory path** we can use to market these new products quickly and effectively.”

Dr. Laws nodded. “Okay, let’s hear your ideas first.”

A New MSO Hip Implant

Dr. Develp pulled up some slides on the projector screen. “As you know, hip implants are medical devices intended to restore mobility and

relieve pain usually associated with arthritis and other hip diseases or injuries (see Figure 1). Every hip implant has a distinct set of benefits and risks. The key design features of each implant, such as size, materials, and dimensions, make each system unique. In addition, the same hip implant system will have different outcomes in different patients. Another important factor to recognize is the lifespan of the hip implant because they may need to be replaced. Factors that influence the longevity of the device include the patient’s age, sex, weight, diagnosis, activity level, conditions of the surgery, and the type of implant chosen (see Figure 2 on page 4).

The top hip and knee implant manufacturers have cultivated the belief that these surgeries can restore close to normal joint function. The latest technological advancements in minimally invasive surgical procedures, novel materials leading to better performance and enhanced durability, and advanced designs of joint stability and functionality have made these implants attractive to more and younger adults—particularly those who want to maintain an active lifestyle.

“One of MSO, Inc.’s business priorities is to find ways to expand our market shares by providing better product quality and reliability. We have considered focusing our development efforts to target certain

patient populations. Creating a gender-specific hip implant was one of our first considerations; however, we abandoned a strategy to address women’s hip implants because we couldn’t find a precedent or any relevant demographic data. We’d want to avoid over-generalization and being too far-reaching in our gender-specific claims, and any gender-specific correlation would be difficult and complicated to achieve. The level of data required to support such a claim would be significantly high and the time required for clinical study would be much longer than what we want to pursue.

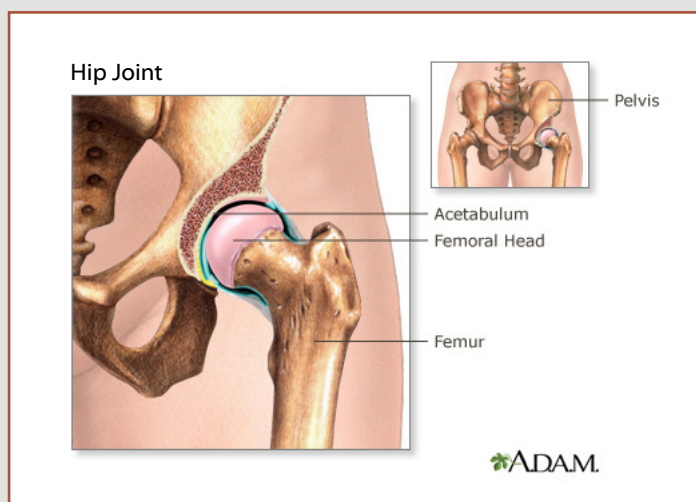
“We have also identified a new chemistry for an alloy. We thought this new material would be a good fit for a new femoral neck and stem (see Figure 3 on page 11). However, further literature research has shown that there is very little knowledge about any toxic or injurious effects on human tissues resulting from the use of this material. If we wanted to use it, we would need to investigate the immune response by the human body to the material. A large battery of **in vitro** tests according to some recognized standard (usually the **International Organization for Standardization [ISO] 10993** or similar acceptable standards) would need to be carried out for biocompatibility testing. It is highly likely we’d have to use this new material to do animal and human studies to identify any adverse reactions or safety concerns.

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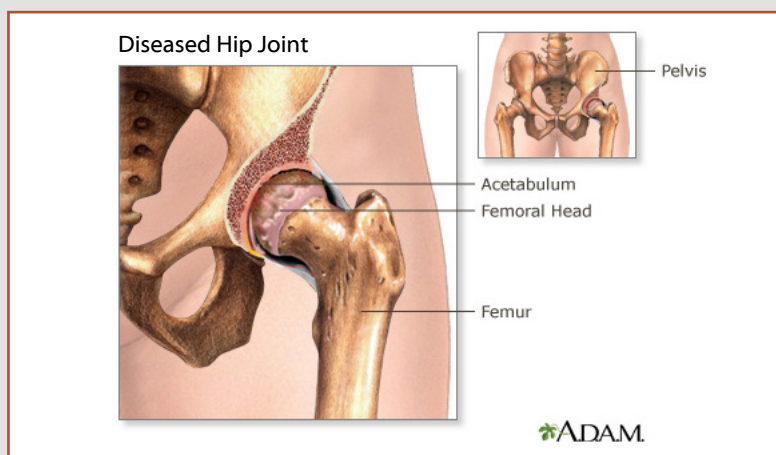
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→ FIGURE 1: THE HIP JOINT

The hip joint is a ball-and-socket joint. The ball portion of the hip joint (femoral head) fits into the socket (acetabulum) of the hip bone (pelvis). The bone of the femoral head and the acetabulum of the pelvis are separated by spongy material (cartilage) and by a sac of fluid (synovial fluid), both of which serve to lubricate the joint. A properly functioning hip joint is critical for normal everyday activities such as walking, running, and climbing.



The cartilage or bones that make up the hip joint can deteriorate for a variety of reasons, leading to pain, stiffness, or difficulty walking. Painful hip conditions can be treated in several ways including physical therapy, exercise, and medications. When a patient’s symptoms do not respond to these treatments, an orthopedist may recommend traditional hip replacement surgery or hip resurfacing surgery.



Source: FDA. (2013). “The Hip Joint.” Available at: <http://www.fda.gov/MedicalDevices/ProductsandMedicalProcedures/ImplantsandProsthetics/MetalonMetalHipImplants/ucm241593.htm>

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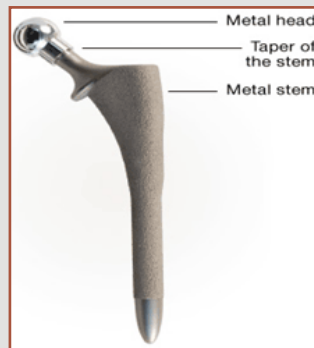
FIGURE 2: HIP IMPLANTS

In the United States, there are currently five types of total hip replacement devices available with different bearing surfaces:

- Metal-on-Polyethylene: The ball is made of metal and the socket is made of plastic (polyethylene) or has a plastic lining.
- Ceramic-on-Polyethylene: The ball is made of ceramic and the socket is made of plastic (polyethylene) or has a plastic lining.
- Metal-on-Metal: The ball and socket are both made of metal.
- Ceramic-on-Ceramic: The ball is made of ceramic and the socket has a ceramic lining.
- Ceramic-on-Metal: The ball is made of ceramic and the socket has a metal lining.

An orthopedic surgeon should determine which hip implant will offer the most benefit and least risk for each patient. When making a recommendation, orthopedic surgeons should consider several factors such as the patient's age, weight, height, activity level, and cause of hip pain. Hip surgery may involve total hip replacement or resurfacing.

During total hip replacement surgery, the damaged portions of the hip joint are removed. The ball (femoral head) is removed and replaced with a prosthetic ball made of metal or ceramic, and the socket (acetabulum) is removed and replaced with a prosthetic cup. The cup consists of one or two components made of metal, ceramic, or plastic. A stem



is also placed in the femur to support the femoral head. The femoral head attaches to the taper of the stem.

Hip surgery, like any medical procedure, carries risks. The risks of surgery include reaction to the anesthesia, heart attack, wound infection, excessive bleeding, and blood clots. There may be adverse events after surgery, regardless of the type of hip system implanted, including:

- Hip dislocation: when the ball of the thighbone (femur) slips out of its socket in the hip bone (pelvis)
- Bone fracture
- Joint infection
- Local nerve damage with numbness/weakness
- Device loosening or breakage
- Difference in leg lengths
- Bone loss (osteolysis)

Patients who have hip implants should be aware of potential symptoms that may occur 3 or more months after surgery that may indicate that their device is not functioning properly. Symptoms may include:

- Pain in the groin, hip, or leg
- Swelling at or near the hip joint
- A limp or change in walking ability
- Noise (popping, grinding, clicking, or squeaking) from the hip joint

Depending on the severity of the adverse event(s), additional surgery may be necessary. Many of the recommendations, warnings, and contraindications outlined here are from manufacturers' labeling.

Source: FDA. (2013). "Hip Implants". Available at <http://www.fda.gov/MedicalDevices/ProductsandMedicalProcedures/ImplantsandProsthetics/MetalonMetalHipImplants/ucm241594.htm>

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We decided to postpone these efforts as well until we had the resources available to us to proceed.

“Instead, we shifted our product development focus to rely on the strength of our own technological improvements. As you know, Dr. Laws, most of our **devices** are covered under section 510(k) of the **Food, Drug, and Cosmetic Act (FD&C) Act**, also called the **Premarket Notification**, or 510(k). We must submit a new 510(k) to the FDA for market **clearance** before we can sell. The FDA decides whether the device is substantially equivalent (SE) to one or more legally marketed predicate devices, and then we can go to market. The other track available to us is a **Premarket Approval (PMA)** application. However, from what you’ve told me in the past, this is a much more intensive process necessary for a new bearing surface material or other significant change in technology. For this round of device development, we tried to make it simple, easy, and less burdensome than some of our other improvement efforts.”

Dr. Laws was curious. “What are your ideas? Are there any new attributes or components that you have modified or improved upon in our current products?”

“We are piggy backing on one of our own existing line of products!” said Dr. Develp. “Every technological aspect of this new hip implant will remain the same as in one of our current product lines, except we’re focusing on a specific patient

MEETING AGENDA

1. Define intended use/indication for use
2. Identify predicate device(s)
3. Demonstrate SE
 - a. Examine technological characteristics
 - b. Compare performance

population and adding an additional size.”

“Okay, hold that thought for a few minutes,” Dr. Laws interrupted. “Now that we know what direction you are going in with this new device, let me introduce the agenda we should follow for the rest of our meeting.” Dr. Laws passed around two printouts.

“For the rest of this meeting, we’ll need to focus on how to establish that the new implant is SE to a predicate,” said Dr. Laws. “Our initial step will be to determine the new implant’s **intended use** and **indication for use**. This information will be part of the **device labeling**. Then, we have to identify the relevant predicate device that has the same intended use as the new implant.

“A predicate,” he continued to explain to the R&D staff, “is a legally marketed device, as described in 21 **CFR** Part 807.92(a)(3), that:

1. Was legally marketed prior to May 28, 1976, for which a PMA is not required;

2. Has been reclassified from **Class III to Class II or I**; or

3. Has been found SE through the 510(k) process.

The legally marketed device used for the purpose of determining SE is commonly referred to as the ‘predicate’ device. Section 513(i) of the FD&C Act states that for a new device to be considered SE to a predicate device, the new device must have the same intended use and technological characteristics. If the new technological characteristics differ, they should not raise different questions of safety and effectiveness than the predicate device. You must have at least one predicate that can make it through the critical decision points in the 510(k) decision making process (intended use and technological characteristics), and then do a comparison to the most applicable predicate(s).

“After identifying the the most relevant predicate(s), our next step will be to demonstrate SE, usually by examining the technological characteristics of

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the new and predicate device(s). This may involve comparing performance data or evaluating these characteristics by testing and comparing results. We will go through all of these details as described in the decision process illustrated in the second handout I gave you after the most relevant predicate(s) is identified” (See Table 2).

Determining Substantial Equivalence

“Okay Paul,” said Dr. Laws, “tell us more about this new hip implant system. You mentioned you’ll be piggy backing off of one of our current device systems, so I’m assuming you have identified the most relevant predicate(s) for the new implant?”

“Our current hip implant system on the market is intended for use in total hip replacement for reduction of pain and improved hip function in skeletally mature patients,” Dr. Develp replied. “The system indicates the following uses:

- non-inflammatory degenerative joint disease such as painful hip dysplasia
- inflammatory degenerative joint disease such as rheumatoid arthritis
- correction of functional deformity
- revision procedures where other treatments or devices have failed

These descriptive statements are typical for hip implant replacement devices.

“Building on this indication statement, our first idea for the new hip implant system is product differentiation. Specifically, we propose adding a few more words to the indication for use statement to distinguish our product from others. No new materials or components have been introduced to this implant! My team was able to drastically improve the femoral head and neck corrosion resistance.

Corrosion is likely to occur inside the taper connection after a prolonged period of implantation. Fretting corrosion, which is most associated with these types of implants, occurs at the interface between contacting, highly-loaded metal surfaces when subjected to slight vibratory motions. It can be greatly reduced when the contacting surfaces are well lubricated or separated by corrosion inhibitors, such as other non-metal materials or protective coatings. Corrosion resistant design should always be practiced for implants because the by-products of corrosion may exist as micro particles or become toxic to the surrounding tissues—a sure path to implant failure. For the new implant, we utilized the same materials but used a different treatment process to help reduce this corrosion.

“We also used a similar neck design with only dimensional adjustments in the taper angle for the mating of

the head and the neck. With these improvements, we have the data we need to support a new product line that will last much longer—we can demonstrate 10 to 15 years longer—than our existing products.”

Dr. Laws looked concerned, “What are the words that you want to add to the indication for use statement?”

Dr. Develp answered, “We’d like to add ‘who have an active lifestyle’ after ‘skeletally mature patients’.”

Dr. Laws responded quickly, “Paul, I’m afraid that you won’t be able to get the device quickly to the market if you do that! By adding those words, you are proposing a potential change in the intended use or indication for use because you are targeting a different patient population. FDA will consider it a new product that raises new issues of safety and effectiveness even though the heat treatment process is the only change. At a minimum, you would have to provide clinical data to support your target population that has an active lifestyle. The agency may also consider it a PMA device, which would mean a much more extensive and time consuming approval process.”

Dr. Develp tried to defend his product differentiation idea, “Stan, we can be certain that our new product is significantly more durable and lasts much longer! We have already compared our data to that of a few competitive devices.

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The comparisons are statistically significant and show that our new hip implant is much better!”

“FDA’s 510(k) clearance process only focuses on the demonstration of SE, not better or superior performance,” Dr. Laws explained.

Dr. Develop appeared disappointed, “I see. Well, if that is the case, we’ll move on to our second idea. I’ll find time to discuss with you the details of how to pursue this new indication via the shortest **regulatory path** at later date.

“Our second strategy, ‘speed-to-market’, is very simple. We will use this same hip implant system that we have marketed, but we’ll add a smaller femoral head to meet a clinical need as shown in the predicate device comparison table (see Table 1).

“Here, you can see both devices listed. We have compared the new implant with its predicate for intended use, indication for use, method of sterilization, design, and materials used. All other attributes

of the femoral head are exactly the same as in the product family.”

“Good!” Dr. Laws said. “I think we’re getting somewhere with this idea. Let’s follow the decision-making process outlined in the handout I gave you earlier to determine whether your new product idea is SE (see Table 2).

“Essentially, we have already gone through *Step 1: Is product a device?* and *Step 2: Is the device subject to 510(k)?* Clearly, this new implant

TABLE 1. EXAMPLES OF PREDICATE DEVICES COMPARISON

| Component / Characteristics | MSO Hip Joint (510[k]# TBD) | Predicate Hip Joint (510[k]# e.g., K13XXXX*) | Comments |
|-----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|
| Intended Use | ✓ Intended for use in total hip replacement for reduction of pain and improved hip function in skeletally mature patients. | ✓ Intended for use in total hip replacement for reduction of pain and improved hip function in skeletally mature patients. | N/A |
| Indications for Use | <ul style="list-style-type: none"> ✓ Non-inflammatory degenerative joint disease such as painful hip dysplasia ✓ Inflammatory degenerative joint disease such as rheumatoid arthritis ✓ Correction of functional deformity ✓ Revision procedures where other treatments or devices have failed | <ul style="list-style-type: none"> ✓ Non-inflammatory degenerative joint disease such as painful hip dysplasia ✓ Inflammatory degenerative joint disease such as rheumatoid arthritis ✓ Correction of functional deformity ✓ Revision procedures where other treatments or devices have failed | N/A |
| Sterility | Gamma irradiation | Gamma irradiation | N/A |
| Design | 22 mm | 28 mm, 32 mm, 36 mm | Added smallest head into the family |
| Materials | Bilox Forte manufactured by CeramTec | Bilox Forte manufactured by CeramTec | N/A |

Note: This table is simplified for illustration purposes; further details may be found by searching FDA’s medical device databases.

*K represents 510(k); first two digits represent the year of submission; last four digits are the queuing number of the submission.

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TABLE 2. 510(K) “SUBSTANTIAL EQUIVALENCE” DECISION-MAKING PROCESS

| Step | Description | YES | NO | Next Step |
|------|-----------------------------------------------------------------------------------------|-----|----|----------------------------------------------------|
| 1 | Is the product a device? | ✓ | | If YES = Go to next step If NO = Stop |
| 2 | Is the device subject to 510(k)? | ✓ | | If YES = Go to next step If NO = Stop |
| 3 | Does the new device have the same indication statement as the predicate? | ✓ | | If YES = Go to 5 If NO = Go to next step |
| 4 | Do differences in the indication statement raise new issues of safety or effectiveness? | | | If YES = Stop ➔ NSE If NO = Go to next step |
| 5 | Does the new device have the same technological characteristics as the predicate? | | ✓ | If YES = Go to 7 If NO = Go to next step |
| 6 | Could the new technological characteristics affect safety or effectiveness? | ✓ | | If YES = Go to 8 If NO = Go to next step |
| 7 | Are the descriptive characteristics precise enough to ensure equivalence? | | | If YES = Stop ➔ SE If NO = Go to 10 |
| 8 | Are there any new types of safety or effectiveness questions? | | ✓ | If YES = Stop ➔ NSE If NO = Go to next step |
| 9 | Are there any accepted scientific methods that exist? | ✓ | | If YES = Go to next step If NO = Stop ➔ NSE |
| 10 | Are performance data available? | | ✓ | If YES = Go to next step If NO = Request Data |
| 11 | Do the data demonstrate equivalence? | | | If YES = Final decision ➔ SE If NO = Stop ➔ NSE |

SE = Substantial Equivalent; NSE = Not Substantial Equivalent

is a medical device and we believe it is subject to 510(k). Now for *Step 3: Does the device have the same indication statement as the predicate?* Yes, I accept what you have just presented in the predicate device comparison table.

The next step is to evaluate technological characteristics of the new implant. *Step 5: Does the new implant have the same technological characteristics as the predicate device(s)?*

Dr. Develop responded, “Yes! There are no new characteristics. As you

can see from the predicate device comparison, this new femoral head is identifiable with three others in the same family that are on the market. So the next step in the process is seven, right?”

Dr. Laws had a different perspective, “Well, you are introducing the smallest head into this hip implant family. It has a different ball size and that is a different technological characteristic. Therefore, we have to go to Step 6, not Step 7. *Step 6 is, could the new technological characteristics affect safety or effectiveness?*”

“Yes,” Dr. Develop replied. “This new 22 mm femoral head will become the smallest size in the family and that could affect safety or effectiveness.”

Dr. Laws continued, “So, we go to *Step 8: Are there any new types of safety or effectiveness questions?*” Dr. Develop considered this. “Well, the 22 mm femoral head is exactly the same as the predicates with the exception of the femoral head size. So there are no new types of safety or effectiveness questions outside

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of those established for the other implants.”

Dr. Laws responded, “Okay, then on to *Step 9: Do accepted scientific methods exist for assessing effects of the new characteristics? These methods may include validation or test methods for material fatigue, hardness, or others.*”

Dr. Develp looked less burdened, “Yes, of course! Our team has evaluated the design and materials used for the new femoral head. The femoral heads are all identical except for the diameters. We can use the same validation and test methods used for the predicate femoral heads in sizes 28 mm, 32 mm, and 36 mm. There is definitely no new type of concern about safety and effectiveness!”

Dr. Laws was puzzled, “You truly believe they are identical? How did your team evaluate the new femoral head?”

“We have searched the literature thoroughly and examined our experimental data files, but we have not done any bench testing yet.”

Dr. Laws continued to probe for the R&D team’s current evaluation efforts, “That means we are stuck at *Step 10: Are performance data available?* You don’t have data that is specific enough to ensure equivalence. To be sure, your team will have to develop a comprehensive test plan to assess equivalence and the worst case scenario that can occur with this

size femoral head. Once you’ve gathered it, my team will examine the adequacy of the performance data much like an FDA review team will assess your 510(k) submission. Providing performance data that demonstrate equivalence in the regulatory submission is a necessary step in the 510(k) clearance process.”

Taking a look at the clock, Dr. Laws decided it might be a good time to take a break. “Why don’t we take a quick break for lunch and reconvene in an hour or so? I’d like to discuss some things with my team about the next steps to take in this process, and this would be a good time for you to speak with your staff and gather any questions you may have for us.”

Demonstrating SE through Testing

After the break, Dr. Laws passed around another handout to Dr. Develp’s R&D team. “To continue from where we left off, my team and I have prepared a summary guideline on the requirements for nonclinical testing information for the 510(k) submission (see Table 3). “This table summarizes some major nonclinical testing requirements for the new device to get the data that the R&D team will need to address *Step 10*. The testing requirements include sterility, biocompatibility, fatigue properties, modular connections, fretting and corrosion testing of the femoral stem, mechanical testing on the ball

design, and labeling. It will be the R&D team’s responsibility to first analyze the risks of the device, then determine which activities would be appropriate for the performance testing (*Step 9* in the SE decision-making process) of our device in comparison with its predicates to the same recommended standards. A predicate’s 510(k) summary of performance information, national and international standards (e.g., American Society for Testing and Materials [ASTM International] and FDA recognized standards), and FDA guidance may be used as benchmarks for testing.

“Be mindful that FDA may request clinical data for a 510(k) submission when nonclinical testing methods cannot replicate the way the device will be used or the way the predicates have been demonstrated to fail in a clinical setting; clinical data can also be requested if there is a significant difference between the subject and predicate devices in either indications or technology. Moreover, don’t forget to gather shelf life data for the device packaging. Your team needs to provide data to support the label claims on the device package such as an expiration date, storage environment, transportation conditions, and other performance information.”

“Thank you! This is very helpful!” Dr. Develp replied. “Are there any other regulatory principles, guidelines, or personal insights of

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your own that you believe my team should be aware of?”

“Since you asked,” said Dr. Laws, “let me give you my recommendations:

1. A ceramic ball must be compatible with the stem used. Labeling for the new ball is an important part of your project. The labeling must state that the ball will be used only with stems labeled for use with the ball.
2. Ceramic heads are perceived as having greater risks (femoral head fracture) and must be closely evaluated. Your team must be thorough and comprehensive in planning all the nonclinical testing.
3. The results of any **Finite Element Analysis (FEA)** must be

validated by actual testing of the subject device. The results of the mechanical testing should be compared to the performance of the predicate device.

4. You must provide testing and a scientific rationale to demonstrate that the ceramic heads have adequate burst strength. We must also present data that include the comparisons of material, taper angle, length, diameter, straightness, surface roughness, and length of ball/cone overlap.
5. All test protocols must be validated and include predetermined acceptance criteria. They must be officially approved by MSO management before the start of any testing. Any retroactive amendment of

the test protocol after the test has begun must be justified and approved.

6. You must provide justification or scientific rationale as to the acceptability of any test results that include out-of-specification data, failure data, outliers, or any other unexpected results.

“These recommendations are based on my experience and are not exhaustive,” warned Dr. Laws. “FDA reviewers may have their own regulatory perspectives.”

Preparation of a 510(k) Submission

Dr. Laws went on to explain the 510(k) submission requirements. “My regulatory team will follow

TABLE 3. NON-CLINICAL TESTING METHODS AND RECOMMENDED STANDARDS FOR FEMORAL HEAD

| Areas of Concern | Test Methods /Conditions | Recommended Standards |
|----------------------------------------------|----------------------------------------------------------------|-------------------------------------------------------------------------------------------|
| Design optimization, etc. | Finite Element Analysis (FEA) | Computer models must be validated with experimental tests |
| Compressive loads (static) | > 5 balls loaded axially in compression to failure | ISO 7206-5 |
| Axial pull-off loads | > 5 balls at 2kN preload | MSO should develop standard operating procedure |
| Sterility | Sterility Assurance Level (SAL) of at least 1x10 ⁻⁶ | 510(k) Sterility Review Guidance |
| Biocompatibility | See ISO Std 10993-1. | ISO 10993-1 |
| Modular connections, fretting, and corrosion | See FDA Guidance on testing non-articulating components. | FDA Guidance: Testing Non-Articulating, “Mechanically Locked,” Modular Implant Components |

Note: This table is for illustration purposes only. For testing details, please refer to relevant FDA Guidance Documents and ISO and ASTM International standards.

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FDA’s suggested premarket notification submission format (see Appendix). We’ll need information from your team after they produce the performance data and other evidence of SE to complete the process. However, we don’t have to wait until everything is completed for the regulatory team to begin writing for the submission. We can begin as long as we have the appropriate information needed to complete a specific section.

“One more tip for your team,” Dr. Laws cautioned, “please exclude any

enhanced claims in the intended use or indication for use statements (e.g., *‘who have an active lifestyle’*) or any statements of performance (e.g., *‘femoral head features to enhance better angular movement’*) in the device labeling because they are considered by the agency to be performance claims.”

“Thank you for all the tips!” said Dr. Develp. “We will divide up our team to gather the information needed to complete each of the required sections and send it to you as soon as we can.”

Conclusion

“Excellent,” Dr. Laws replied. “To wrap up the major points of this meeting, we discussed your new “Me-Too” product idea, a new femoral head to be added to one of our existing hip implant families. We have gone over its intended use and indication for use statement, examined the steps on how to determine SE, and touched on biocompatibility due to material

→ FIGURE 3: HIP IMPLANT SYSTEM DESIGN

The durability or longevity of a hip implant is highly dependent a patient’s age, sex, weight, prognosis, activity level, and conditions of the surgery. An orthopedic surgeon, with the help of the manufacturer’s product expert, will consider these factors when choosing a design to fit a patient’s unique anatomical requirements. The design features include methods of fixation, dimensions, and materials used.

A typical hip implant system consists of acetabular and femoral components. A hip implant system design can be a combination of the size (e.g., ball diameter, stem length), material (e.g., metal, ceramic, plastic), and physical design (e.g., neck angle, neck taper, method of fixation: cemented or un-cemented).

- Acetabular components: usually have a cup-like metal alloy shell with an alloy or polyethylene (plastic) insert or liner.
- Femoral components: usually fabricated with a ball-like head to be fitted with a tapered neck that is detachable.
 - Femoral head: can be metal or ceramic.
 - Neck and stem: usually made of a metal alloy.

HIP IMPLANT COMPONENTS

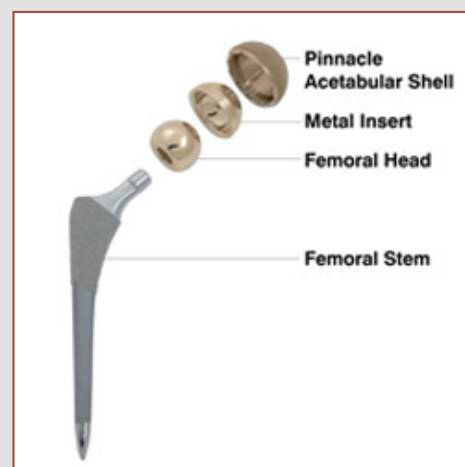


Image Source: Healthbase.com. “Johnson & Johnson DePuy Hip Replacement Implants.”

Available at: <http://www.healthbase.com/resources/orthopedics/total-hip-replacement-surgery-implants/depu-hip-replacement-implants-medical-tourism-affordable-india-asr-xl-pinnacle-corail-summit-s-rom.html>

AN INNOVATIVE “ME-TOO” IDEA: PREMARKET NOTIFICATION—510(K) MEDICAL DEVICE SUBMISSIONS CONTINUED

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| | | |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| change and some details of bench testing. Your team will need to address labeling and provide sterilization and shelf life data. This covers the major sections of a 510(k) submission. | data to demonstrate that the new 22 mm femoral head is SE to the other heads in the MSO hip implant family?” | months; fulfilling Step 11 of the SE decision-making process (<i>Do the data demonstrate equivalence?</i>).” |
| “When do you think the R&D team could provide the Regulatory team with all the necessary performance | Dr. Develp responded confidently, “Our team will complete all the performance testing and provide you with the data needed to demonstrate equivalence in 2 | “We look forward to receiving it,” Dr. Laws smiled. Both teams left the meeting feeling informed and confident about their newest collaboration efforts. They were ready to tackle this new submission. |

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APPENDIX: SECTIONS RECOMMENDED IN A 510(K) SUBMISSION

ELEMENTS OF A COMPLETE SUBMISSION FOR TRADITIONAL/ABBREVIATED PREMARKET NOTIFICATION 510(K) SUBMISSIONS BASED ON GUIDANCE FOR INDUSTRY AND FDA STAFF (RTA ITEMS)

| Title | Related Information | Yes | No | N/A |
|----------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|----|-----|
| MDUFMA Cover Sheet | Medical Device User Fee Cover Sheet Premarket Notification [510(k)] Review Fees | | | |
| CDRH Premarket Review Submission Cover Sheet or 510 (k) Cover Letter | CDRH Premarket Review Submission Cover Sheet (Form 3514) | | | |
| Indications for Use Statement | Device Advice "Content of a 510(k)" | | | |
| 510(k) Summary or 510(k) Statement | Device Advice "Content of a 510(k)" 510(k) RTA Policy for 510(K) Guidance Summary Checklist | | | |
| Truthful and Accuracy Statement | Device Advice “Content of a 510(k)” | | | |
| Class III Summary and Certification | Class III Summary and Certification Form | | | |
| Financial Certification or Disclosure Statement | FORM FDA 3454, Certification: Financial Interests and Arrangements of Clinical Investigators FORM FDA 3455, Disclosure: Financial Interests and Arrangements of Clinical Investigators Financial Disclosure by Clinical Investigators | | | |

AN INNOVATIVE “ME-TOO” IDEA: PREMARKET NOTIFICATION—510(K) MEDICAL DEVICE SUBMISSIONS CONTINUED



APPENDIX: SECTIONS RECOMMENDED IN A 510(K) SUBMISSION CONTINUED

| Title | Related Information | Yes | No | N/A |
|----------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|----|-----|
| Declarations of Conformity and Summary Reports (Abbreviated 510(k)s) | Use of Standards in Substantial Equivalence Determinations FDA Standards program Declaration of conformity Required Elements for Declaration of Conformity to Recognized Standard | | | |
| Proposed Labeling | Device Advice “Content of a 510(k)” | | | |
| Prior Submissions Identified for the Same Device | Provide submission numbers for Pre-Submission, IDE, prior NSE determination, prior 510(k) deleted or withdrawn. http://www.fda.gov/downloads/MedicalDevices/DeviceRegulationandGuidance/GuidanceDocuments/UCM311176.pdf http://www.fda.gov/medicaldevices/deviceregulationandguidance/databases/default.htm | | | |
| Device Description | Device Advice “Content of a 510(k)” | | | |
| Substantial Equivalence Discussion | Guidance on the CDRH Premarket Notification Review Program 6/30/86 (K86-3) | | | |
| Sterilization and Shelf Life | Updated 510(k) Sterility Review Guidance (K90-1) For reuse of single use devices, see Guidance for Industry and FDA Staff – Medical Device User Fee and Modernization Act of 2002 Validation Data in Premarket Notification Submissions (510(k)s) for Reprocessed Single-Use Medical Devices | | | |
| Biocompatibility | FDA Blue Book Memo, G95-1, Use of International Standard ISO-10993, “Biological Evaluation of Medical Devices Part 1: Evaluation and Testing” | | | |
| Software | Guidance for the Content of Premarket Submissions for Software Contained in Medical Devices | | | |
| Electromagnetic Compatibility/Electrical Safety | CDRH Medical Device Electromagnetic Compatibility Program See also IEC 60601-1- 2 Medical Electrical Equipment -- Part 1: General Requirements for Safety; Electromagnetic Compatibility -- Requirements and Tests (Second Edition, 2001) | | | |

Note: Related information for the 510(k) submission elements can be found on the Device Advice: Comprehensive Regulatory Assistance web page at: <http://www.fda.gov/MedicalDevices/DeviceRegulationandGuidance/default.htm>

AN INNOVATIVE “ME-TOO” IDEA: PREMARKET NOTIFICATION—510(K) MEDICAL DEVICE SUBMISSIONS CONTINUED



APPENDIX: SECTIONS RECOMMENDED IN A 510(K) SUBMISSION CONTINUED

| Title | Related Information | Yes | No | N/A |
|------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|----|-----|
| Performance Data - General (Bench, Animal, and Clinical Testing) | Device Advice “Content of a 510(k)” | | | |
| FORM FDA 3654, Standards Data Report for 510(k)s | Standards Data Report Form—Form 3654 No standard used— No Standards Form Required Declaration of Conformity— Yes Standards Form Required Standard but no declaration— Yes Standards Form Required | | | |
| Kit Certification | Device Advice | | | |

Notes: In the instances that clinical data may be required to support a 510(k) submission, the sponsor must comply with the Investigational Device Exemption (IDE) regulations if device is a significant risk device, requires an IDE, and the study is conducted in United States (21 CFR Part 812). In addition, such investigations must comply with the regulations governing institutional review boards (21 CFR Part 56) and informed consent (21 CFR Parts 50 and 54).

The “Refuse to Accept checklist and guidance” is what FDA currently uses to determine if a 510(k) is administratively complete. Please refer to the guidance for details. Available at: <http://www.fda.gov/downloads/MedicalDevices/DeviceRegulationandGuidance/GuidanceDocuments/UCM315014.pdf>

Source: FDA. (2013). “Guidance for Industry and FDA Staff: Format for Traditional and Abbreviated 510(k)s.” Available at: <http://www.fda.gov/MedicalDevices/DeviceRegulationandGuidance/GuidanceDocuments/ucm084365.htm>



GLOSSARY

American Society for Testing and Materials (ASTM International): An international standards organization that develops and publishes voluntary consensus technical standards for a wide range of materials, products, systems, and services.

Approval: Approval of a medical device must be obtained from the FDA by demonstrating that the device is reasonably safe and effective, and that the benefits outweigh the risks for the intended patient population before it can be put into commerce.

Clearance: Clearance of a medical device must be obtained from the FDA by demonstrating substantial equivalence (SE) to its predicate device(s) before it is put into commerce.

Clinical Investigation: A systematic investigation conducted to evaluate the safety and effectiveness of a medical device using human subjects or specimens.

Code of Federal Regulation (CFR): The Code of Federal Regulations (CFR) is the codification of the general and permanent rules and regulations (sometimes called administrative law) published in the Federal Register by the executive departments and agencies of the federal government of the United States. The CFR is published by the Office of the Federal Register, an agency of the National Archives and Records Administration (NARA), and is divided into 50 titles that represent broad areas subject to Federal regulation.

AN INNOVATIVE “ME-TOO” IDEA: PREMARKET NOTIFICATION—510(K) MEDICAL DEVICE SUBMISSIONS CONTINUED

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Device Classification: The FDA has established classifications for approximately 1,700 different generic types of devices and grouped them into 16 medical specialties referred to as panels. Each of these generic types of devices is assigned to one of three regulatory classes based on the level of control necessary to assure the safety and effectiveness of the device. The three classes and the requirements which apply to them are:

Device Class and Regulatory Controls:

1. Class I General Controls
 - With Exemptions
 - Without Exemptions
2. Class II General Controls and Special Controls
 - With Exemptions
 - Without Exemptions
3. Class III General Controls and Premarket Approval

Device Labeling: “Labeling” includes all labels and other written, printed, or graphic matter (1) upon any article or any of its containers or wrappers, or (2) accompanying such article [section 201(m).], such as safety and effectiveness considerations, indication for use, contraindications, warnings, precautions, special patient populations, adverse reactions, prescription devices, restricted devices, and patient information.

Federal Food, Drug, and Cosmetic Act (FD&C Act): This is a set of laws passed by Congress in 1938 giving authority to the FDA to oversee the safety of food, drugs, and cosmetics. The Act has been amended many times, most recently to add requirements about bioterrorism preparations and user fees.

Finite Element Analysis (FEA): A type of computer program that uses the finite element method to analyze an object and determine how applied loads or environmental conditions will affect the material or design of the object. FEA can help determine points of weakness in a design before it is manufactured.

FEA tools are being used more widely with the spread of more powerful computers, but are still mainly used in aerospace and other traditional engineering applications. The analysis is done by creating a mesh of points in the shape of the object. Each point contains information about the material of the object. In addition to determining the reaction to a load or some environmental condition, FEA can also analyze the effect of vibrations, acoustics, fatigue, heat transfer, and electromagnetism.

In vitro: Outside the living body and in an artificial environment.

In vivo: In the living body of a plant or animal.

Indication for Use: The term “Indication for Use” describes the disease or condition the device will diagnose, treat, prevent, cure, or mitigate, including a description of the patient population for which the device is intended.

Intended Use/Purpose: Intended use means the general purpose of the device—or what the device does—and encompasses the indications for use. It is the use for which a product, process or service is intended according to the specifications, instructions, and information provided by the manufacturer.

International Organization for Standardization (ISO): An international standard-setting body composed of representatives from various national standards organizations. Founded on February 23, 1947, the organization promulgates worldwide proprietary, industrial, and commercial standards. It has its headquarters in Geneva, Switzerland.

Investigational Device Exemption (IDE): IDE refers to the regulations under 21 CFR Part 812. A regulatory submission to study a medical device in human subjects. IDEs are only required for studies performed in the United States. An IDE allows an investigational device to be used in a clinical study to collect the safety

AN INNOVATIVE “ME-TOO” IDEA: PREMARKET NOTIFICATION—510(K)
MEDICAL DEVICE SUBMISSIONS CONTINUED

and effectiveness data required for a marketing application. An approved IDE means that the IRB (and FDA for significant risk devices) has approved a sponsor’s study application.

Medical Device: An instrument, apparatus, implement, machine, contrivance, implant, in vitro reagent, or other similar or related article, including any component, part, or accessory that is the following:

- 1. Recognized in the official National Formulary, the United States Pharmacopeia, or any supplement to them.
- 2. Intended for use in the diagnosis of disease or other conditions, or in the cure, mitigation, treatment, or prevention of disease in man or other animals.
- 3. Intended to affect the structure or any function of the body of man or other animals.
- 4. Does not achieve its primary intended purposes through chemical action within or on the body of man or other animals and which is not dependent upon being metabolized for the achievement of its primary intended purposes (Section 201[h] of the FD&C Act).

Predicate Device: A legally marketed device to which a new device may be compared for a determination regarding substantial equivalence because the devices have the same intended use and the same technological characteristics or different technological characteristics that do not raise different questions of safety and effectiveness.

Premarket Approval (PMA): The FDA process of scientific and regulatory review to evaluate the safety and effectiveness of Class III medical devices. Any Premarket Approval application for a Class III medical device, including all information submitted with or incorporated by reference therein (21 CFR Part 814.3). Class III devices are those that cannot be classified as Class I or Class II devices because insufficient information exists to determine that general and special controls are sufficient to provide reasonable assurance of the safety and effectiveness of the device, and either (1) are purported to be for

a use in supporting or sustaining human life or for a use which is of substantial importance in preventing impairment of human health; or (2) present a potential unreasonable risk of illness or injury.

Premarket Notification—510(k) Clearance: Section 510(k) of the FD&C Act requires device manufacturers, who must register, to notify FDA of their intent to market a medical device at least 90 days in advance. This is known as premarket notification—also called PMN or 510(k). This allows FDA to determine whether the device in question is equivalent to a device already placed into Class I, Class II, or Class III requiring 510(k), or a legally marketed preamendment device. Thus, “new” devices (not in commercial distribution prior to May 28, 1976) that have not been classified can be properly identified. Specifically, medical device manufacturers are required to submit a premarket notification if they intend to introduce a device into commercial distribution for the first time or reintroduce a device that will be significantly changed or modified to the extent that its safety or effectiveness could be affected. Such change or modification could relate to the design, material, chemical composition, energy source, manufacturing process, or intended use.

Regulatory Pathways: Before a medical device can be put into the U.S. market, manufacturers of medical devices have to submit evidence to demonstrate product safety and effectiveness to the Office of Device Evaluation (ODE) and to the Office of In Vitro Diagnostics and Radiological Health (OIR) of the Center for Devices and Radiological Health (CDRH) at FDA. There are various submission processes and applications for evaluation. PMA, PMA Supplement, Product Development Protocol (PDP), Humanitarian Device Exemption (HDE), IDE, IDE Amendment, IDE Supplement, and 510(k) are programs administered by ODE and OIR. These programs are also called regulatory pathways.

Sponsor: An individual, company, institution, or organization that takes responsibility for the initiation, management, and/or financing of a clinical trial.

AN INNOVATIVE “ME-TOO” IDEA: PREMARKET NOTIFICATION—510(K) MEDICAL DEVICE SUBMISSIONS CONTINUED



STUDENT ACTIVITIES

SESSION 1

I. Review the following materials before Session 1:

1. CDRH Learn Videos

- a. Overview of Regulatory Requirements: Medical Devices

(Approximately 30 minutes)

<http://fda.yorkcast.com/webcast/Viewer/?peid=040308365ec8405bad39b06de8561bdc1d>

- b. Premarket Notification Process—510(k)
(Approximately 1 hour)

<http://fda.yorkcast.com/webcast/Viewer/?peid=f59814465f674e59a19f3b61c6880ea81d>

<http://fda.yorkcast.com/webcast/Viewer/?peid=e0ea02ad4f0c4532a98fa9406caa01d0>

<http://fda.yorkcast.com/webcast/Viewer/?peid=2360fdf6adf7468aaebd0431ffd76ace>

2. Hip Implant Videos

- a. Explanation of Different Hip Implant Designs

(Approximately 5 minutes)

<http://www.youtube.com/watch?v=k-QOqOayBUQ>

- b. Hip Replacement Surgery: PreOp Patient Education

(Approximately 6 minutes)

<http://www.youtube.com/watch?v=YsVln5JaCmc>

- c. Total Hip Replacement Surgery: Animation Video

(Approximately 2 minutes)

<http://www.youtube.com/watch?v=YrSmlwNWAmQ>

3. Mandatory Reading

Note: Draft guidance is subject to change and is not for implementation.

- a. The 510(k) Program: Evaluating Substantial Equivalence in Premarket Notifications

<http://www.fda.gov/downloads/MedicalDevices/DeviceRegulationandGuidance/GuidanceDocuments/UCM284443.pdf>

- b. “Substantial Equivalence” (SE) Decision-making Documentation

<http://www.fda.gov/downloads/MedicalDevices/DeviceRegulationandGuidance/GuidanceDocuments/ucm082205.pdf>

4. Optional Reading

Note: Draft guidance is subject to change and not for implementation

- a. General/Specific Intended Use

<http://www.fda.gov/downloads/MedicalDevices/DeviceRegulationandGuidance/GuidanceDocuments/ucm073945>

- b. Use of Standards in Substantial Equivalence Determinations

<http://www.fda.gov/downloads/MedicalDevices/DeviceRegulationandGuidance/GuidanceDocuments/ucm073756.pdf>

II. Answer the following questions before Session 1—Fundamental concepts:

- 1. Describe the intended use of the 22 mm femoral head.

<http://www.fda.gov/downloads/MedicalDevices/DeviceRegulationandGuidance/GuidanceDocuments/ucm073945.pdf>

AN INNOVATIVE “ME-TOO” IDEA: PREMARKET NOTIFICATION—510(K) MEDICAL DEVICE SUBMISSIONS CONTINUED

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2. How do you justify that the premarket notification, 510(k), submission is the correct regulatory pathway for the 22 mm femoral head?

<http://www.fda.gov/MedicalDevices/DeviceRegulationandGuidance/HowtoMarketYourDevice/PremarketSubmissions/PremarketNotification510k/default.htm>

III. Additional references

1. The Federal Food, Drug, and Cosmetic (FD&C) Act:

<http://www.fda.gov/RegulatoryInformation/Legislation/FederalFoodDrugandCosmeticActFDCA/default.htm>

2. Sub Chapter II – Definitions § 321. Definitions [p. 32, paragraph (h)]:

<http://www.gpo.gov/fdsys/pkg/USCODE-2010-title21/pdf/USCODE-2010-title21-chap9-subchapII-sec321.pdf>

SESSION 2

I. Review the following materials before Session 2:

1. Hip Replacement Surgery Videos

Warning: The following videos present live surgical operations and contain graphic images that may be disturbing to some viewers. Viewer discretion is advised.

- a. Total Hip Replacement Video Part 1
(Approximately 5 minutes)

<http://www.youtube.com/watch?v=lh2UX8gQnBM>

- b. Total Hip Replacement Video Part 2
(Approximately 5 minutes)

<http://www.youtube.com/watch?v=YFQ7haTbN0g>

2. Mandatory Reading

Note: Draft guidance is subject to change and is not for implementation.

- a. The Preparation of Premarket Notification for Ceramic Ball Hip Systems

<http://www.fda.gov/downloads/MedicalDevices/DeviceRegulationandGuidance/GuidanceDocuments/ucm080786.pdf>

- b. Submission and Review of Sterility Information in Premarket Notification [510(k)] Submissions for Devices Labeled as Sterile

<http://www.fda.gov/downloads/MedicalDevices/DeviceRegulationandGuidance/GuidanceDocuments/ucm072790.pdf>

3. Optional Reading

- a. Nonclinical Information for Femoral Stem Prostheses

<http://www.fda.gov/downloads/MedicalDevices/DeviceRegulationandGuidance/GuidanceDocuments/ucm075223.pdf>

II. Questions for in-class discussion (instructor guidance required)

1. Using the Table 2 format in the case study, discuss the SE decision-making process for each scenario:

- a. A porous coating on the tibial baseplate of a knee system is a well-understood technology in other orthopedic implants. One company's 510(k) submission proposes applying the same coating to a subject femoral stem for biologic fixation purposes. Additional tests are performed to demonstrate that the coating is fit for the intended fixation. Testing should be performed according to the modified metallic surface guidance document:

<http://www.fda.gov/downloads/MedicalDevices/DeviceRegulationandGuidance/GuidanceDocuments/ucm081247.pdf>

AN INNOVATIVE “ME-TOO” IDEA: PREMARKET NOTIFICATION—510(K) MEDICAL DEVICE SUBMISSIONS CONTINUED

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- b. A 510(k) submission proposes introducing a new bone screw with a larger diameter into a company’s product line. All materials and processes used in manufacturing are the same.
- c. A different alumina matrix composite material has been used to create a ceramic femoral head similar to the alumina BIOLOX forte. This new BIOLOX forte composite material is not a well-understood technology. A 510(k) submission proposes using the new material to create a ceramic femoral head prosthesis like the BIOLOX forte. Additional tests are performed and different failure modes are identified.

II. In-class group discussion

Dr. Develp has decided to pursue his product development strategies for MSO, Inc. He divided his research and development group into four teams to help him develop a hip implant system for patients who have an active lifestyle:

- 1. **Team Alloy (Team A)** is responsible for addressing the biocompatibility concerns associated with using a new treatment chemistry process for the alloy used in the new femoral neck and stem. The team may discuss other concerns such as fatigue strength etc., if time allows.
- 2. **Team Claim (Team B)** is responsible for developing the product claim by addressing patients “who have an active lifestyle” in the indications for use statement. Students in this group should think in detail about the intended population (age, level of everyday activity, etc.).

- 3. **Team Corrosion (Team C)** is responsible for discussing corrosion in the implant (how corrosion would impact patient health and possible solutions). Students should refer to ASTM International standards for guidance: ASTM F1875-98(2009) Standard Practice for Fretting Corrosion Testing of Modular Implant Interfaces: Hip Femoral Head-Bore and Cone Taper Interface

<http://www.astm.org/Standards/F1875.htm>

III. Additional references:

Note: Draft guidance is subject to change and is not for implementation.

- 1. Biological Evaluation of Medical Devices Part 1: Evaluation and Testing
<http://www.fda.gov/downloads/MedicalDevices/DeviceRegulationandGuidance/GuidanceDocuments/UCM348890.pdf>
- 2. Clinical Data Presentations for Orthopedic Device Applications
<http://www.fda.gov/downloads/MedicalDevices/DeviceRegulationandGuidance/GuidanceDocuments/ucm072283.pdf>
- 3. ISO 21535 Non-Active Surgical Implants—Joint replacement implants —Specific requirements for hip-joint replacement implants

AN INNOVATIVE “ME-TOO” IDEA: PREMARKET NOTIFICATION—510(K) MEDICAL DEVICE SUBMISSIONS CONTINUED

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SESSION 3: STUDENT PROJECT AND PRESENTATION

I. Review the following materials before beginning the project:

1. Product example: Accolade®
 - a. System Brochure
<http://www.gkqcw.com/admin/uppic/023525.pdf>
 - b. Accolade® System Surgical Technique
<http://www.emmersivemedia.com/pdf/SurgicalGuideAccoladeII.pdf>
2. Safety and Effectiveness Summary examples
 - a. PBP Total Hip System Summary of Safety and Effectiveness
http://www.accessdata.fda.gov/cdrh_docs/pdf12/K122158.pdf

This is an example of a total hip system Safety and Effectiveness Summary. It provides descriptions of what has been completed to fulfill the 510(k) performance testing requirements on femoral stems and heads, and acetabular shells and liners.
 - b. Orthocon Absorbable Hemostatic Bone Putty Summary of Safety and Effectiveness
http://www.accessdata.fda.gov/cdrh_docs/pdf12/K122156.pdf

This brief example of a 510(k) Summary of Safety and Effectiveness discusses bone putty.
 - c. Accolade® II Hip Stem 510(k) Summary of Safety and Effectiveness
http://www.accessdata.fda.gov/cdrh_docs/pdf12/K120578.pdf

This resource provides a brief overview of a 510(k) Summary of Safety and Effectiveness for a femoral hip stem.

3. Refuse to Accept Policy for 510(k)s: Elements for a Complete Submission

<http://www.fda.gov/downloads/medicaldevices/deviceregulationandguidance/guidancedocuments/ucm315014.pdf>

II. 510(k) Submission Team Project

Note: This project may be used to satisfy in part a senior or graduate project, or other special academic requirement.

After reviewing the materials above, choose option A or B for your project:

A. Based on your in class group discussion, prepare the following sections of a 510(k) submission for the MSO hip implant:

➤ Indication for Use Statement

Refer to “Statement of Indications for Use” section:

<http://www.fda.gov/MedicalDevices/DeviceRegulationandGuidance/GuidanceDocuments/ucm080275.htm>

To access the IFU form, use the following link:

<http://www.fda.gov/downloads/AboutFDA/ReportsManualsForms/Forms/UCM360431.pdf>

➤ Device Description

See Chapter II, Section 11 of “Guidance for Industry and FDA Staff Format for Traditional and Abbreviated 510(k)s updated November 17, 2005” document:

<http://www.fda.gov/downloads/MedicalDevices/DeviceRegulationandGuidance/GuidanceDocuments/ucm084396.pdf>

AN INNOVATIVE “ME-TOO” IDEA: PREMARKET NOTIFICATION—510(K) MEDICAL DEVICE SUBMISSIONS CONTINUED

- Substantial Equivalence Discussion
(describe how your team would follow the steps in Table 2)

Refer to “Guidance on the CDRH Premarket Notification Review Program 6/30/86 (K86-3)” document:

<http://www.fda.gov/MedicalDevices/DeviceRegulationandGuidance/GuidanceDocuments/ucm081383.htm>

And one of the following sections:

- Biocompatibility

Note: Draft guidance is subject to change and is not for implementation.

<http://www.fda.gov/downloads/MedicalDevices/DeviceRegulationandGuidance/GuidanceDocuments/UCM348890.pdf>

- Performance Testing – Bench

See Chapter II, Section 18 of “Guidance for Industry and FDA Staff Format for Traditional and Abbreviated 510(k)s”

- Performance Testing – Animal

See Chapter II, Section 19 of “Guidance for Industry and FDA Staff Format for Traditional and Abbreviated 510(k)s”

- Performance Testing – Clinical

See Chapter II, Section 20 of “Guidance for Industry and FDA Staff: Clinical Data Presentations for Orthopedic Device Applications”:

<http://www.fda.gov/MedicalDevices/DeviceRegulationandGuidance/GuidanceDocuments/ucm072263.htm>

- B. Using the prompts above, prepare four sections of a 510(k) submission for a medical device design project or a medical device prototype of your choice.

III. Additional references

Note: Draft guidance is subject to change and is not for implementation.

1. Biological Evaluation of Medical Devices Part 1: Evaluation and Testing

<http://www.fda.gov/downloads/MedicalDevices/DeviceRegulationandGuidance/GuidanceDocuments/UCM348890.pdf>

2. FDA Decisions for Investigational Device Exemption (IDE) Clinical Investigation

<http://www.fda.gov/downloads/MedicalDevices/DeviceRegulationandGuidance/GuidanceDocuments/UCM279107.pdf>

3. Information on Premarket Approval (PMA)

<http://www.fda.gov/MedicalDevices/DeviceRegulationandGuidance/HowtoMarketYourDevice/PremarketSubmissions/PremarketApprovalPMA/default.htm>