CooperSurgical

95 Corporate Drive
Trumbull, CT 06611
(203) 601-5200
FAX (203) 601-4740

August 18, 2005

Document Mail Center, HFZ-401
Office of Device Evaluation
515(i) Submission
Center for Devices and Radiological Health
9200 Corporate Boulevard
Rockville, MD 20850

RECLASSIFICATION PETITION – MUA

Dear Madam or Sir,

At this time CooperSurgical, Inc. would like to petition for the reclassification of **P990016** McCue CUBAClinical™ Utrasonic Bone Sonometry System. Under the provisions of 515(i) Reclassification Letter to Manufacturers, April 30, 1998, and with reference to the provisions of the Safe Medical Devices Act of 1990 (SMDA) we respectfully submit and seek your consideration for reclassification for Product Code: "MUA", within the Medical Specialty: Radiology [but no reference to corresponding Section 892 of 21 CFR] **from Class III, PMA - to Class II - 510(k)**. Enclosed you will find a summary of information supporting this petition, updated safety and effectiveness data, and a review of Adverse Events as compiled in the FDA – MAUDE database.

Note – FDA acknowledged transfer of ownership of PMA P990016 on March 8, 2004 from McCue, Plc. (FDA Est. Registration #9617153) to CooperSurgical, Inc. (FDA Est. Registration # 1216677 - Owner/Operator #9002384).

Similar clinical practice is performed utilizing Ultrasound and X-Ray Densitometers available on the market as Class II, 510(k) devices.

Therefore, and following FDA suggested format for reclassification, CooperSurgical, Inc. petitions for:

Reclassification Request for P990016,
CUBAClinical Ultrasound Bone Sonometry System
with CUBA^{plus+} V4.2.1 Software

2005P-0431

CCP1

I. Description of Device:

The McCue CUBAClinical Ultrasonic Bone Sonometry System performs quantitative ultrasound (QUS) measurement of the calcaneus by passing non-audible, high frequency sound waves through the heel. The System is small, lightweight (10 Kg), and portable. It plugs into a "Hospital Grade" GROUNDED power outlet. Ultrasound measurements are performed with the patient seated, and the foot positioned and secured. Use of Foot Positioning Inserts is determined by patient foot size.

After patient's foot is secured, using Velcro® straps, and coupling gel is applied, a pair of silicone elastomer covered transducer heads are brought into contact with opposite sides of the patient's heel using low power stepper motors. One transducer transmits the sound waves and the other, on the opposite side of the patient's heel, receives the sound waves. The results are then analyzed and displayed on the screen of the computer. The ultrasound power levels used by the CUBAClinical are lower than the limits for standard imaging ultrasound devices set forth in the 1997 FDA Guidance Document, "Information for Manufacturers Seeking Marketing Clearance of Diagnostic Ultrasound Systems and Transducers".

A. Description of Device in Detail:

1) System Components

The McCue CUBAClinical Ultrasonic Bone Sonometry System consists of the following components: CUBAClinical Unit with carrying case, the serial cable, the power cable, the hybrid phantom for routine quality assurance testing (in its own carrying case), the User Manual, a set of Foot Positioning Inserts, the CUBA^{plus+} V4.2.1 software on one 3.5" diskette (1.44 MB diskette), and ultrasound coupling gel. Additional equipment necessary for operation includes a user-supplied desktop or portable computer (PC) with display and printer.

2) System Operation

The McCue CUBAClinical is controlled by push buttons on the unit and by a user-supplied PC. Operator instructions and results are displayed on the screen of the PC. A hard copy printout of measurement results can be obtained using the user-supplied printer. The printout reports the subject's BUA, T-Score, Z-Score, and as a percent expected value (age matched-%exp). In addition, the printout displays the patient's results graphically. Additional information entered in the patient record is the patient identification information and demographic information, i.e., age, sex, etc.

For measurement, the operator applies ultrasound-coupling gel to the patient's heel. The patient then places the designated foot into the footwell. Labels inside the footwell indicate if and which size Foot Positioning Insert should be used. Once the foot is positioned, the operator secures the calf into position with the

Velcro® straps and activates the transducers by pushing a button. Following a settling period of 30 seconds, the CUBAClinical takes a minimum of three separate readings of BUA and providing that they are within a defined tolerance, the mean value is calculated and reported as the result. Results are displayed on the PC screen, retained on hard disk, and are available for printing.

The McCue CUBAClinical is provided non-sterile and is not intended to be sterilized. The User Manual provides instructions for post-use decontamination. The System is indicated for use with intact skin only. Low-level disinfection using hospital-grade solutions is recommended.

3) Principles of Operation

For ultrasonic measurements of the calcaneus (the heel bone), the CUBAClinical uses two ultrasound transducers: one as the transmitter, and one as the receiver. The measurement provided by the CUBAClinical, broadband ultrasound attenuation (BUA) is defined as the slope (dB/MHz) between attenuation (dB) and frequency, typically between 0.2 MHz and 0.6 MHz.

VOS (velocity of sound, in m/s) is used in the QA test with the Phantom. For calculation of VOS, a linear transducer measures the distance between the two-ultrasound transducers. Transit time is calculated from the point source of the ultrasound signal to the leading edge of its detection with adjustment for the transit time through the transducer faceplates and the silicone pads.

B. <u>Description of Range of Devices that should be Included in this Reclassification</u>:

There is only one CooperSurgical marketed model affected under this request – CUBAClinical Mk2.6 with Software CUBA^{Plus+} V4.2.1, running on a Windows Operating System. However, the range of devices that should be considered in the reclassification is the other seven (7) devices with Product Code MUA, PMA approvals, as follows:

Trade Name	Applicant	PMA #	Notice Date
1.) Osteospace	Medilink	P010058	03/15/2004
2.) UBIS 5000 Bone Sonometer	Diagnostic Medical Systems	P000055	07/17/2001
3.) DTU-ONE Ultrasound Scanner	Osteometer Meditech, Inc.	P980010	09/19/2000
4.) Sunlight Omnisense Sonometer	Sunlight Ultrasound Tech LTD.	P990035	01/20/2000
5.) Achilles Express Ultrasonometer	GE Lunar Corporation	P970040	06/26/1998
6.) Myriad Ultrasound	Myriad Ultrasound Systems LTD.	P970026	05/29/1998
7.) Sahara Clinical Bone Sonometer	Hologic, Inc.	P970017	03/12/1998

Also see **Appendix I** - Similar Devices with Approval / Clearance.

C. Intended Use of the Device:

The intended use of the McCue CUBAClinical Ultrasonic Bone Sonometry System is to perform a quantitative ultrasound measurement of the calcaneus (heel bone), the results of which can be used in conjunction with other clinical risk factors as an aid for the diagnosis of osteoporosis and other medical conditions leading to reduced bone density and, ultimately for the determination of fracture risk.

The CUBAClinical measures two parameters, Broadband Ultrasound Attenuation (BUA in dB/MHz) that is used for the clinical measurement and Velocity of Sound (VOS in m/s), which is used for QA purposes only. The BUA output is expressed both as an absolute value and, with reference to the embedded Normative Data, as a T-Score, Z-Score, and the percent expected (%exp, age-matched).

D. Contraindications:

There are no known contraindications associated with the use of the McCue CUBAClinical system.

II. Specific Risk Statements:

CUBAClinical is a reusable device and is considered a non-critical device for infection control practices, but should not be used with patients who show breached skin or open sores of the lower leg, which might come into contact with the device. Direct contact as with any surface may increase the risk of transmission of infection. Proper cleaning and disinfection per instruction is required between patients.

The CUBAClinical requires 90 – 240 V AC / 50 – 60 Hz and **must** incorporate an effective ground. The device is not designed for use in explosive or oxygen-rich environments. CUBAClinical is not user serviceable other than external cleaning. The device was designed with a power cord to meet UL 498 and has been submitted and passed testing to BS EN 60601 standards. It is important that only a "Hospital Grade" power cord (supplied with the unit) be utilized with a receptacle of suitable "Hospital Grade" grounding.

Hazardous voltages are present within the unit necessitating the need to isolate the mains power before a qualified technician can perform work.

It has been demonstrated, in the literature included with this submittal, that women and men prone to osteoporosis, when detected early enough, may benefit from supplemental diet and pharmaceutical products that can increase bone mass to reduce fracture risk while postponing osteoporotic change.

The CUBAClinical is not designed to be serviced in any way by the user, other than for external cleaning. There is no regular maintenance required.

There are small stepper motors used to position the transducer against the heel and stops when the heel is touched. By design these stepper motors are not capable of exerting enough force to cause discomfort. In the event the patient feels uncomfortable, he or she can easily pull the heel out without even the slightest injury.

III. Special Controls to Address Risks (above):

A. Electrical Safety and Electromagnetic Compatibility:

The CUBAClinical is in compliance with the following standards:

1) UL 498	Attachment Plugs and Receptacles.
2) BS EN 55022	Information Technology Equipment Radio Disturbance Characteristic Limits & Method of Measurement.
3) FCC Part 15	Subpart B, Class A, Electromagnetic Emissions
4) BS EN 55024	Electrostatic Discharge Requirements.
5) BS EN 60601-1	Medical Electric Equipment Part 1: General Requirements for Safety. [Class 1, Type B, Not AP/APG]
6) BS EN 60601-1-1	Collateral Standard. Safety Requirements for Medical Electrical Systems.
7) BS EN 60601-1-2	Collateral Standard. Electromagnetic Compatibility. Requirements and Tests.
8) BS EN 60601-1-4	Collateral Standard. General Requirements for Programmable Electrical Medical Systems.
9) BS EN 61157	Requirements for the Declaration of the Acoustic Output of Medical Diagnostic Ultrasonic Equipment.
10) ISO 10993-1	Biological Evaluation of Medical Devices. Eval. & Testing.
11) ISO 10993-5	Biological Evaluation of Medical Devices. Tests for Cytotoxicity.
12) ISO 10993-10	Biological Evaluation of Medical Devices. Tests for Irritation and Sensitization.

B. Software:

Software verification tests used for the CUBAClinical were submitted by McCue PLC. A hazards analysis indicated that all software and hardware, patient and user concerns were adequately addressed. Verification, validation, and unit testing demonstrate that the device operates in a manner described in the System Specification.

C. Acoustic Output:

McCue PLC provided testing to demonstrate compliance with the acoustic output requirements of the CUBAClinical transducers. Intensities were within the limits specified in CDRH Guidance, "Information for Manufacturers seeking Marketing Clearance of Diagnostic Ultrasound Systems and Transducers" (1997). Global Maximum Value of MI (mechanical index) = 0.27 (±17%, $I_{spta3 = 5.3}$ (±31%) $\mu W/cm^2$, and I_{sppa3} = 1.9(±32%) W/cm^2.

IV. Potential Benefits of the Device:

Quantitative Ultrasound (QUS) measures the transmission of ultrasound through accessible limb bones or reflectance of the ultrasound waves from the bone surface. QUS measures structural characteristics that allow a clinician to differentiate between young and elderly bone, as well as between osteoporotic bone and osteomalacic bone. Additionally, QUS correlates with the density and the elasticity of bone tissue. Potential benefits of this technique compared with current Dual Photon Absorptiometry include lower expense, portability, and lack of radiation exposure. The calcaneus (heel) is an ideal site for study as it is composed of cancellous bone, which is similar to vertebral composition.

Quantitative Ultrasound (QUS) has proven to be a good predictor of fracture risk:

- In a large prospective study of 6189 postmenopausal women over age 65, quantitative ultrasonography of the calcaneus predicted hip fracture as accurately as bone densitometry. Each standard deviation (SD) reduction in calcaneal BUA was associated with a doubling of the risk for hip fractures (relative risk [RR], 2.0; 95% CI 1.5 to 2.7)[1].

- In a larger study of 14,824 patients that included younger women as well as men ages 42 to 82 years, quantitative calcaneal ultrasound also was a good predictor of total and hip fracture risk. BUA predicted fracture risk in all subgroups of patients, with a relative risk similar to the study above [2].

- A third study of 2837 women (463 ages 20 to 39 years and 2374 ages 55 to 79 years) found that quantitative ultrasound of the calcaneus worked as well as central DXA for identification of women at high risk for osteoporotic vertebral fractures[3].

- In addition to predicting fracture risk, other studies have found that quantitative ultrasound is at least as good, and possibly better than clinical risk factors for predicting women at risk for osteoporosis[4].

Peripheral QUS has now been well validated and is supported by scientific documentation sufficient to warrant the following statement by the British National Osteoporosis Society (NOS)[5].

- A low QUS value constitutes an independent risk factor for osteoporotic fracture in postmenopausal women.
- A low QUS value is a marker for low bone mass that is more important than clinical risk factors.
- Patients with low QUS values can be prescribed a further BMD (Bone Mineral Density) test or a therapeutic regimen if other clinical risk factors are present.

The Quantitative Ultrasound technique for the measurement of fracture risk is reliable, fast, inexpensive, and does not expose patients to radiation.

[1] Bauer, DC, Glüer, CC, Cauley, JA, et al. Broadband ultrasound attenuation predicts fractures strongly and independently of densitometry in older women. Arch Intern Med 1997; 157:629.

[2] Khaw, KT, Reeve, J, Luben, R, et al. Prediction of total and hip fracture risk in men and women by quantitative ultrasound of the calcaneus: EPIC-Norfolk prospective population study. Lancet 2004; 363:197.

[3] Gluer, CC, Eastell, R, Reid, DM, et al. Association of Five Quantitative Ultrasound Devices and Bone Densitometry With Osteoporotic Vertebral Fractures in a Population-Based Sample: The OPUS Study. J Bone Miner Res 2004; 19:782.

[4] Hodson, J. BMJ 2003; 326:1250.

[5] Reid DM, Stewart A. Position statement on the use of quantitative ultrasound in the management of osteoporosis. Bath: National Osteoporosis Society. 2001.

V. Recommendation for Reclassification:

CooperSurgical recommends that the Class III / PMA required for Product Code MUA, be reclassified as Class II / 510(k) required **and** that FDA add a section under Part 892 - Radiology Devices - in 21 CFR for all devices that fall into the following category for Product Code MUA [as this type of device is currently UNCLASSIFIED]:

> ***"Ultrasonic Bone Sonometry Systems that perform a quantitative ultrasound (QUS) measurement and/or broadband ultrasound attenuation (BUA) of the calcaneus (heel bone) or tibia (shin bone) results of which can be used in conjunction with other clinical risk factors as an aid for the diagnosis of osteoporosis and other medical conditions leading to reduced bone density and, ultimately, for the determination of facture risk."***

VI. Summary of Valid Scientific Evidence Supporting Recommendation [See Appendix II]:

CUBAClinical was first introduced into the market place in Europe in 1992. PMA P990016 Approval was obtained on January 07, 2000. The design and function of the device is based on the work of Dr. Christian Langton who described the measurement of Broadband Ultrasound Attenuation (BUA) in the calcaneus as a potential indicator of the risk of fracture in his 1984 PhD Thesis. [Langton CM, Palmer SB, Porter RW, The measurement of broadband ultrasonic attenuation in cancellus bone. Eng in Med 1984; 13(2): 89-91.] Clinical studies have demonstrated the effectiveness and validity of BUA as a predictor of fracture risk.

VII. MDR Experience:

There are no MDR's in the FDA Database for the CUBAClinical or any of the other seven (7) devices listed in **I. B.** of this submission.

There are no MDR's reported in the MAUDE database for Product Code - MUA.

VIII. European Union Adverse Events:

The CUBAClinical is CE marked and has been in distribution in the EU since 1992. There have been no reported adverse events to date.

IX. Bibliography of Published Literature:

See **Appendix III** for Bibliography of Published Literature.

X. Appendix List:

Appendix I Similar Devices with Approval / Clearance

Appendix II Summary of Valid Scientific Evidence Supporting Recommendation
[Copies of these articles ARE INCLUDED in this submission. See Appendix II for location.]

Appendix III Bibliography of Published Literature
[Copies of this literature ARE INCLUDED in this submission. See Appendix III for location.]

Respectfully submitted,

Thomas G. Williams,
Dir., Business Assurance/Official Correspondent
CooperSurgical, Inc.

jsy