Statement of Work

Annual Diagnostic Physics Equipment Survey

Southeast Louisiana Veterans Health Care System
New Orleans, LA

12/15/2016 Revised December 29, 2016

1. **PURPOSE**

1.1 The overall purpose is to provide for the annual diagnostic physics survey of diagnostic equipment under the control of the Southeast Louisiana Veterans Health Care System (SLVHCS).

2. **SCOPE**

2.1 The Contractor shall furnish all necessary travel, labor, material, supplies, tools, equipment, documentation, and qualified personnel to provide on-site diagnostic medical physics support or services for the Veterans Health Administration (VHA) listed in the Mandatory Services to be performed, located sites controlled by Southeast Louisiana Veterans Health Care System (SLVHCS) in New Orleans, Louisiana under the terms stated herein.

2.2 This contract shall cover the **period of January 2017, through September 30, 2017,** in accordance with all terms, conditions, provisions, schedules, and specifications of this solicitation.

2.3 The Contractor shall comply with radiation protection standards in 29 CFR 1910.1096 and immediately report any unsafe conditions with the potential to adversely impact the facility radiation workers or patients to the Radiation Safety Officer (RSO).

3. **QUALIFICATIONS:**

3.1 All work shall be performed by a qualified diagnostic medical physicist. A qualified diagnostic medical physicist is a person who is certified by the American Board of Radiology (ABR) in Diagnostic Radiology, American Board of Medical Physics (ABMP), or the Canadian College of Physicists in Medicine.

3.2 For diagnostic computed tomography (CT), nuclear medicine, Positron Emission Tomography (PET), or Magnetic Resonance Imaging (MRI), a qualified medical physicist can meet the following requirements in lieu of board certification:

3.3 A graduate degree in physics, medical physics, biophysics, radiologic physics, medical health physics, or a closely related science or engineering discipline from an accredited college or university

3.4 Formal graduate-level coursework in the biological sciences with at least one course in biology or radiation biology and one course in anatomy, physiology, or a similar topic related to the practice of medical physics

3.5 Documented 3 years of clinical experience in CT, nuclear medicine, PET, or MRI. The physicist must document the 3 years of experience for the modality being inspected.

4. **DELIVERY – Mandatory Services to be Performed**

4.1 The qualified diagnostic medical physicist shall perform imaging equipment (x-ray equipment, nuclear medicine cameras, PET/CT cameras, ultrasound units, and MRIs) inspections to ensure compliance with the current American College of Radiology (ACR). In the absence of ACR guidance, manufacturer recommendations will be

utilized. Any deficiencies or non-conformances discovered during the inspection shall be verbally communicated to the Radiation Safety Officer (RSO) prior to the qualified diagnostic medical physicist leaving the facility. Deficiencies or non-conformances which represent unsafe conditions with the potential to adversely impact the facility radiation workers or patients shall be reported to the RSO immediately upon discovery. A written report of the results shall be provided to the RSO within 14 working days after completion of the inspection. An equipment inventory of the diagnostic equipment to be surveyed will be provided at the appropriate time during the contracting process, and at the schedule time of services are to be provided. Scheduling of compliance testing will be conducted at times to be mutually agreed upon by the RSO and Biomedical Engineering Service. For all equipment requiring corrective action, the Biomedical Engineering Section will provide the necessary repairs, adjustments or arrange to have qualified service personnel perform the required adjustments or repairs.

4.2 If necessary, the Contractor will perform a follow-up survey ninety (30) days after the date of the written annual survey results and following major repairs or adjustments to verify all faults noted in the original survey or major repairs or adjustments have been corrected. Reported faults will contain test parameters and Biometric test setup for the purpose of duplication of results.

4.3 Delivery of services will be coordinated through the Radiation Safety Officer.
4.3.1 The scope includes the following deliverables:
4.3.2 Annual site visits to carry out evaluations.
4.3.3 The equipment evaluation reports according to federal rules, standards and regulations.
4.3.4 Assistance with regulatory requirements.
4.3.5 Regular updates in anticipation of standard and regulation changes.
4.3.6 Rapid response to facilities' unanticipated and/or emergent needs.
4.3.7 Any extra in-scope needs of the facility, new equipment installation testing can be performed upon request for an additional fee.
4.3.8 Any education or training according to needs of each facility can be delivered through live or web lectures upon request for an additional fee.

4.4 The Contractor shall conduct equipment inspections or quality control surveys of the imaging equipment listed below. The Contractor shall ensure the imaging equipment's compliance with applicable Federal regulations and ACR recommendations, and shall include, but not be limited to, monitoring the following basic performance characteristics:

4.4.1 **Radiographic and Fluoroscopic Equipment (16 each)**

4.4.1.1 Physics inspections of radiographic and fluoroscopic equipment shall comply with the current ACR Technical Standard for Diagnostic Medical Physics Performance Monitoring of Radiographic and Fluoroscopic Equipment. The performance of each radiographic and fluoroscopic unit must be evaluated at least annually and no greater than 14 months from the previous inspection. This evaluation should include, but not be limited to, the following tests (as applicable):

4.4.1.2 Integrity of unit assembly.
4.4.1.3 Collimation and radiation beam alignment.
4.4.1.4 Fluoroscopic system resolution.
4.4.1.5 Automatic exposure control system performance.
4.4.1.6 Fluoroscopic automatic brightness control performance (high-dose-rate, pulsed modes, field-of-view [FOV] variation).
4.4.1.7 Image artifacts.
4.4.1.8 Fluoroscopic phantom image quality.
4.4.1.9 kVp accuracy and reproducibility.
4.4.1.10 Linearity of exposure versus mA or mAs.
4.4.1.11 Exposure reproducibility.
4.4.1.12 Timer accuracy.

4.4.1.13 Beam quality assessment (half-value layer).
4.4.1.14 Fluoroscopic entrance exposure. Maximum output for all clinically used settings.
4.4.1.15 Image receptor entrance exposure.
4.4.1.16 Equipment radiation safety functions.
4.4.1.17 Patient dose monitoring system calibration.
4.4.1.18 Video and digital monitor performance.
4.4.1.19 Digital image receptor performance.
4.4.1.20 Grids used with portable x-ray units shall be imaged for uniformity.

4.4.2 **Computed Radiography (CR) (1 each), and Digital Radiography (DR) (19 each)**

4.4.2.1 Physics inspections of CR and DR equipment shall comply with the American Association of Physicist in Medicine (AAPM) Report Number 93, Acceptance Testing and Quality Control of Photostimulable Storage Phosphor Imaging Systems. This evaluation should include, but not be limited to, the following tests (as applicable):

4.4.2.2 Component and Imaging Plate Physical Inspection and Inventory.
4.4.2.3 Imaging Plate Dark Noise and Uniformity.
4.4.2.4 Exposure Indicator Calibration.
4.4.2.5 Linearity and Auto-ranging Response.
4.4.2.6 Laser Beam Function.
4.4.2.7 Limiting Resolution and Resolution Uniformity.
4.4.2.8 Noise and Low-Contrast Resolution.
4.4.2.10 Spatial Accuracy.
4.4.2.11 Erasure Thoroughness.
4.4.2.12 Aliasing/Grid Response.
4.4.2.14 IP Throughput.
4.4.2.15 Positioning and Collimation Errors.

4.4.3 **Computed Tomography (CT) Scanners (4)**

4.4.3.1 The physics inspection shall conform to the 2012 ACR Computed Tomography Quality Control Manual. This evaluation should include, but not be limited to, the following tests (as applicable).

4.4.3.2 Review of Clinical Protocols.
4.4.3.3 Count Prescription and Alignment Light Accuracy.
4.4.3.4 Image Thickness – Axial Mode.
4.4.3.5 Table Travel Accuracy.
4.4.3.6 Radiation Beam Width.
4.4.3.7 Low-Contrast Performance.
4.4.3.8 Spatial Resolution.
4.4.3.9 CT Number Accuracy.
4.4.3.10 Artifact Evaluation.
4.4.3.11 CT Number Uniformity.
4.4.3.12 Dosimetry (the scanner displayed $CTDI_{vol}$ values must be within +/- 20% of the measured $CTDI_{vol}$ values).
4.4.3.13 Grey Level Performance of CT Acquisition Display Monitors.

4.4.4. **Dental X-Ray Machines-Handheld (7 each) and Wall Mounted (27 each)**

4.4.1 The physics inspection shall conform to the Conference of Radiation Control Program Directors (CRCPD), Quality Control Recommendations for Diagnostic Radiography Volume 1 Dental Facilities July 2001. This evaluation should include, but not be limited to, the following tests (as applicable).

4.4.5.2 Collimation.
4.4.5.3 Beam quality (half value layer).
4.4.5.4 Timer Accuracy and Reproducibility.
4.4.5.5 kVp Accuracy and Reproducibility.
4.4.5.6 mA or mAs Linearity.
4.4.5.7 Exposure Reproducibility.
4.4.5.8 Entrance Skin Exposure Evaluation.
4.4.5.9 Technique Chart Evaluation.
4.4.5.10 Image uniformity (artifact evaluation).

4.4.5 **Dental Cone Beam CT (CBCT) Performance Testing (2 each)**

4.4.5.1 Performance Testing. Each CBCT unit shall undergo periodic quality control tests to insure that the performance of the machine has not significantly deteriorated and is operating within the manufacturer's technical specifications.

4.4.5.2 Some manufacturers provide a phantom and procedures to perform machine specific quality assurance (QA) tests. In cases where the manufacturer provides a phantom and procedures to perform specific tests but the tests are not included in this SOW, then the manufacturer's machine-specific QA tests shall be performed in addition to the QA tests in this SOW.

4.4.6 **Magnetic Resonance Imaging (MRI) (2 each)**

4.4.6.1 The physics inspection shall conform to the 2004 ACR Magnetic Resonance Imaging Quality Control Manual. This evaluation should include, but not be limited to, the following tests (as applicable).

4.4.6.2 Magnetic field homogeneity.
4.4.6.3 Geometric accuracy.
4.4.6.4 Inter-slice RF interference.
4.4.6.5 Slice position accuracy.
4.4.6.6 High-contrast resolution
4.4.6.7 RF coil performance.

(a) Volume coils' signal-to-noise ratio
(b) Volume coils' image uniformity
(c) Volume coils' ghosting ratio
(d) Phased array coils' signal-to-noise ratio
(e) Surface coils' signal-to-noise ratio

4.4.6.8 Slice thickness accuracy
4.4.6.9 Low-contrast detectability
4.4.6.10 Soft copy displays
4.4.6.11 Technologist's QC program
4.4.6.12 Site phantom inventory
4.4.6.13 Site RF coil inventory

4.4.7 **Positron Emission Tomography (PET/CT) (1 each)**

4.4.7.1 The physics inspection shall conform to the ACR PET Phantom Instructions for Evaluation of PET Image, ACR Nuclear Medicine Accreditation Program PET Module. This evaluation should include, but not be limited to, the following tests (as applicable):

4.4.7.2 Uniformity.
4.4.7.3 Spatial resolution.
4.4.7.4 SUV analysis.

4.4.8 **Display Monitors (18 each)**

4.4.8.1 The annual performance evaluation conducted by the diagnostic medical physicist includes testing of image acquisition display monitors for maximum and minimum luminance, luminance uniformity, resolution, and spatial accuracy. The image acquisition display monitors for nuclear medicine, PET, CT and MRI units shall be tested. Assess the viewing conditions for the area in which the monitor used to evaluation the CBCT studies is located. Minimum criteria as follows:

4.4.8.2 Perform a visual analysis of the SMPTE test pattern. Display the test pattern on the imaging console. Set the display window width/level to the manufacturer-specified values for the pattern. Do not set the window/level by eye; doing so invalidates the procedure.

4.4.8.3 Examine the pattern to confirm that the gray level display in the imaging console is subjectively correct.
Review the line pair patterns in the center and at each of the corners.
Review the black-white transition.
Look for any evidence of "scalloping" (loss of bit depth) or geometric distortion.
4.4.8.4 Use a photometer to measure the maximum and minimum monitor brightness (0% and 100% steps)
4.4.8.5 Measure additional steps within the pattern to establish a response curve.
4.4.8.6 Measure the brightness near the center of the monitor and near all 4 corners (or all 4 sides, depending on the test pattern used).
4.4.8.7 Review of the technical QA program
4.4.8.8 The qualified expert shall review the technical QA program. The review shall include a trend analysis of the QA data. The results of the technical QA program review shall be included in the written report. Any trends that identify problems shall be included in the report along with recommended corrective actions.

4.4.9.1. **Nuclear Medicine Spect CT, Spec and Cardiac Units (4 each)**

4.4.9.2 The physics inspection shall conform to the ACR PET Phantom Instructions for Evaluation of PET Image, ACR Nuclear Medicine Accreditation Program PET Module. This evaluation should include, but not be limited to, the following tests (as applicable):
4.4.9.3 Uniformity.
4.4.9.4 Spatial resolution.
4.4.9.5 SUV analysis.

4.4.10 **Interventional Equipment (6 each)**

4.4.10.1 Physics inspections of radiographic and fluoroscopic equipment shall comply with the current ACR Technical Standard for Diagnostic Medical Physics Performance Monitoring of Radiographic and Fluoroscopic Equipment. The performance of each radiographic and fluoroscopic unit must be evaluated at least annually and no greater than 14 months from the previous inspection. This evaluation should include, but not be limited to, the following tests (as applicable):

4.4.10.2 Integrity of unit assembly.
4.4.10.3 Collimation and radiation beam alignment.
4.4.10.4 Fluoroscopic system resolution.
4.4.10.5 Automatic exposure control system performance.
4.4.10.6 Fluoroscopic automatic brightness control performance (high-dose-rate, pulsed modes, field-of-view [FOV] variation).

4.4.10.7 Image artifacts.
4.4.10.8 Fluoroscopic phantom image quality.
4.4.10.9 kVp accuracy and reproducibility.
4.4.10.10 Linearity of exposure versus mA or mAs.
4.4.10.11 Exposure reproducibility.
4.4.10.12 Timer accuracy.
4.4.10.13 Beam quality assessment (half-value layer).
4.4.10.14 Fluoroscopic entrance exposure. Maximum output for all clinically used settings.
4.4.10.15 Image receptor entrance exposure.
4.4.10.16 Equipment radiation safety functions.
4.4.10.17 Patient dose monitoring system calibration.
4.4.10.18 Video and digital monitor performance.
4.4.10.19 Digital image receptor performance.
4.4.10.20 Grids used with portable x-ray units shall be imaged for uniformity.

5. **OPERATOR TRAINING**

Non-applicable.

6. **SECURITY REQUIREMENTS**

6.1 The C&A requirements do not apply and a Security Accreditation Package is not required.