MEMORANDUM

To: Board of Regents

From: Board Office

Subject: University of Iowa - Equipment Purchases

Date: June 7, 2004

Recommended Action:

Approve the following equipment purchases for the University of Iowa Hospitals and Clinics (UIHC)

• 3.0 Tesla MRI system	$2,371,757
• PET/CT system	2,311,148
• LANTIS and COHERENCE Systems	2,102,945
• Four linear accelerators	6,304,589
Total	$13,090,439

Executive Summary:

The Center of Excellence for Image-Guided Radiation Therapy, which is currently under construction, is scheduled for completion in 2004. The Center will offer world-class cancer care in advanced accommodations.

The University is requesting approval for the purchase of four equipment systems totaling $13.1 million for the new facility. The University reports that the purchases would all be made through Siemens Medical Solutions and would be installed in the Center of Excellence for Image-Guided Radiation Therapy.

The University has provided written explanations. See pages 3-6 for details.

Background:

Policy Manual

Chapter 7.05B(12) of the Regent Policy Manual requires that:

- Equipment costing more than $1,000,000 must be submitted to the Board for approval; and
- Requests submitted to the Board Office for approval must include the following information:
  - Description of the equipment;
  - Justification of the need for the equipment;
  - Any known alternatives to the equipment proposed; and
  - Estimated cost and source of funding.

Analysis:

The four equipment systems proposed for purchase are all needed for the new Center of Excellence for Image-Guided Radiation Therapy. The University reports that each piece of equipment is the best value for the investment and that they all perform specific functions essential for cancer therapy. The information that these systems provide will make it possible to provide optimal doses of radiation to tumors while normal tissue is spared.

The University reports that the systems were selected through the competitive bidding process and will be paid for with funds allocated for purchasing capital equipment. No state of Iowa appropriation support will be used.

The four systems are described below:

3.0 TESLA (3T) MAGNETIC RESONANCE IMAGING (MRI) SYSTEM - $2.3 MILLION

The 3T MRI system would provide oncologists with image datasets of the best quality. The strength of the 3T system gives oncologists the ability to non-invasively observe and monitor the tumor status of patients undergoing radiation therapy.

POSITRON EMISSION TOMOGRAPHY/COMPUTED TOMOGRAPHY UNIT (PET/CT) - $2.3 MILLION

Images obtained with the PET/CT system would provide an accurate depiction of the patient's anatomy and tumor location. Having information about the tumor's activity (PET), and the location (CT) helps the oncologist to design appropriate treatment plans.

LANTIS AND COHERENCE SYSTEMS - $2.1 MILLION

The LANTIS system is the information bridge between the imaging systems, planning systems, and treatment systems proposed for the new facility. COHERENCE is a system of software packages that allows medical personnel access to the images and treatment parameters of patients undergoing radiation therapy.

FOUR LINEAR ACCELERATORS - $6.3 MILLION

The four linear accelerators would replace the existing four outdated units currently in use. The new accelerators incorporate the latest radiotherapy treatment technology and will significantly enhance the ability to treat patients with the most accurate methodologies available.

Andrea L. Anania

Gregory S. Nichols

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ACTION REQUESTED: Approve Purchase of 3.0 Tesla Magnetic Resonance Imaging System for Radiation Oncology Treatment Planning

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EXPLANATION

The University of Iowa Hospitals and Clinics (UIHC) requests approval to proceed with the purchase of a 3.0 Tesla MRI system to serve as a treatment planning simulator in the new Center of Excellence for Image-Guided Radiation Therapy. The requested MRI system will be purchased from Siemens Medical Solutions. The price of the 3.0 Tesla MRI system is $2,371,757.

The field of radiation oncology has evolved to the point where serial image datasets serve as the basis for designing treatment fields. To provide the maximum benefit to the patient, these image datasets must be the best quality available. The high field strength of the 3T system gives radiation oncologists the ability to non-invasively observe and monitor the tumor status of patients undergoing radiation therapy.

Combined with high precision CT, MR images obtained with the 3T system will provide an accurate depiction of the patient's anatomy and tumor location so that treatment fields can be designed to maximize the dose to the tumor and minimize the dose to normal structures.

A 3T system was selected over a lower field system because the 3T system provides better detail than a lower field strength system. This is particularly important for prostate cancer which is a growing concern in Iowa's aging population. In cases where imaging time is of concern, the 3T system allows the operator to trade resolution for a shorter scan time. For some patients, the shorter scan time will provide information that would not otherwise be possible on a lower field strength system.

A successful course of radiation therapy for a particular patient occurs over many days. Each treatment must be reproduced exactly in order to be effective. It is imperative that patients be positioned such that the setup can be faithfully reproduced each day. The positioning requirements for patients undergoing radiation therapy differ from those for diagnostic purposes and scans obtained for diagnostic purposes only are often not suitable for radiation therapy. Additionally, enhanced use of functional imaging and spectroscopy for treatment planning is likely to offer integral improvements in tumor control and patient safety in years to come.

The 3T MRI system will be installed in the Center of Excellence for Image-Guided Radiation Therapy which is presently under construction.

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ACTION REQUESTED: Approve Purchase of PET/CT Imaging System for Radiation Oncology Treatment Planning

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EXPLANATION

The University of Iowa Hospitals and Clinics (UIHC) requests approval to proceed with the purchase of a PET/CT system to serve as a treatment PLANNING simulator in the new Center of Excellence for Image-Guided Radiation Therapy. The requested PET/CT system will be purchased from Siemens Medical Solutions. The price of the PET/CT unit is $2,311,148.

The field of radiation oncology has evolved to the point where serial CT image datasets routinely serve as the basis for designing treatment fields. To provide the maximum benefit to the patient, these image datasets must be obtained with the patient in treatment position using the best image quality available. It is also an advantage to obtain the images quickly so the patient does not move out of treatment position. CT images obtained with the PET/CT system will provide an accurate depiction of the patient's anatomy and tumor location so that treatment fields can be designed to maximize the dose to the tumor and minimize the dose to normal structures. The data obtained from CT images are necessary to accurately calculate the dose in the patient.

The PET component of the PET/CT allows radiation oncologists to obtain functional information about the tumors they are trying to control. The PET localization for tumors in the lung and head and neck has been shown to be particularly promising. Having information about the tumor's activity (PET), as well as location (CT) is another tool in the oncologist's belt that gives him/her additional information to design appropriate treatment plans. Having the CT and PET images taken on the same machine at essentially the same time will ensure that the functional information is correctly registered to the anatomically relevant CT image.

The PET/CT will be installed in the Center of Excellence for Image-Guided Radiation Therapy which is presently under construction. Images obtained from the PET/CT will be exported to the treatment planning systems using the LANTIS and COHERENCE networks, which are planned for installation in the new facility along with the new scanner.

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ACTION REQUESTED: Approve purchase of LANTIS and COHERENCE Radiation Oncology Information Systems.

EXPLANATION

The University of Iowa Hospitals and Clinics (UIHC) requests approval to proceed with the purchase of the LANTIS radiation oncology information system and COHERENCE radiation oncology system for the new Center of Excellence for Image-Guided Radiation Therapy. The LANTIS system is the information bridge between the imaging systems, planning systems and treatment systems proposed for the new facility. COHERENCE is a system of software packages that allows radiation oncologists, radiation therapists, dosimetrists and physicists access to the images and treatment parameters of patients undergoing radiation therapy. The price of the LANTIS and COHERENCE systems is $2,102,945.

Image Guided Radiation Therapy utilizes high resolution PET/CT and MRI images to precisely define the location of the region of a patient to be treated. The images needed to define the treatment must be transferred accurately to a system designed to calculate the dose distribution that the patient will receive during therapy. Once the dose is calculated, the treatment parameters must be accurately transferred to the treatment delivery equipment (linear accelerators). The LANTIS computer network provides the necessary network to perform this information transfer.

Radiation therapy has evolved to the point where "hand transfer" of information between systems is not possible. In addition to bridging the gap between the different subsystems, the LANTIS system is the basis for the COHERENCE software system that allows radiation oncologists to design and view treatment parameters for patients undergoing radiation therapy. Manual transfer in this environment is not appropriate due to the complexity of high resolution multi-modality imaging, multiple treatment parameters, intensity modulation and multileaf collimation. It would be unsafe not to have such systems for therapy delivery in today's environment. Radiation oncologists will use COHERENCE to view images (PET/CT and/or MRI) of patients, design treatment schemes, review treatment plans and review treatment progress of patients who are being treated in the new Center of Excellence for Image-Guided Radiation Therapy. Dosimetrists will use COHERENCE to verify treatment parameters of patients undergoing treatment. Radiation therapists will use COHERENCE to control the linear accelerators that deliver the treatments. Physicists will use COHERENCE to perform patient specific and machine specific quality control measures. It integrates into the LANTIS system for digital control of the simulation to treatment delivery processes and is therefore an important element in feedback systems for patient safety.

The LANTIS and COHERENCE systems will be purchased from Siemens Medical Solutions. LANTIS is the only information system that Siemens supports. It creates an integrated solution for the new facility. COHERENCE is the only software system supported by Siemens. COHERENCE is an integral component of the planning and delivery components.

The LANTIS and COHERENCE systems will be installed in the new Center of Excellence for Image-Guided Radiation Therapy which is presently under construction.

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ACTION REQUESTED: Approve Purchase of Four Linear Accelerator Systems

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EXPLANATION

The University of Iowa Hospitals and Clinics (UIHC) requests approval to proceed with the purchase of four linear accelerators to equip the new Center of Excellence for Image-Guided Radiation Therapy. These accelerators will replace the existing four outdated mega voltage units (three linear accelerators and a cobalt machine) currently in use within the present Radiation Therapy suite. Two of the accelerators currently in use are over 25 years old. The useful life of such equipment is normally seven years. Likewise, the cobalt unit is over 25 years old. One accelerator will be five years old when replaced. However, it is not compatible with the proposed replacement accelerators, treatment planning and information systems that must all be linked to provide image-guided radiation therapy. For this reason, it must also be replaced. The new accelerators will be purchased from Siemens Medical Solutions. This change in vendors (formerly Varian) provides a significant cost savings and will create a fully integrated facility. The new accelerators incorporate the latest radiotherapy treatment technology and will significantly enhance the ability to treat patients with the most accurate methodologies available. The total price for the four replacement linear accelerators is $6,304,589. The current units will be sold at fair market value.

Radiation therapy today is more precise and more complex than it has ever been in the past and requires high quality equipment. The existing accelerators are unreliable and are not capable of delivering the precise radiation treatments that are the standard of care in radiation therapy. Siemens accelerators were selected for a number of reasons, these being, 1) competitive price, 2) innovative delivery technology, 3) reliability, 4) ability to interface to Siemens imaging equipment (CT/PET and MRI systems), 5) ability to interface to LANTIS radiotherapy information systems, and 6) ability to interface to existing treatment planning systems.

Each of these accelerators will be equipped with multileaf collimators (MLC) and online portal imaging systems. The MLC system consists of individually controlled leaves that adjust the size and shape of a radiation beam automatically without the need to create heavy custom lead alloy blocks. This enhances patient safety and is more cost effective. The shape of a radiation beam is designed during the treatment planning process and electronically transferred to the MLC system on the linear accelerator. Field shaping using the MLC is more precise than using lead blocks to shape the beam. Additionally, the computer controlled MLC can move the leaves while the beam is on, in essence varying the beam intensity per treatment field. This is done to precisely control the radiation dose. Such fine control of the radiation beam intensity and location is necessary for both three-dimensional conformal radiation therapy and intensity modulated treatment (IMRT).

The online portal imager is new technology that allows physicians to verify that the radiation is delivered as planned. Images of the patient's treatments are obtained electronically, without film, at the time of delivery. These images can be electronically transported to any computer on the LANTIS network, allowing the physician to conveniently review the status of a patient's treatment. The online imaging system saves film and processing costs. Since the images are electronic, they can be viewed and compared to the original plan at any time without the need for elaborate film storage and retrieval mechanisms. The COHERENCE software provides electronic tools to analyze these images providing a precision not available with a film-based verification system.

The new accelerators will be placed in the lower level of the Center of Excellence in Image-Guided Radiation Therapy which is presently under construction. They are essential replacement equipment.