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Obituary

Professor Keith Boddy (1937-2010)

It is with great sadness that we report the untimely death of our friend and dear colleague Past-President Professor Keith Boddy on September 19th, 2010 at the young age of 72. Keith will be remembered for his superb leadership as President of the IOMP from 1994–1997 and, subsequently, as President of the IUPESM from 1997–2000.

One of his first acts upon assuming the role of President of the IOMP was to devise a Strategic Plan which guided his actions over the next three years. As a result of this Plan, and under Keith's leadership, the IOMP initiated its Regional Organizations program (we now have six regional organizations), aggressively pursued designation of Medical Physics as a profession recognized by the International Labor Office (we now are officially recognized as such in the ILO International Standard Classification of Occupations), and increased national society membership in the IOMP by about 20%. Toward the end of his tenure as IOMP President and during his first months as IUPESM President, there was much discussion about a possible breakup of the IUPESM. One of the major reasons for the formation of the Union (with the IFMBE) was the opportunity to seek full membership in the International Council of Scientific Unions (ICSU), but the IUPESM application to become a Full Member had been rejected (we were only an Associate Member with little opportunity to influence ICSU activities). Keith realized that the future of the existence of the IUPESM depended upon the achievement of Full Membership and he aggressively attacked the problem. He met with the Executive Director of ICSU, made a presentation to ICSU's Scientific Committee on

Membership, Structure and Statutes, personally contacted leaders of other ICSU Full Members to lobby them and obtain Letters of Support, and devised extensive supplemental documentation for submission with the IUPESM application, including an article entitled "Caring for the Human Machine into the 21st Century" published in Science International (the ICSU journal), which was distributed at the ICSU General Assembly in September, 1999. This all culminated in what Keith described as one of his proudest moments, the achievement of Full Membership in ICSU. Without Keith's enormous efforts and superb leadership, this would never have happened.

Throughout his life Keith epitomized the best tradition of British science, both as a man of great integrity and as a highly competent medical physicist. He actually started out in his career working primarily in radiation safety and it was not until 1978 that he entered the field of medical physics when he was appointed Head of the Regional Medical Physics Department in Newcastle, England, where he spent the rest of his working life until retirement in 1997. There he established a truly regional Department, building up to over 270 staff in 18 hospitals/centers. In his spare time (!), in addition to the IOMP and the IUPESM, Keith was President of Institute of Physical Sciences in Medicine, the Hospital Physicists Association, and the European Federation of Medical Physics. He received numerous honors for his work including the IUPESM Award of Merit in 2000, the Institute of Physics (IOP) Glazebrook Medal in 1992, the Order of the British Empire (OBE) in 1989, the Commander of the British Empire (CBE) in 1998, an honorary D.Sc. from De Montford University, and Fellowships in several organizations (the IOP, the British Nuclear Medicine Society, the Royal College of Radiologists, the British Institute of Radiology, the Society of Radiation Protection, and the Institute of Physics and Engineering in Medicine).

In addition to his extraordinary organizational talents and activities, Keith always demonstrated an enthusiastic interest in the development of medical physics in other countries. He consistently provided support and encouragement to the officers of new IOMP member countries and secured financial help for projects,

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some of which were not necessarily involved with current medical physics affairs, such as the restoration of the monument to Mme. Skłodowska-Curie, built in Warsaw (Poland) before World War II and partially damaged during the war.

For those of us who had the privilege to know Keith personally, we will miss most his friendship, humility, and dry sense of humor (see the attached cartoon which he cherished since it presents a true image of how he thought of himself) exemplified by his own words when he completed his three years as IUPESM President "*Becoming your President made an old man very happy. However, the Presidency has been so eventful that it has made a happy man very old*!" With the passing of Professor Keith Boddy, Medical Physics has lost a great leader and true statesman. Keith is survived by his loving wife Sylvia and his sons Chris and Graham, to whom we express our sincere condolences.

Colin Orton & Oskar Chomicki,
□ Past-Presidents.

Welcome to the Electronic Medical Physics World

Deadlines for Future Issues

April 10, 2011

October 10, 2011

Please send material to:

Freyd@musc.edu

Welcome to Vol 1 Number 2 of "Electronic Medical Physics World." eMPW the electronic newsletter of the IOMP.

In this issue we have the sad news of the death of Dr Keith Boddy, one of the giants of medical physics. Dr Boddy passed away earlier this year and we will all miss his contributions to the field.

Focus on Education

We also continue our focus on medical physics education with articles about the 2010 AAPM summer school, an article about an innovative education program and the Image Wisely campaign.

G. Donald Frey

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Teaching Medical Physics: Innovations in Learning

Every medical physicist is a teacher. Only some of us teach in a classroom setting, but all of us teach every day in clinical and research settings. Every conversation with physicians, technologists, patients and our physics colleagues is an opportunity to teach. But how much effort do we expend in becoming better teachers? We all stay up-to-date in our clinical responsibilities and research activities, but few of us take the time necessary to become master teachers. Yet in the long run, the influence that we have as teachers may surpass our contributions in the clinical and research arenas.

In 2008 the American Association of Physicists in Medicine (AAPM) held a special workshop outside of Houston on the topic Becoming a Better Teacher of Medical Physics. The workshop attracted over 100 participants who praised the workshop highly because it addressed an unmet need of the participants. As a consequence, the AAPM decided to hold a Summer School immediately following the 2010 AAPM annual meeting on the topic Teaching Medical Physics: Innovations in Learning. The Summer School was held on the University of Pennsylvania campus in Philadelphia on July 22-25, 2010 and attracted about 140 enrollees. Although most of the enrollees were from the United States and Canada, other countries (Brazil, Australia, Cyprus, Netherlands, Sri Lanka, Greece, Japan, India, Sweden and Thailand) were represented.

Faculty for the Summer School included six master teachers from the world of academics beyond medical physics. The speakers were Ken Heller from the Department of Physics and Astronomy of the University of Minnesota who spoke on Strategies for Learning to Solve Physics Problems; Jannette Collins from the Department of Radiology of the University of Cincinnati who covered the topic How to Be the Speaker Everyone Wants You to Be; Cindy Hmelo-Silver from the Department of Educational Psychology of Rutgers University who discussed Learning Through Problem Solving; Robert Beichner from North Carolina State University who considered Multiple Technologies to Address Multiple Instructional Needs; Suzanne Amador-Kane from the Department of Physics and Astronomy of Haverford College who explained the challenge of Teaching Physics of Biology and Medicine; and Victor Montemayor from the Department of Physics of Middle Tennessee State University who gave a most interesting talk on teaching physics using a presentation platform called Prezi that was unfamiliar to most of the attendees. The Summer School program was filled out with presentations on web-modules for the physics education of radiologists and student medical physicists; recent changes in the processes for accrediting graduate and residency programs in

medical physics and certifying medical physicists; a panel of residents from medical physics, radiation oncology and radiology who discussed what they liked and didn't like about their physics education; break-out and report-back sessions to capture the experiences and ideas of participants in the Summer School; and a panel presentation on Self-Directed Educational Projects (SDEP), followed by time set aside for each participant to create his or her own SDEP to become a better teacher.

Participants at the workshop were engaged and committed to becoming better teachers, and discussions following the presentations and activities were lively and rewarding. Evaluations of the workshop were very positive, and suggest that the AAPM should consider holding another Summer School on Teaching sometime in the not-too-distant future.

Bill Hendee, Director

2010 AAPM Summer School

One Model for Teaching Clinical Skills to Medical Physics Master's Degree Students: Employing a Clinical Skills Workbook as Part of a Structured Clinical Practicum Course

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Students in the health professions may benefit from a formal framework for acquiring the clinical skills necessary for the practice environment. The Rosalind Franklin University (RFUMS) Department of Medical Radiat ion Physics has

developed a structured clinical practicum course,
within which a clinical skills workbook (CSW) is employed. The CSW guides the students through a comprehensive list of topics and tasks that must be mastered prior to graduation. The purpose of this article is to describe the course and the accompanying CSW. .

Background:

In recent years, several articles have been written debating the benefits and drawbacks of various aspects of clinical education for health professionals (for example, see references 1-7). In the fall of 2008, RFUMS implemented a new model of clinical education for medical physics master's degree students. A primary goal of this new model was to minimize the haphazardness often associated with the traditional "follow and learn" apprenticeship approach. The model incorporates the "theory, planning, experience, reflection" cycle described in experiential learning theory (references 1& 8). It complements and enhances the existing didactic curriculum by providing hands-on understanding and motivation for further in-depth study.

Key Aspects of the Clinical Practicum Course Structure:

The medical physics clinical education curriculum model at RFUMS is focused around a clinical practicum course and its clinical skills workbook (CSW). The clinical practicum course experience is preceded by a prerequisite entitled "Introduction to the Radiation Oncology Clinic". This prerequisite course, taken during the students' first quarter in the master's degree program, outlines the fundamentals of practical clinical physics, and is held at one of several affiliated clinical sites after working hours.

Each year the AAPM holds a competition for the best paper highlighting Innovations in Medical Physics Education. This paper was one of the 2010 co-winners

With the introduction to clinical skills that this prerequisite course provides, the students enroll in the clinical practicum course, which is taken for the remaining six quarters of the program. In this course students are expected to actively participate in clinical work at least two full days per week during the school-year and at least four full days per week over the summer.

Required Work:

The RFUMS clinical practicum course demands much from the students. Students are asked to perform tasks & answer questions in the CSW, and to discuss the answers to CSW questions with their preceptor. This discussion is vital to learning; it also allows

the preceptor an opportunity to evaluate the student's understanding of each topic. By being forced to describe a process and the rationale behind that process, for example HDR QA, students are challenged to articulate the depth and breadth of their knowledge of the methodology. By being asked to consider alternate scenarios, for example which IMRT QA method is best, students start to think critically and learn to express their thoughts as logical arguments. These skills begin to prepare the students for their future clinical roles.

In their undergraduate preparation, many students learn to employ logbooks to document the methods and results of science experiments and to reflect in depth upon the experiential aspects of various courses. During the RFUMS clinical practicum course, students are required to create logbook entries or procedures describing how to do each task that they learn. These procedures are reviewed by the student's preceptors for accuracy. In this way each student creates, in their own words, a reference library of procedures as a starting point for future work. In order to hone essential communication abilities which are so important in clinical physics, students are asked to give a presentation in the clinic every quarter. This allows practice in teaching and can benefit the clinic's staff by providing education and continuing education credits.

Students are required to make use of the CSW's clinical competency list to monitor their progress. This list summarizes the tasks that should be mastered by graduation, and is scored by the preceptor at the end of each quarter. It also serves as a hand-off tool when the student moves to a new clinical site, since they are asked to give a copy of their composite competency list to date to their new preceptor. Students are expected to achieve scores of "competent" or "competent with supervision" prior to graduation for the majority of the approximately 150 items listed.

Students are asked to keep an attendance sheet which summarizes daily work done and is signed by their preceptor. Students are also expected to participate in occasional field trips, which serve to introduce them to equipment and procedures that may not be available in their assigned clinic. Examples of past field-trip topics include CyberKnife, Gamma Knife, TomoTherapy, OBI & Cone-beam QA, and Beam Modeling and Commissioning.

Evaluation of Each Student and Each Clinical Site:

An important aspect of the RFUMS clinical practicum course structure involves required meetings with the medical physics department's Director of Clinical Education (DCE). Students meet individually with the DCE every 4-6 weeks. Tracking forms are used to summarize progress on all required work, as the DCE spot-checks items such as the student's competency list, CSW tasks/questions, attendance sheet, logbook entries/procedures, and progress on the in-clinic presentation. Preceptors, too, are required to meet individually with the DCE. These meetings typically take place mid-quarter, and are often done by phone. Similar tracking forms are used to summarize

student progress, with special emphasis on the preceptor's impression of the student's work, ability and attitude. During these meetings an update of information on the site's current activities is obtained, and a re-assessment of the site's continued appropriateness for practicum work is made.

Both the student-DCE and preceptor-DCE meetings serve a dual purpose. Besides gathering information on student progress, attitude, ability, and behavior, a very important outcome of these meetings is the creation and building of relationships, and the consequent building of a climate of trust. When trust is present, both students and preceptors feel comfortable confiding in the DCE, who can then work to solve any difficulties that may arise during the student's time in a particular clinic. Addressing potential problems at an early stage enhances the learning environment for both students and preceptors.

The students participate in an oral practical final exam at the end of each quarter. This exam is administered by university personnel with the aim of catching and correcting any deficiencies in learning and is worth 30% of the quarterly course grade. The preceptor grades the completeness/correctness of the logbook/procedures (worth 20%), the clinical tasks in the CSW (worth 40%), and the in-clinic presentation (worth 10%). A grade of 80% or better is required to pass the course. An additional pass/fail component of the grade is "professionalism": any student who cannot learn to behave respectfully and ethically will not pass the course.

The Clinical Skills Workbook (CSW):

The CSW serves as a guide for both students and preceptors, and is divided into six modules. The first module, *Basic Clinical Skills,* is expected to be completed during the student's 1st clinical quarter. The second and third modules, *Quality Assurance* and *Treatment Planning,* are typically done concurrently during the 2nd & 3rd clinical quarters. Therefore, by the beginning of the second year, the students have mastered the fundamentals. The remaining modules, *Special Procedures*, *Diagnostic Radiology*, and *Health Physics* can be done in any order. Each module is divided into units which begin with references, guidance documents, and objectives, and include various tasks, questions and exercises.

Students are advised to learn whatever is going on in the clinic when they are there, regardless of where it falls in the module structure. Students must also continue to practice skills already learned in order to maintain proficiency. For tasks that are not typically done at a particular clinical site, students are asked to perform "thought experiments" in which they research the topic, plan how they would accomplish the task, write a procedure, and review this procedure with their preceptor. It is important to note that the CSW is a work in progress, and several sections are still being created by the faculty; for modules not yet finalized, students are still responsible for mastering all of the topics in the workbook's list of modules and competency list, but students and preceptors are asked to work together to determine the best way to learn the material.

Evaluation and Modification of the Practicum Course and the CSW:

In order to evaluate and appropriately modify the Clinical Practicum Course and the CSW, the DCE and Program Director rely on both informal feedback from the student and preceptor meetings described above and on formal feedback from quarterly student evaluation forms. Two types of student evaluation form are employed, one focusing on the course and the DCE, and the other focusing on the preceptor and clinical site. The information collected allows regular updating of the course and CSW. For example, when students were asked to evaluate the statement "Meeting with the DCE approximately once a month is about right", student scores over four quarters indicated that they felt the meetings should be less frequent. When the time between meetings was increased to every 5-6 weeks, the subsequent student scores indicated that the students were more in favor of this time frame.

Students were also asked about the helpfulness of the CSW's competency list, list of modules, and tasks, as well as the utility of keeping a logbook documenting the steps of various procedures. Student scores indicated that all of these components are perceived as beneficial (see Figure 1). When students were asked "What do you find most valuable with regard to this course?", they responded with statements such as :

- "gaining hands-on clinical experience",
- "putting classroom topics into practice",
- "creating a logbook of procedures",
- "being guided by the competency list & CSW", and
- "learning from the preceptor & staff".

Students regularly commented that doing clinical work helps them to better understand the didactic concepts presented in their other courses and provides a motivation for further and more in-depth learning.

Preceptor feedback, while obtained informally during the preceptor-DCE meetings, has also been valuable in making adjustments to the course. For example, six new competencies were added after the first three quarters based on preceptor discussions. Formal documentation of preceptor responses to specific questions on the practicum course structure, CSW, students' preparedness and background, and suggestions for program improvements has recently begun as part of each preceptor-DCE meeting.

Another important tool that can be used to determine how well this model is working is the CSW's clinical competency list itself. The final composite competency list scores at graduation for the 2009 and 2010 graduating classes were analyzed. Since the RFUMS model was first implemented in the Fall Quarter of 2008, the 2009 graduates were guided by the model for three quarters and used the traditional "follow and learn" methodology for three quarters. Figure 2 shows the distribution of scores for these six students. It is apparent that no student achieved scores of "competent" or "competent with supervision" in all of the approximately 150 items. Several items were left blank. This is in sharp contrast to the data shown in Figure 3 for the 2010 graduates. These

students were guided by the RFUMS model for all six clinical quarters. Here three of the five students for whom we have data achieved scores of “competent” or “competent with supervision” in every item. Only a few items were left blank.

Innovation:

Several factors contribute to make this model innovative. Both students and preceptors report that the structured format is more conducive to learning than the prior method (“follow and learn”). The CSW’s competency list serves as a guide to what must be learned and provides a way to measure learning outcomes. The CSW’s tasks and questions lead the student through the learning process and help to teach problem-solving skills. The required individual meetings enable adequate oversight, encourage communication, and allow for faculty intervention if necessary. Feedback to date indicates that students are mastering the material and are learning to work in a professional and thoughtful way. In addition, this model merited a national award for “Excellence in Educational Innovation” at the AAPM Annual Meeting in July of 2010.

Conclusion:

Following the RFUMS medical physics clinical practicum model, students actively participate in clinical practicum work at least two full days per week for six of their seven quarters in the program. They accomplish the majority of tasks outlined in the clinical competency list prior to graduation with scores of “competent” or “competent with supervision”. They achieve a good level of understanding of clinical procedures, and benefit from the enhanced structure the course provides. Thus, through the use of a clinical skills workbook and structured practicum course in combination, the RFUMS model seeks to ensure that master’s degree students will learn to safely, competently, and appropriately practice clinical medical physics.

Figure 1: Example questions from the students' course evaluation form with mean scores over 8 quarters (total N=48):

- The CSW **competency list** serves as a helpful guide to what a practicing medical physicist needs to be able to do: **4.0**
- The CSW **list of modules** serves as a useful guide to what topics must be mastered prior to graduation: **3.7**
- The **tasks** outlined in the CSW are appropriate & useful: **3.6**
- Keeping a **logbook** documenting the steps of various tasks will serve as a useful guide for my future work: **3.6**

(1="strongly disagree"; 2="disagree"; 3="neutral";
4="agree"; 5="strongly agree")

Figure 2: Percentage of Final Composite Competency List Scores for 2009 Graduates – these students used the "follow & learn" method for three quarters and the RFUMS medical physics clinical practicum model for three quarters:

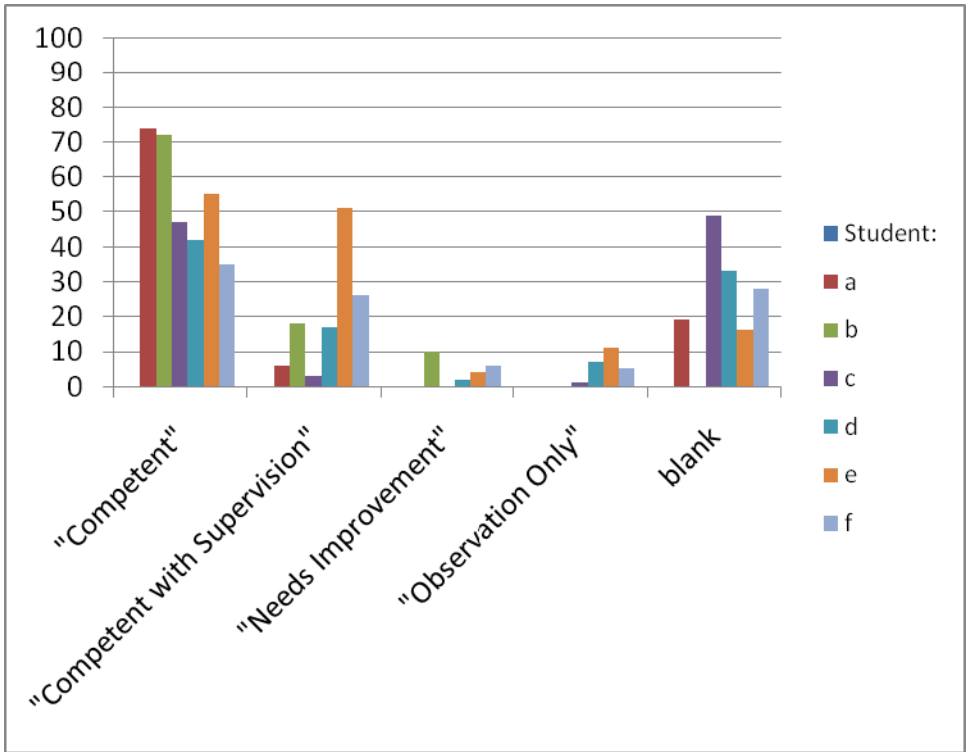
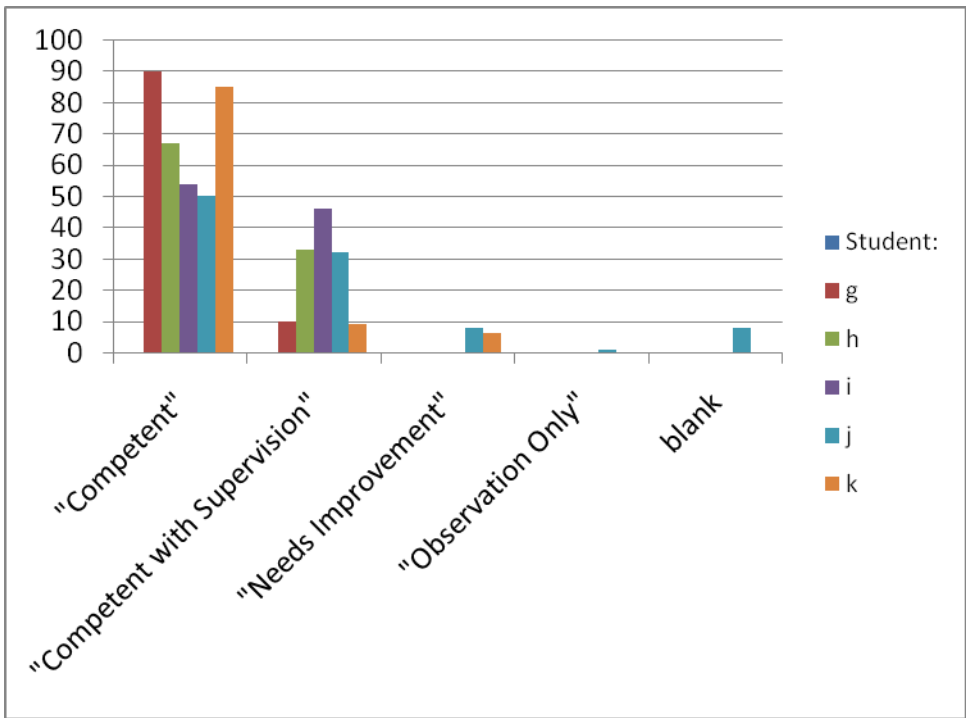


Figure 3: Percentage of Final Composite Competency List Scores for 2010 Graduates – these students used the RFUMS medical physics clinical practicum model over all six quarters:



References:

1.) J. Spencer, “Learning and teaching in the clinical environment”, British Medical Journal 326, 591-594 (2003).

2.) E. Goldstein, et.al., “Promoting fundamental clinical skills: a competency-based approach at the University of Washington”, Academic Medicine 80 (5), 423-433 (2005).

3.) R. Kneebone, “Evaluating clinical simulations for learning procedural skills: a theory-based approach”, Academic Medicine 80 (6), 549-553 (2005).

4.) N. Kenny, et.al., “Role modeling in physicians’ professional formation: reconsidering an essential but untapped educational strategy”, Academic Medicine 78 (12), 1203-1210 (2003).

5.) D.G. Kassebaum and R.H. Eaglen, “Shortcomings in the evaluation of students’ clinical skills and behaviors in medical school”, Academic Medicine 74 (7), 842-849 (1999).

6.) H.H. van der Hem-Stokroos, et.al., “How effective is a clerkship learning environment?”, Medical Teacher 23 (6), 599-604 (2001).

7.) R.K. Reznick, “Teaching and testing technical skills”, The American Journal of Surgery 165 (3), 358-361 (1993).

8.) D.A. Kolb, et.al., “Experiential Learning Theory: Previous Research and New Directions”, in Perspectives on Thinking, Learning, and Cognitive Styles, edited by R.J. Sternberg and L. Zhang (Lawrence Erlbaum Associates, Inc., New Jersey, 2001), pp. 227-229.

Image Wisely™ Focuses on Dose Reduction in Adults

By Matthew Robb

At the RSNA Scientific Assembly and Annual Meeting, Nov. 28–Dec. 3, the ACR/RSNA Joint Task Force on Adult Radiation Protection launched Image Wisely™, a high-visibility campaign that seeks to deepen understanding of adult radiation protection among radiologists, referring practitioners, medical physicists, and radiologic technologists. While

the educational component is sweeping in scope, perhaps even more noteworthy is the Image Wisely call to action.

“Radiation awareness has increased exponentially in the last few years, but now Image Wisely is asking stakeholders to actually commit — by pledging their support and utilizing the radiation safety resources available on its new website,” says James A. Brink, MD, FACR, Chairman of Diagnostic Radiology, Yale University School of Medicine. Brink co-chairs the Image Wisely Joint Task Force with E. Stephen Amis Jr., MD, FACR, Chair of Radiology, Albert Einstein College of Medicine.

Image Wisely is a collaborative effort of four charter members: the American College of Radiology (ACR), the Radiological Society of North America (RSNA), the American Association of Physicists in Medicine (AAPM), and the American Society of Radiologic Technologists (ASRT). Image Wisely follows on the remarkable success of Image Gently™, which since its January 2007 start continues to focus attention on safe imaging of pediatric patients.

“Image Wisely seeks to raise awareness of opportunities to eliminate unnecessary imaging examinations and to lower radiation in necessary imaging examinations to only that needed to acquire appropriate medical images,” Brink notes. “Initially, the campaign will focus on computed tomography (CT), but will broaden to include nuclear medicine procedures, fluoroscopy, and radiography,” says medical physicist William R. Hendee, PhD, FACR, distinguished professor of radiology at the Medical College of Wisconsin.

Through education and networking, the Joint Task Force anticipates the campaign will significantly expand participation among affiliated health care organizations, educational

institutions, government agencies, and vendors. The campaign logo, a wise owl, is expected to give Image Wisely instant brand recognition.

Imaging stakeholders will have at their fingertips an exceptional array of electronic and print resources, including a new, state-of-the-art website linked to **www.RadiologyInfo.org** for patient information. This highly successful website, cosponsored by the ACR and the RSNA, will give patients and the general public an interactive resource guide outlining the benefits of medical imaging vis-à-vis the risks of exposure to ionizing radiation. In addition, the Image Wisely website will provide links to vendor microsites that outline dose-reduction techniques on specific equipment. Combined, these user-friendly resources — described as "the best of the best" by Amis — will foster greater insight among imaging professionals, patients, and the public at large, while underscoring the reality that radiation dose in adult imaging requires further study and is impacted by numerous factors.

In its calls to action, Image Wisely will ask stakeholders (individuals and groups) to demonstrate their involvement by electronically signing formal online pledge cards "that demonstrate their commitment to the campaign's overarching principles," Amis says.

Amis also encourages facilities to enroll in ACR accreditation programs and participate in national dose index registries. Brink notes that the ACR has "a vigorous radiation protection process as part of its CT accreditation program," and says ACR Appropriateness Criteria™ enhance quality of care by providing evidence-based guidelines so that referring practitioners and other professionals can make the most appropriate imaging decision for a specific clinical condition.

Image Wisely reminds all that the radiation received from medical imaging scans could, over time, have adverse effects, but these advanced technologies also save lives, reduce the need for surgery, and speed recovery. "CT, nuclear medicine procedures, angiography, and interventional imaging methods give us powerful tools, but do deliver fairly high doses of radiation. We as medical physicists need to ensure the protocols we use are optimized according to the as low as reasonably achievable (ALARA) concept, without compromising quality," says Hendee.

Greg Morrison, Chief Operating Officer, American Society of Radiologic Technologists, sees the nation's 300,000 registered technologists as central to dose reduction. "As the final imaging professional that can make a difference before exposure, it is the technologist's

responsibility to take an active role and ensure that dose is reduced through every means possible," says Morrison.

A special interest session at the RSNA Annual Meeting provided additional details about the Image Wisely campaign.
