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From the editor . . .

This issue of *The Radiographer* is dedicated to education. We are pleased to include the winning essays from our 1996 MSRT Competition.

Shawn Snider won first place at the technologist level for "Documentation in Radiology: Essentials of Recording the Exam History"; Debbie Kinsella won first place at the student level for "Gamma Knife: The Personal Observations of a Second Year Student."

With continuing education becoming a requirement, we are offering .5 accreditation points to everyone who reads Shawn's essay, correctly answers the questions at the end, and returns the answer card no later than Feb. 28. Answers must be mailed to Denise West, 1605 West Ninth, Sedalia, MO 65301. Please include your name, Social Security number, and ARRT registry number.

We hope you enjoy this issue; Happy New Year!

Denise West

From the president-elect . . .

Fellow Technologists:

The success and growth of the Missouri Society of Radiologic Technologists over the past few years is due largely in part to the many dedicated, hard working volunteer technologists. The MSRT is once again looking for a fresh supply of volunteers.

Committee volunteers for the following areas are needed: Essay, Legislative Activities, Program, Student Activities, Ways and Means, Nominations, Student Bowl, Membership, and Exhibit.

The technologists in Missouri are all dedicated professionals who, I am sure, want to help maintain the strength and respect of their fellow healthcare professionals. This can best be done by maintaining the strength of their professional organizations, so please lend your time and talents to the MSRT. The more technologists who volunteer, the less work there will be for each individual technologist to help lead our profession into the next millennium.

Contact me or any MSRT Board member to find out more about these positions and how you can help!

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Documentation in Radiology: Essentials of Recording the Exam History

By SHAWN SNIDER

Introduction

Documentation is an area that is problematic for many radiographers.[1] However, radiographers contribute to patients' health care through quality in imaging, and should contribute to the medical record through quality in documentation.

Essential Radiology documentation which should be included in the medical record include: the radiologists' interpretation, documentation of informed patient consent to procedures, documentation of contrast administration, pre- and post-procedure instructions, and detailed documentation of care during invasive procedures. In this essay, I will focus on the radiographer's role in the most familiar type of documentation in Radiology: the patient history related to routine radiographic exams. Although this documentation is discussed from a hospital-based Radiology department perspective, the information is applicable in any Radiology practice.

The Medical Record

A complete and accurate medical record serves many purposes. The medical record serves to keep all members of the health care team informed about a patient's care and provides a permanent record of the care delivered. Accurate documentation of care helps ensure the safety and continuity of care, and the medical record is a legal document regarding the patient's health care.[2]

Data is also extracted from the medical record for other uses within the health care organization. Continuing education, risk management, reimbursement, and research all depend on the medical record for accurate information regarding a patient's care and the outcomes of that care.[3] Documentation of care is also essential for receiving and retaining facility accreditation and licensing.[4]

The Exam History

The type of documentation with which radiographers are most familiar is recording the history for a radiographic exam. Even though writing an exam history is seen as a relatively routine task, the information presented in the history can affect exam interpretation, continuity of care, and reimbursement for the procedure.

The exam history, even on simple procedures, communicates to the radiologist the patient's symptoms and/or clinical diagnosis. Accurately relaying clinical information to the interpreting radiologist has been shown to improve diagnostic accuracy.[5,6] Berbaum, El-Khoury, et al, identified two important aspects of the clinical history which improved evaluation of radiographs by radiologists: "...indication of specific locations for intensive evaluation," and "clues to search for particular abnormalities."[7] Information must be provided in sufficient detail to guide the radiologist's attention to the area of interest and present the relevant "clues" which assist in making an accurate diagnosis.

Shawn Snider is the author of the winning tech essay printed here.

The satisfaction of referring physicians is also increased when the question which they sought to have answered when referring the patient is directly addressed by the interpreting radiologist.[8] A general surgeon may expect quite different information from an abdominal CT scan of a patient with post-surgical abdominal pain than a vascular surgeon desires from the same exam on a patient with a pulsatile abdominal mass. The radiologist's understanding of the clinician's needs is, again, dependant on the information presented in the exam history.

In a perfect Radiology department, each patient would present with a history from the referring physician which relayed in detail the patient's history, symptoms, and a clinical diagnosis. However, this ideal history is often difficult to obtain from clinicians.[9] Time pressure in the referring physician's office and on the personnel scheduling the exam in the Radiology department may prevent detailed communication of clinical findings when an exam is ordered by telephone. Also, many physicians seem reluctant to give a patient a written order which contains a clinical diagnosis which may cause anxiety in the patient. This reluctance is compounded by the fact that the exam will often disprove the clinical diagnosis. This "misdiagnosis" may cause the patient to doubt the physician's diagnostic skills, the results of the radiologic exam, or both. While

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radiographers must not ignore symptoms and clinical diagnoses provided by referring physicians, they must also become skilled at obtaining pertinent clinical information directly from the patient and communicating it accurately to the interpreting physician.

Medical Records Coding

After the exam, the history obtained by the radiographer must be relayed to the Medical Records department with the exam interpretation. Ideally, the history is incorporated into the radiologist's report as the indication for the procedure. If the history is not dictated in the radiologist's interpretation, a mechanism for transferring the history obtained by the radiographer to Medical Records must be developed. This may be as simple as copying the exam history form and attaching it to the radiologists' written interpretation.

The Medical Records department has the responsibility of ensuring that documentation is complete and accurate for each patient encounter in the facility.[10] In Medical Records, the diagnostic and treatment procedures performed, the symptoms for which they were performed, and the diagnosis obtained are all converted into numerical codes.[11] These codes are designed to standardize communication with public health agencies, regulatory bodies, and payers regarding a patient's care and diagnosis[12] For inpatient Medicare patients, the final diagnosis made by the attending physician and coded by Medical Records will result in assignment of the patient to a diagnosis related group (DRG). The hospital's reimbursement for the patient's stay will be based on the DRG.

For outpatient radiology procedures, the accuracy of coding is directly dependant on the accuracy of the history provided to Medical Records by referring physicians and Radiology personnel. Extended direct contact with the patient gives the radiographer an excellent opportunity to obtain and document an accurate history relevant to the imaging exam performed. This is especially important when the information provided by the clinician is limited.

Reimbursement

The codes produced in Medical Records communicate what procedure was performed on a patient and provide documentation of the medical necessity for the procedure.[13] Accurate documentation of medical necessity is essential when payment is being made by "third-party" payers such as Medicare, Medicaid, or an insurance company. The need for proof that only medically necessary procedures are performed is created because neither the buyer (the patient) or the seller (the hospital) has an incentive to limit the amount of service consumed if someone else (insurance or Medicare) is paying for it. In an unrestricted third-party payment system, the patient wants to receive the best and most complete care available at any cost, and the provider receives more income with each additional service[14]. To control the overuse inherent in such a system, third party payers require that medical necessity is proven before a procedure is reimbursed.

The link between reimbursement and the coded indication for an exam is undeniable. Some diagnoses or symptoms are more likely to cause a diagnostic imaging study to be viewed as medically necessary by payers.[15] However, the radiographer must never record an exam history in order to generate reimbursement.[16] This can have several adverse effects.

Statistics which determine future health care planning and budgeting are based on the codes reported to Medicare and other third-party payers.[17] These statistics are skewed if diagnoses are inaccurately recorded and, therefore, inaccurately coded.

More tragic consequences can result from misrepresenting patient history to obtain reimbursement:

> "...A patient...following a CT scan, happened to see the diagnosis 'brain tumor' listed on her Medicare claim form. Although she had been told she was free of cancer, the woman went home and committed suicide. A billing secretary had used white-out over the words 'rule out' preceding the tumor diagnosis, apparently because the carrier wouldn't pay for a CT scan to rule out an illness."[18]

Although this is an extreme example, a diagnosis recorded to facilitate reimbursement can result in other devastating effects on a patient. Health conditions documented in the medical record may cause a person to be considered uninsurable or a poor risk for a some kinds of employment. Altering a diagnosis or misrepresenting the necessity for a procedure may also result in scrutiny of a health care provider under fraud and abuse regulations.[19]

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Practical Application

In view of all the ramifications of something as "simple" as the history of a routine radiology exam, what are the practical applications for the radiographer?

Some of the essentials for the exam history are axiomatic. Name, age, gender, birth date, and patient identification number must be included.[20] This data provides confirmation that the history recorded is for the patient to whom it is attributed. The exam performed, date of the exam, and the time the exam was performed are also vital to correlate the history with a specific patient encounter. Recording the time is especially important when the same patient is radiographed on multiple occasions on the same date.

Although abbreviations are not used in this essay to prevent misunderstanding by the reader; in actual practice, abbreviations should be used whenever possible.[21] Abbreviating common terms allows more information to be recorded in the space available. Only abbreviations approved by the facility should be used, however, so the information can be understood by others involved in the patient's care.[22] Each facility has a list of approved abbreviations. In hospitals, this list is available from the Medical Records department.

Documentation of female patients' pregnancy status or last menstrual period is needed to ensure that a developing fetus is not exposed to unnecessary radiation.[23] Any time a physician orders an exam performed in spite of a known pregnancy, that information and shielding precautions taken must also be noted. A note such as, "Patient pregnant. Dr. X informed, ordered exam performed. Abdomen shielded front and back," provides documentation of the medical decision to perform the exam and the technologist's adherence to proper radiation protection practices as outlined in facility policies.

Documentation of radiation shielding, even when pregnancy is not an issue, is valuable. Since radiation has potential adverse effects on future generations, any individual - male or female - who is potentially reproductive should be shielded whenever possible.[24] Consciously checking off on the exam history form whether appropriate shielding was used can encourage radiographers to be more conscientious in shielding.

In recording the indications for the exam, the radiographer must first review any history or diagnosis provided by the referring physician. This information should be noted as the clinical diagnosis with the diagnosis in quotation marks to denote that it came from the referring physician. As previously discussed, knowing why the clinician ordered the exam aids the radiologist in interpreting it in a satisfactory manner.

However, a hand x-ray with the common clinical history of "rule out fracture" doesn't provide much guidance for interpretation. The radiographer must be able to enhance this history by careful questioning of the patient and accurate recording of the information obtained. Pertinent questions in this case would include: When and how was the injury sustained? What is the specific area of injury? Is the range of motion affected? The history then might be recorded as:

> "Clinical diagnosis: 'Rule out fracture.' Patient reports crushing injury to hand last night. Pain/ swelling to 3rd metacarpal-phalangeal joint. Unable to straighten 3rd finger."

This history will relay the clinical diagnosis while focusing the radiologist on the area of injury and suggesting specific types of damage to suspect.

A simple rule of thumb for documenting history is to record "cause and effect" when they can be determined. This is especially helpful in exams performed subsequent to injury.

> "High-speed motor vehicle accident with seat belt on. Pain and swelling to left clavicle. Cervical collar in place on arrival. Obvious deformity of left ankle."

A history such as this provides documentation of several items important for interpretation, legal, and reimbursement purposes. The radiologist can determine that high-energy injuries are likely to be present and envision a seat belt injury to the left clavicular area. The presentation of the patient with a cervical collar on explains why a cross-table lateral cervical spine radiograph was obtained in addition to a routine cervical series (in accordance with facility trauma policies). From this history, a payer would be expected to view radiographs of the left clavicle, left ankle, and cervical spine as medically necessary.

The fact that the injuries in this example were sustained in a car accident is significant from another reimbursement standpoint. Injuries sustained in a motor vehicle accident may be covered by an auto insurance policy instead of, or in addition to, a standard medical insurance policy[25]. This may also be true of other types of accident insurance. Inclusion of the cause of an

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injury will help in filing claims with the correct source of payment. This prevents delays and confusion, and benefits both the hospital and the patient.

The indications for radiology exams are not always readily apparent. A patient scheduled for a chest x-ray is unlikely to say, "I was involved in a high fat diet, and now I have chest pain." However, there is often pertinent information which is not provided by the clinician, yet needs to be recorded for the accuracy and completeness of the exam history.

The need to record the presence or absence of current symptoms is well documented in mammography.[26] Current breast complaints determine that a "diagnostic" mammogram must be performed; in the absence of symptoms, "screening" mammography is performed. In the eyes of the radiologist, the Medical Records coder, and third-party payers, the two types of mammography exams are completely different. The difference is the presence of current symptoms.

The same precept applies to other diagnostic imaging procedures with one difference: Except for mammography, there are no screening procedures performed in Radiology. Every exam should be performed for current complaints. Table 1 lists some of the basic indications which should be reviewed for the noted exams[27]. Similar questionnaires can be developed for other exams by brainstorming with radiologists and Medical Records personnel. The symptoms and history elicited in questioning provide documentation of symptoms which can be coded by Medical Records when the physician diagnosis is absent. It is important to limit documentation in such cases to recording symptoms; the radiographer must not attempt to make a diagnosis for the physician.

The over-riding question which the exam history must address is: Why is this patient having this exam at this time? Any information which contributes to answering that question is pertinent and should be recorded as accurately as possible.

Table 1. INDICATIONS FOR COMMON EXAMS

Patients should be questioned about current symptoms and/or clinical diagnoses appropriate to the procedure. Care should be taken to phrase all questions in laymen's terms.

EXAM: CHEST X-RAY

Current complaints of:

Cough? Fever? Congestion? Coughing blood? Shortness of breath? Chest pain?

Clinical diagnosis of:

Myocardial infarction? Heart failure? Heart disease? High blood pressure? Pneumonia? Tuberculosis? Pneumothorax? Broken ribs? Cancer?

EXAM: INTRAVENOUS PYELOGRAPHY

Current complaint of:

Pain? Fever? Difficulty in urination? Blood in urine?

Clinical diagnosis of:

Kidney failure? Cancer? Kidney stones? Bladder or kidney infection?

Based on Obergfell, A.M. *Law and Ethics in Diagnostic Imaging and Therapeutic Radiology*, pp. 192-193.

Conclusion

Radiographers need to view meticulous documentation of the exam history as an integral part of the practice of their profession. Education about the facility's policies governing documentation must be a part of the orientation and continuing education for radiographers. Even though the document may only be a few lines long, an accurate and complete exam history has great value to the patient, the interpreting physician, and the facility. Radiographers readily accept their responsibility to produce accurate diagnostic images. With practice, radiographers will become just as comfortable and competent in their duty to contribute to patient care through accurately documenting the history which makes those images necessary.

(Notes on page 8.)

Documentation in Radiology Notes . . .

1. Obergfell, A.E. *Law and Ethics in Diagnostic Imaging and Therapeutic Radiology.* (Philadelphia: Saunders, 1995), p. 69.

2. Timby, B. K., Lewis, L.W. *Fundamental Skills and Concepts of Patient Care, 5th Edition.* (Philadelphia: Lippincott, 1992), pp. 54-55.

3. Loeb, S., Cahill, M., et al. *Nurses Handbook of Law and Ethics.* (Springhouse, PA: Springhouse, 1992), p. 238.

4. Timby, B. K., Lewis, L.W. p. 55.

5. Berbaum, K.S., Franken, E.A.,Jr., Dorfman, D.D., et al. "Tentative Diagnoses Facilitate the Detection of Diverse Lesions in Chest Radiographs," *Investigative Radiology*, 1986, 21: 532-539.

6. Berbaum, K.S., Franken, E.A.,Jr., Dorfman, D.D., Barloon, T.J. "Influence of Clinical History Upon Detection of Nodules and Other Lesions," *Investigative Radiology*, 1988, 23: 48-55.

7. Berbaum, K.S., El-Khoury, G.Y., et al. "Impact of Fracture Clinical History on Fracture Detection with Radiography," *Radiology*, 1988, 168: p. 510.

8. Hoy, R., Straub, W., and Cassidy, F. "Radiology Reporting - A Concatenation," Administrative Radiology, Feb. 1992: p. 44.

9. Walsh, E. "The Coder's Dilemma: Expediency vs. Accuracy," *Administrative Radiology*, April, 1992: p. 41.

10. Skurka, M.F. *Health Information Management in Hospitals.* (Chicago: American Hospital Publishing, 1994), p. 10.

11. Wright, M.L., Clinton, M.G., et al. *AHRA Radiology Reimbursement Reference.* (Sudbury, MA: American Healthcare Radiology Administrators, 1991), p. 4-5.

12. Skurka, op cit: pp. 105-106.

13. Wright, Clinton, et al. op cit: p. 6.

14. Menzel, P.T. *Strong Medicine: The Ethical Rationing of Health Care.* (New York: Oxford, 1990), p. 3, 5-6.

15. Walsh, E., op cit: p. 40.

16. Hubbard, P. (ed.) *St. Anthony's Radiology Coding Clinic: Managing the Coding and Reimbursement Challenges.* (Reston, VA: St. Anthony, 1995), p. 1.

17. Hubbard, op cit: p. 1.

18. Walsh, op cit: p. 41.

19. Hubbard, op cit: pp. 8-9.

20. Obergfell, op cit: p. 70.

21. Timby and Lewis, op cit: p. 64.

22. Obergfell, op cit: p. 73.

23. Obergfell, op cit: pp. 70-71.

24. Dowd, S.B. *Practical Radiation Protection and Applied Radiology.* (Philadelphia: Saunders, 1994), p. 188.

25. Segraves, D., Ed. *Compensation for Automobile Injuries in the United States.* (Oak Brook, IL: AIRAC), p. 5.

26. Public Health Service, Agency for Health Care Policy and Research. *Quality Determinants in Mammography.* (Rockville, MD, 1994), p. 5.

27. Obergfell, op cit: pp. 192-193.

Please turn to page 9 to begin 20-question quiz on the essay, "Documentation in Radiology: Essentials of Recording the Exam History."

An answer card has been provided for you on the back cover of this magazine.
To be eligible for .5 accreditation points,
please fill in the answer card, cut along dotted line,
affix 32 cents postage, and return no later than Feb. 28 to:

Denise West
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Questions from Documentation Essay . . .

1. A patient's medical record

a) is not considered a legal document.

b) is public information.

c) provides a permanent record of the patient's health care.

d) all of the above.

2. The radiology exam history should be limited to information provided by the referring physician.

a) True

b) False

3. A detailed radiology exam history

a) can improve the accuracy of the radiologist's interpretation.

b) can improve physician satisfaction with interpretations.

c) has little impact on interpretation.

d) a and b

4. Referring physicians may not provide clinical diagnoses when ordering radiographic exams

a) to see if the radiologist is able to find unsuspected disease.

b) to prevent patient anxiety.

c) because the exam is for disease screening.

d) all of the above.

5. Symptoms and diagnoses may be coded by Medical Records as the indications for a Radiology exam.

a) True

b) False

6. The numerical codes used in Medical Records are unique to each facility.

a) True

b) False

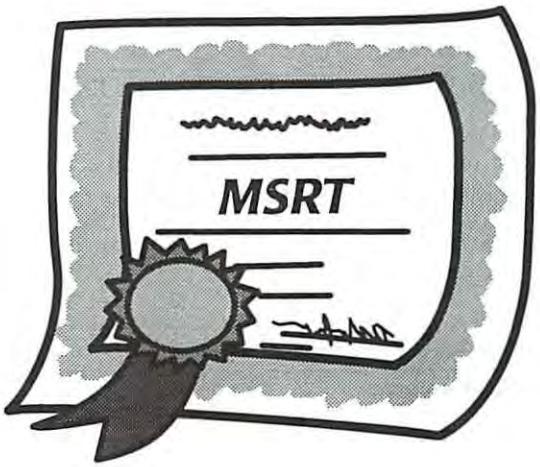
7. The Medical Records department is responsible for

a) patient scheduling.

b) billing.

c) ensuring that the medical record is complete for each patient encounter.

d) none of the above.



8. Numerical codes are used

a) to record the procedures performed on a patient.

b) to report the symptoms for which a procedure was performed.

c) to standardize communication between health care entities.

d) all of the above.

9. The radiographer has little opportunity to obtain a history from the patient.

a) True

b) False

10. Documenting the "medical necessity" of a procedure is essential

a) for "screening" procedures.

b) when reimbursement is being made by a third-party payer.

c) when payment is being made in cash.

d) when the procedure is experimental.

11. If written by a physician as the indication for an exam, "Rule out..." and "probable..." are acceptable to code as a diagnosis.

a) True

b) False

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Questions from Documentation Essay . . .

(Continued from page 9)

12. Recording diagnoses which are more likely to be paid can result in

a) inaccurate health and epidemiology statistics.
b) classification of a patient as uninsurable.
c) prosecution for fraud.
d) all of the above.

13. Patient identification data which must be on the patient's medical record include

a) name.
b) birth date.
c) patient identification number.
d) all of the above.

14. Abbreviations

a) should never be used in recording the radiology exam history.
b) may be used if they are common.
c) must be approved by the facility.
d) are standardized by Medicare.

15. Radiation shielding should be documented only if a patient is known to be pregnant.

a) True
b) False

16. Useful information which the radiographer can provide in the radiography exam history includes

a) the x-ray unit used.
b) the cause of the injury.
c) the specific area of pain.
d) b and c

17. Medical necessity for a radiology exam need only be documented for Medicare patients.

a) True
b) False

18. Documentation of current symptoms is necessary for

a) diagnostic mammography
b) screening mammography
c) fluoroscopy exams
d) a and c

19. The essential information which the exam history should document is

a) past illnesses.
b) prior radiology exams performed at other facilities.
c) why the patient is having the ordered exam at this time.
d) a physician's diagnosis.

20. When obtaining history from a patient, the technologist must

a) phrase questions in laymen's terms.
b) find out what the physician is trying to rule out.
c) make a clinical diagnosis.
d) determine if the patient needs additional exams.

GAMMA KNIFE:
The Personal Observations of a Second Year Student

By DEBBIE KINSELLA

The date is April 6, 1984. After nine long months of watching your infant have uncontrollable seizures, nine long months of hospital stays and nine long months of negative tests and CT scans, you take all his films and records to a children's hospital, praying they might have a cure. The pediatric neurologist answers your prayers. He has consulted with the pediatric neurosurgeon and they concur. Your ten month old son should be transferred to their facility immediately. He has a massive brain tumor and surgery has already been scheduled.

In 1984, surgery would have been the only option. However in 1995, with the technological advances in radiology, the patient would have another option, gamma knife treatment. Gamma knife treatment is a "stereotactic radiosurgery, which involves a single dose of precisely targeted radiation to noninvasively destroy an intracranial lesion" (Morantz, Wara, p. 300).

Request was made, and granted by the Midwest Gamma Knife Center located in Kansas City, Missouri, that this second year student observe an actual gamma knife procedure. The patient being treated was a 68 year old woman who had been experiencing numbness in her right shoulder followed by right sided numbness. Her right leg began to drag. She began bumping into objects on her right side. Her only previous surgery had been an appendectomy. She had been diagnosed with having an anaplastic astrocytoma.

When I arrived at 7:00 am, the patient was already being prepared for treatment. One of the two registered nurses (RN), took base line vital signs, and they looked good. The other RN asked the patient a whole litany of questions.

A Polaroid photograph of the patient was taken for the gamma knife center's records. Keeping the photograph in the patient's record is a regulation of the Nuclear Regulatory Commission to ensure patient identification for any future treatment.

Ativan was administered in order to relax the patient. "I don't think I'll need too much," she said, "because I didn't sleep well last night."

The RN's began to drape sterile cloths around the patient's neck. Her forehead and neck areas were wiped clean with alcohol. The two neurosurgeons arrived to attach the head frame to the patient's skull. They lined up the frame to marks made at an earlier date on her forehead and injected Lidocaine where the screws would enter her skull. The left. frontal area was injected with Lidocaine and the screw was set in place. The right rear, the right frontal and the left rear areas were also injected and the screws were set in place. After all the screws were in place, they were double checked for accuracy, and then tightened. I observed blood dripping down from the forward screws but was unable to see if the same was happening with those in back.

A plastic piece of head gear referred to as a "fiducial" was attached to the head frame with clips. This fiducial, a clear globe, similar in design and appearance to a salon style, upright hair dryer costs about $30,000. Like a hair dryer, this globe also contains holes. These 201 holes go straight through, from the outside in, at specific intervals, toward the skull. The RN's inserted a long thin tool into the holes taking a series of readings both right and left, front and back, in order to plot the size and shape of the patient's skull. These readings were first taken on one side and then the other. The RN's then switched places, taking the readings twice as a double check. These readings were entered into a computer and checked again for accuracy.

Debbie Kinsella is the author of the winning student essay printed here.

One more Polaroid photograph was taken of the patient. This time the photograph was for the patient. She said her grandchildren would think she was an astronaut.

We wheeled the patient into the holding area and transferred her to the Magnetic Resonance Imaging (MRI) gurney. In order to reduce patient discomfort, earplugs were inserted into her ears to decrease the loud noise generated by the magnets in the MRI suite.

Upon arriving at MRI, I was told that in order to go into the magnet room I had to remove all metallic objects, which was no small task for me. Off went the rings, earrings and necklace. I emptied my pockets of change, pens and car keys. I also had to leave my radiation badge outside and any credit cards. The other

(Continued on page 12)

GAMMA KNIFE: Personal Observations . . .

(Continued from page 11)

three people in the room knew better. One RN only had to remove his watch! The patient was transferred to the MRI table where the fiducial was then attached to a specialized frame for sterilization.

The importance of the head frame was explained as follows by a physicist, who would prove to be an integral part of the gamma knife team. On each side of the head frame was a diagonal going from the bottom left of the patient's skull to the top right of the patient's skull. The head frame would show up on the MRI's cuts as three dots on each side of the patient's skull, one dot at the intersection of the bottom left with the diagonal of the head frame, one dot at the center point of the diagonal and one dot at the intersection of the top right with the diagonal. The distances left and right of the center dots would be measured and compared for alignment. A variance of two millimeters would be an acceptable limit for the equipment. With this patient, a variance of only one millimeter was tolerated. These measurements had to be accurate so the co-ordinates would be as precise as possible for the gamma knife treatment.

The MRI technologist began the test scan and the head frame was, in fact, barely seen as three dots lateral to the patient's skull. The first alignment measurements were off by two millimeters. The RN's went back into the MRI suite and tried to readjust the head frame to a one millimeter alignment level. They did this with nudges from door stops and other smaller plastic shivs to the fiducial.

Another test scan, more measurements, and alignment was still off two millimeters. The RN's seemed to be getting a little frustrated as they went back into the MRI suite to realign the fiducial once more.

One more test scan taken by the MRI technologist and more measurements. This time, the MRI technologist reported the good news, the measurements were only off one millimeter. It was a "go." The first series of scans took about eight minutes. The second series of scans took nearly another fifteen minutes.

The images were checked, visualized and approved by the physicist. The patient was then injected with contrast, thirteen cc's of Gadolinium, to better visualize the anatomy. Contrast will collect wherever there is a breakdown in the blood-brain barrier. The MRI technologist began the scanning again. The same series of scans would be repeated, this time with the contrast agent instilled.

After the MRI scanning, we moved the patient back to holding and transferred her onto the Gamma gurney. I was asked to stay with her while the RN's returned to MRI. The patient was still awake and very relaxed. She commented to me that she was just amazed at modern medicine and though she looked like she was from outer space with all her head gear on, it was worth it to not suffer the consequences of conventional surgery.

Upon returning to the gamma knife suite, the patient's family was invited into the gamma knife procedure room where they would keep her company until the actual procedure began. The patient rested comfortably, dozing on and off, conversing with her family for the next few hours before the gamma knife procedure began.

I was allowed to accompany the physicist to his office where the gamma knife plan was initiated. The first thing he did was to call the MRI computer to access and transfer to his computer (Laksell Gamma Plan) the set of images we had just taken with the MRI. This transfer took only thirty minutes. He then had to re-program the scans to the gamma computer and reset the fiducials.

The physicist made his display of the scans smaller for greater precision. He outlined the mass on his computer generated scan and compared it to the previous scan, looking for any unilateral differences to outline.

After he outlined the mass, the plan began. How many doses (gamma treatments from 201 points) must be given based on the size and shape of the mass? The color computer normalized to the "hot spot." Because of the precision of the gamma knife, any target that is not circular in shape may require any number of doses to cover the entire area. On a previous procedure, only 30 minutes was spent in planning. This mass was elliptical in shape and rested in a very difficult area, the thalamus gland. Over an hour went by and the physicist was still planning the treatment, plotting his fourteenth dose. Adding one dose may affect the placement of the ones that were planned before. Unfortunately, this was the case.

The neurosurgeon and radiation oncologist arrived and all three reviewed the plan. Any needed adjustments to the plan were made at this meeting. Volume was 3mm x 2mm x 3mm, much larger than the neurosurgeon had anticipated. There was conversation to determine if the surrounding border of the image displayed edema or tumor. The neurosurgeon justified that during

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GAMMA KNIFE: Personal Observations . . .

(Continued from page 12)

the biopsy he chose a larger area, far from the border, to biopsy because he believed he was dealing with "a less dense, minimally enhancing tumor with a good border and very encapsulated." The radiation oncologist concurred.

At this point, everything must be and wad justified. Discussion regarding the desired dosage of radiation began. "Based on the volume of the lesion, 18 mm, 15 gray, 60% isotope producing a greater penumbra, 750 to 1000 shot would have no deficit, brain stem tolerance 1200, optic chiasm/optic nerve 800," stated the radiation oncologist. (It was truly hard to keep up with my notetaking, and it did not seem like the best time for questions.) The radiation oncologist believed the "anaplastic astrocytoma also knocked off neurons." The neurosurgeon believed "that there was no good tissue of the thalamus gland left." They cited facts that resulted with their findings. It was finally decided. The patient would receive 14 doses to her egg-shaped mass.

The patient was transferred from her gurney to the gamma knife bed. The head gear she has worn all day was attached to trunnions on the collimator helmet. X, Y and Z coordinates were set, checked and rechecked. All steps were not only double checked but now triple checked to ensure accuracy. The only thing the patient felt from this point on is the bed moving into position for treatment. Her vital signs were being monitored and she was wired with a microphone for two-way voice contact because we left the room to monitor her by camera.

The actual time taken to produce one dose was relatively short; 400 rads of radiation can be given each minute. Because this mass requires 14 doses, this patient was moved in and out of the gamma knife and repositioned by X, Y and Z coordinates within the collimator helmet 13 more times as planned.

After all the doses were administered, the patient was brought back to the prep area in the gamma knife suite where she had begun her day and the doctors removed the head frame by loosening the screws that held the fiberglass pins in place. If there had been a point of excessive bleeding where the pins were located, stitches would be required, but they were not required today. The patient was brought to the neurosurgical unit and was closely monitored for several hours to watch for any adverse reactions or effects which might include bleeding, headaches or nausea.

"Patients usually leave the hospital the day after the procedure. Gamma knife treatments do not cause long-term side effects like those attributed to external beam radiation. Also, unlike surgery, no infections, hemorrhages or other standard neurosurgical complications are associated with gamma knife procedures.

Long-term follow-up is coordinated by the patient, the referring physician and the neurosurgeons. To ensure adequate treatment either in reducing tumor size or stabilizing growth, both diagnostic testing and imaging with and without contrast is required at regular intervals following treatment. Because gamma knife treatments do not immediately obliterate the tumors, this follow-up testing is needed to chart progress" (Nestos et al., 1990 p. 981)

"The benefits of gamma knife treatments are reduced health risks, no hair loss or scarring, no pain, shorter hospitalization and reduced costs" (Wolf, p. 62). "The risks are mild nausea or headache. Though the dose is selected to treat the tumor while sparing surrounding brain tissue and nerves, depending on the size and location of the tumor, there may be delayed neurological difficulties due to radiation. Possible side effects would include reduced hearing, problems with vision, facial weakness, balance problems and weakness of arms or legs" (The Gamma Knife).

"With respect to benign and metastatic brain tumors, I believe radiosurgery will become the procedure of choice within the next several years.

The use of radiosurgery in the treatment of functional disorders will almost certainly increase as better imaging techniques allow us to delineate normal brain nuclei on MRI scans" (Morantz, p 4).

By way of introduction, the infant referred to in the opening paragraph of this essay is my twelve year old nephew. He was "mainstreamed" in fourth grade and received his first "B" last quarter, in sixth grade. His vision will never be 20-20, he will always experience some difficulty shooting from the three-point line and when shopping for new shoes he will probably always choose velcro over ties.

He is living with the effects of brain surgery and learning to overcome any difficulties it handed him. His brain tumor has not recurred but, if it does, there is another option.

(See References on page 14)

GAMMA KNIFE References . . .

(Continued from page 13)

Morantz, MD, Robert A. and Wara, MD, William M. "Gamma Knife Radiosurgery in the Treatment of Brain Tumors." *Cancer Control*, July/August 1995: pp. 300-308.

Nestos, RN, Angela, Mendicino, RN, Wanda, Gearhart, RN, SuEllen, and Sherer, RN, Joanne. "The Gamma Knife: Neurosurgery Without an Incision." *AORN Journal*, April, 1890: p981.

Wolf, MD, Aizik L. "Gamma Knife," *Medical Electronics*, February 1994: pp. 62-63.

The Gamma Knife, a pamphlet, Midwest Gamma Knife Center.

Morantz, MD, Robert A. "Use of Gamma Knife Radiosurgery in the Treatment of Functional Disorders and Potential Future Applications," Midwest Gamma Knife Center

Have you taken the quiz yet?

Please turn back to page 9 to begin 20-question quiz on the essay, "Documentation in Radiology: Essentials of Recording the Exam History."

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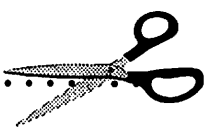

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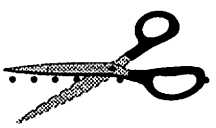

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