

Learning Portfolios in Radiology Residency Education: How Do I Get Started?

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As medical education and continuous professional development shift toward an outcomes-based model, there is increasing focus on the documentation of physician self-assessment and a commitment to lifelong learning. The Accreditation Council for Graduate Medical Education is helping prepare trainees for these changes by increasing the focus of graduate medical education on outcomes through the development of the 6 competencies. As part of this process, the learning portfolio is a new component of the Accreditation Council for Graduate Medical Education radiology residency program requirements. The purpose of this article is to familiarize the reader with the role of portfolios in medical education and to discuss strategies for the implementation of learning portfolios in a residency education program.

Key Words: Learning portfolio, residents, radiology, Accreditation Council for Graduate Medical Education
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INTRODUCTION

Medical education has evolved significantly during the past decade with increasing focus on self-directed learning, evidence-based practice, and outcomes-based assessment. These changes are occurring in response to an increasing demand for physician accountability and documentation of a commitment to lifelong learning [1]. The Accreditation Council for Graduate Medical Education (ACGME) helps prepare trainees for these changes by increasing the focus of graduate medical education on outcomes through the development of the 6 competencies: patient care, medical knowledge, interpersonal and communication skills, professionalism, practice-based learning and improvement, and systems-based practice [2]. Competency-based evaluation poses new challenges resulting in a search for additional assessment and documentation methods, including 360-degree evaluations, Objective Structured Clinical Examinations, and learning portfolios. Specifically, learning portfolios are recommended to fulfill the ACGME practice-based learning and improvement competency [3].

The purpose of this article is three-fold: (1) to familiarize the reader with learning portfolios in medical edu-

cation, (2) to outline the new radiology ACGME requirements for a portfolio, and (3) to discuss strategies for the implementation of a portfolio as a learning and assessment tool in a residency education program and continued professional development.

WHAT IS A LEARNING PORTFOLIO?

Portfolios were described by Wilkinson et al [4] as a “collection of material brought together for a specific purpose.” Portfolios have been used in the graphic arts to track the professional development of artists for a long time. They are also used extensively in primary and secondary education, and more recently, there is increasing interest in the implementation of learning portfolios in medical education [5,6].

There are myriad definitions and descriptions of portfolios in the literature. However, there is agreement that key features of learning portfolios:

- represent a purposeful collection that demonstrates evidence of learning and achievement over time;
- be learner-centered with a personal investment on the part of the student;
- include self-reflection and critical thinking;
- require active involvement of a coach or mentor;
- can function as a formative learning tool; and
- may be used as a formal assessment tool. However, concerns remain regarding reliability and validity [2,5-11].

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A portfolio can take the form of a notebook, computer-based template, or Web-based program [2,5,7,12]. Perhaps one of the greatest challenges and potential benefits of the learning portfolio involves the element of self-reflection. Although self-reflection is critical to professional development, this is difficult to perform in isolation, and formative feedback from a mentor fosters reflective learning. This learning can be triggered by a variety of situations, such as a critical incident, defined as a memorable positive or negative encounter or event in medical training or practice [5]. For example, an encounter with a patient, referring physician, or hospital staff personnel results in self-reflection and assessment, which then serve as a catalyst for professional growth. A perceived gap in knowledge, incorrect interpretation of a radiographic examination, or suboptimal result on a standardized in-training test stimulates the learner to identify an area of weakness. Learning activities are then developed that address specific objectives. These activities are followed by self-reflection and the assessment of measurable outcomes to demonstrate that the learning objectives have been met [4]. Documentation of this self-directed learning process in the portfolio then serves as evidence of a commitment to practice-based learning and continuous professional development.

WHAT ARE THE POTENTIAL BENEFITS OF PORTFOLIO LEARNING?

Learning portfolios evolved from a pedagogic reflection on the part of some major educational theorists, such as Donald Schon. In his book *The Reflective Practitioner*, Schon [13] described the challenges facing professionals, including physicians, resulting from rapid technologic advancements requiring continuous learning and adaptability to change. He then went on to describe the key role that reflection plays in the continuing process of self-education. Self-reflection is an essential component of learning portfolios and the development of an individualized learning plan. Through reflection, physicians identify learning needs and develop strategies so that they can apply this new knowledge to their ever-changing medical practice.

Although there is some evidence that learning portfolios improve educational outcomes, these data are limited. In a study of portfolio use in a psychiatry residency program, an unanticipated beneficial educational outcome was the impact on the curriculum, specifically, in identifying areas of curricular weakness [6]. This type of information has been used to help implement desired changes in curriculum and instruction [14]. In addition, there are qualitative data suggesting that portfolio learning increases recognition of accomplishments, encourages self-discovery and mentoring, and reinforces the

process of acquiring knowledge that can be applied in the work environment [15].

A potential benefit of portfolio learning in medical training is that it promotes self-directed learning and evidence-based practice, and it is proposed that this may ultimately result in improvements in the delivery of cost-effective quality medical care [7]. The portfolio will likely become an essential component of the documentation of a commitment to lifelong learning in the physician recertification process [4]. Thus, the reflective learning skills that physicians acquire during residency training will carry over into their continuous professional development during their career.

Outcomes that training programs can monitor to assess the return on the time and effort involved with learning portfolios have not been formally established; however, suggestions include the following:

- changes in medical practice or institutional guidelines as the result of a resident systems-based practice project;
- evidence for increased self-directed learning among trainees, such as an increased frequency of use of online resources or improved performance on standardized examinations;
- improvement in the quality of resident-dictated reports or a decrease in report errors (eg, left/right discrepancy) resulting from the formal evaluation of dictated reports; and
- changes in the curriculum resulting from portfolio assessment.

THE RADIOLOGY ACGME REQUIREMENTS FOR LEARNING PORTFOLIOS

The ACGME program requirements for diagnostic radiology graduate medical education (effective July 1, 2008) state that a program must “provide each resident with documented semiannual evaluation of performance with feedback” and ensure that this assessment includes global faculty evaluations, 360 evaluations, and resident learning portfolios.

The following learning portfolio components are required by the ACGME:

1. Patient care: case/procedure log
2. Medical knowledge: documentation of conferences, courses, meetings attended, self-assessment modules completed, and so forth
3. Medical knowledge: documentation of compliance with regulatory-based training requirements in nuclear medicine and breast imaging
4. Medical knowledge: documentation of performance on a yearly objective examination

5. Practice-based learning and improvement: annual resident self-assessment and learning plan
6. Interpersonal and communication skills: formal evaluation of quality of dictated reports
7. Professionalism: documentation of compliance with institutional and departmental policies (eg, Health Insurance Portability and Accountability Act, Joint Commission on Accreditation of Healthcare Organizations, patient safety, infection control, dress code)
8. Professionalism: status of medical licensure, if appropriate
9. Systems-based practice: documentation of a learning activity that involves deriving a solution to a system problem at the departmental, institutional, local, or national level
10. Scholarly activity: documentation of scholarly activity (eg, publications, announcement of presentations) [11]

Some of these requirements consist purely of documentation (eg, documentation of medical licensure, compliance with institutional and departmental policies for professionalism), whereas other components require evidence of reflective learning (eg, annual self-assessment and learning plan). Because of time constraints and other factors, it will likely be prohibitive and even undesirable for a program director to serve as the sole mentor for each resident's learning portfolio [16]. The establishment of a mentorship program within the residency is recommended.

DEVELOPING A LEARNING PLAN

Annual resident self-assessment and the development of a learning plan are required components of the learning portfolio. However, without mentoring, there can be a high level of uncertainty among residents as to how to develop an individualized learning plan. This process starts with a self-assessment resulting in the identification and prioritization of a specific learning need. A plan is then developed that addresses specific objectives for learning, identifies resources, and strategies to achieve these objectives, and determines evidence that can be gathered to demonstrate achievement [1].

The creative component of the learning plan should be balanced with a measurable assessment of learner performance [2]. As an example, on the basis of a suboptimal result on the annual in-training examination, a resident might identify ultrasound as an area of weakness. Specific learning objectives are formulated, and resources such as textbooks and online materials to achieve these objectives are identified. The results of the subsequent in-training examination are then used to assess performance.

Another example focuses on image interpretation. The resident might decide to measure a baseline dis-

crepancy rate between his or her preliminary interpretation and the final attending radiologist's interpretation on trauma abdominal computed tomography scans. After the development of specific learning objectives to improve this discrepancy rate, resources such as online teaching files, journal articles, and self-assessment modules are identified to address these objectives. The discrepancy rate is then reassessed after a specified timeframe.

DEVELOPING A SYSTEMS-BASED PRACTICE PROJECT

Documentation of a learning activity that involves deriving a solution to a system problem at the departmental, institutional, local, or national level is another required component of a learning portfolio. On first glance, it may not be intuitive as to what specifically constitutes a systems-based problem. However, on further inspection it becomes apparent that systems-based problems occur on a regular basis in daily clinical practice.

For example, a radiologist receives a call from the emergency department regarding perceived delays in obtaining computed tomography examination results on patients presenting to the emergency department. There are multiple steps involved in this process that might contribute to this problem. These include data entry of the order, patient transportation, computed tomography technologist staffing, scanner availability, making the images available for interpretation, dictating and transcribing the report, and relaying the results to the emergency department. Once each of these steps is analyzed for potential delays, a solution is developed to address the problem, and the result is assessed after implementation. In their article on interdepartmental problem-solving, Panek et al [17] addressed a similar systems-based emergency radiology problem in which their solutions included establishing a direct line of communication via a cellular phone, using additional transport personnel, and developing a joint emergency medicine/radiology teaching conference.

As another example, an actual portfolio entry of a systems-based analysis is documented in an article by Chisholm and Croskerry [3] that addresses a delay in the diagnosis of deep venous thrombosis and pulmonary embolus in a patient presenting to the emergency department. System errors identified in their analysis include lack of access to medical information in a timely manner, lack of equipment, delay in reassessing vital signs, and difficulty in finding a care provider for the patient. Systems-based projects can also focus on cost-appropriate care and health economics [18,19].

INTRODUCING LEARNING PORTFOLIOS INTO THE RESIDENCY PROGRAM

Step 1: Establishing the Ground Rules

There are a number of challenges involved with introducing a learning portfolio to the faculty and residents within a residency program. In their article on the use of portfolio learning in medical education, Snadden and Thomas [5] emphasize the importance of establishing ground rules before starting the portfolio. It is recommended that the following questions be addressed:

- “Who sees what is written in the portfolio?”
- Who can write in a portfolio?
- What will happen to the written material?
- Where does assessment fit in?
- When will the portfolio be used and how much time will be set aside for it?
- Where will it be kept?” [5]

The issue of confidentiality is particularly important if the portfolio is highly personal and includes evidence of self-assessment and reflective learning. Although there is typically a natural reluctance of the learner to describe personal weaknesses and negative outcomes, reflection on these experiences has tremendous potential for learning and professional growth. If this evidence of self-reflection is not a required component of the portfolio, these experiences may be left out by the learner. However, if this is a required component, it is imperative to maintain learner confidentiality through limited accessibility to the portfolio sections containing these sensitive elements, which perhaps should be accessible only to the resident and mentor. This also brings to light the concept of ownership and who has permission to write in the portfolio. It has been suggested that a portfolio offers greater opportunity for learning when it is learner-owned [5].

The time commitment associated with portfolio learning varies depending on the individual learner and the number of elements in the portfolio. This can be a significant cause of apprehension and concern among residents and faculty mentors because of the time constraints involved with residency training. The portfolio should be structured in a user-friendly format, perhaps as a Web-based program or computer-based template, and the focus should be on minimizing the time involved with the data documentation and compliance elements (eg, case/procedure log, Health Insurance Portability and Accountability Act, Joint Commission on Accreditation of Healthcare Organizations). As much as possible, efforts should be made to collate individual resident data by administrative personnel, such as the program coordinator or an administrative assistant. These data can be forwarded to the resident for portfolio entry or undergo automated entry as agreed on by the resident and admin-

istrative personnel. Structured portfolio assessment is a complex issue because of concerns regarding reliability and validity [2], and will be addressed in more detail.

Step 2: Orienting Mentors and Residents to Learning Portfolios

Barriers to portfolio use that are typically cited include the time investment and uncertainty of how to use the portfolio as a learning and assessment tool [2]. Anxiety regarding new residency education requirements, including self-assessment and reflection, often results in initial resistance to portfolio learning. The acceptability of portfolios depends on how they are introduced and, to a certain extent, on the level of training of the resident. In their study on portfolios in psychiatry residency, O’Sullivan et al [6] observe that newer residents seem more enthusiastic about portfolios, and they suggest that this enthusiasm can be encouraged by including a resident as part of the portfolio team. They recommend the careful development of portfolio guidelines that are clear to residents as to what is expected and how the portfolio will be evaluated.

The value of the support of a mentor throughout this process is emphasized, particularly when it comes to encouraging reflective learning [20]. In their assessment of the use of portfolios in undergraduate medical education, Driessen et al [21] note that reflection does not come naturally to most students, and it is important for the mentor to guide students with the formulation of questions that will facilitate self-reflection [21].

Therefore, it is crucial that the orientation process involves both the mentors and the learners. This can be accomplished through workshops or focus sessions that include a detailed explanation of the specific expectations for the portfolio and a review of sample portfolio entries, such as individualized learning plans, systems-based practice learning activities, and scholarly activities.

Step 3: Using Learning Portfolios As an Assessment Tool

The resident learning portfolio has great potential to function as a formative learning tool and an assessment tool during the semiannual individual resident performance evaluation required by the ACGME. The issue of portfolio scoring is complex, partially because of the subjective nature of certain components of the portfolio and concerns regarding the establishment of reliability and validity. In their study on portfolio scoring in psychiatry, O’Sullivan et al [6] used 2 external raters who were trained to rate portfolio entries using 6-point rubrics developed specifically for each entry and found an overall agreement of 75% between raters. However, several entries had low agreement. In their guide on portfolios as a method of student assessment, Friedman et al [8] noted

that “high agreement depends on clear criteria, adequate examiners’ training, communicating criteria to students, good student orientation materials, examiners’ familiarity with the context and shared understanding of expected student performance and the assessment purpose.” Internal and external examiners may be used. The time commitment involved with the development of complex scoring criteria and subsequent rater training may be prohibitive in the residency setting. The validity of medical education portfolio assessment has been less studied than the reliability [22].

It is important to keep the purpose of the portfolio in mind when determining the method of assessment. If the purpose is to encourage reflective learning, a structured portfolio scoring system may actually discourage learners from including critical incidents that do not go well. As stated by Snadden and Thomas [5], “It must be stressed, however, that if portfolios are to be used for formal assessment purposes learners may keep quite different material than if the portfolio is to be used for purely learning purposes.” If reflective learning is the goal, perhaps the portfolio should be used in a similar manner as the 360-degree evaluations, simply as one of several assessment tools reviewed with the resident during the semiannual evaluations.

PRELIMINARY EXPERIENCE WITH RESIDENT LEARNING PORTFOLIOS

Learning portfolios were introduced into the radiology residency program at the University of Florida, Jacksonville during the summer of 2006. Initially, an electronic portfolio template was developed by the education committee and faculty mentors, and included the proposed new ACGME portfolio requirements. A 1-hour orientation focus session familiarized the residents with the portfolio template and addressed resident questions or concerns. Although the written instructions were discussed in detail, there were no sample portfolios available for review during this orientation. Residents were given 2 months to work on their portfolios with guidance from their mentors, and they were asked to record time spent on their portfolio. It was during this timeframe that it became apparent that the expectations for the development of a learning plan and systems-based practice learning activity needed further clarification. Another focus session was held to address these issues, and residents were then given an additional 2 months to develop their learning portfolios.

An initial concern for both faculty mentors and residents was the time commitment associated with learning portfolio development and review. During the first 2-month timeframe, residents reported a mean of 3.3 hours (range 30 minutes to 21 hours) spent developing their learning portfolios. During the second 2-month timeframe, residents reported a mean of 2.8 hours (range,

Goal: To prepare for and pass the radiology oral board examination
Learning Objectives and Resources:

1. Enhance knowledge base
 - Continue reading subspecialty radiology series
 - Review board preparation presentations (in progress)
 - Review ACR disks (March – June)
 - Attend case conferences (January – June)
 - Attend board review courses
2. Enhance teachings skills
 - Continue to give lectures as needed by department
 - Review and update previous lecture material

Assessment: Oral board examination performance in June

Figure 1. Sample learning plan from a resident portfolio.

30 minutes to 8 hours) of additional time spent on their portfolios. Mentors reported spending 10 to 30 minutes reviewing each portfolio.

When asked about possible measures to improve the portfolio experience, residents suggested making the portfolio Web-based, having data collation or entry performed by an administrative assistant or the program coordinator, and increasing mentor guidance with the development of a learning plan. An example of a learning plan portfolio entry by a resident from our program is included (Figure 1).

From our initial experience with introducing portfolios into the residency program, we recommend the following:

- Mentor and resident orientation sessions should include samples of portfolio entries, such as learning plans and systems-based practice projects.
- Active mentor involvement is crucial, particularly to provide ongoing guidance in the development of a learning plan.
- Individual resident data collation should be performed by an administrative assistant or the program coordinator; this is helpful in decreasing the resident perception that the portfolio is “busy work” and allows the resident more time for the reflective learning components of the portfolio.
- Determine how the portfolio will be assessed during the development phase. Keep in mind that portfolio content may be influenced by who has access to the portfolio and the method of assessment.

FUTURE POSSIBILITIES: PORTFOLIOS FOR DOCUMENTATION OF CONTINUED PROFESSIONAL DEVELOPMENT?

A new paradigm is evolving in medical education and practice with an outcomes-based educational model. Traditional continuing medical education focuses on episodic interventions to address the educational needs of groups of learners and is generally conducted by a teacher in a formal setting, such as a conference. In contrast, continuous professional development focuses on lifelong learning, and self-

assessment is generally learner-centered and conducted in a variety of different venues. It is predicted that we will see a continuum in the future physician's education that spans the physician's entire training period and career, starting with the decision to attend medical school and ending with the physician's retirement [23,24].

The recent focus on accountability and patient safety in the health care system has led to a widespread acceptance of the concept of continuous professional development in health care providers, including physicians. This is a priority for the American Board of Medical Specialties, which has adopted a Maintenance of Certification program requiring practicing physicians to provide evidence of commitment to lifelong learning and periodic self-assessment, as well as evidence of evaluation of performance in practice [23]. The American Board of Radiology Maintenance of Certification includes the following 4 components:

- professional standing;
- lifelong learning and self-assessment;
- cognitive expertise;
- assessment of performance in practice [25].

On comparison of these Maintenance of Certification requirements with the ACGME learning portfolio requirements, it is clear that there is considerable overlap, particularly in the areas of self-assessment and self-directed learning and improvement.

It is suggested that continuous professional development and practice-based learning and improvement documentation should include a portfolio-based approach [23].

CONCLUSIONS

As medical education and continuous professional development shift toward an outcomes-based model, there is increasing focus on documentation of physician self-assessment and a commitment to lifelong learning. The ACGME program requirements for diagnostic radiology graduate medical education effective July 1, 2008, include learning portfolios as one method for this documentation. Although there are some challenges associated with the implementation of learning portfolios, it is likely that portfolios will prove to be a valuable learning and assessment tool not only in graduate medical education but also throughout a physician's career and recertification process.

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