

The Early Bird Gets the Work: Maintaining a Longitudinal Learner Portfolio From Medical School to Physician Practice

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INTRODUCTION

As the journey through medical school, residency, and medical practice has evolved with requirements and milestones added, the ability to document and report those ongoing achievements has become more complicated. Portfolios have been reported to be a good method for cataloging and explaining academic performance in medical student and resident education, and in academic practice (1–3). Academic educator portfolios have been discussed for some time in the medical education literature (4), specifically in relation to promotion as an academic physician (5).

Professional portfolios are a “collection of material brought together for a specific purpose” (6). Portfolios have specific components that may evolve over the course of the training and career of a physician, but key components include documentation of learning and achievement over time (7). The creation of a professional portfolio, along with the practice of updating and reviewing a longitudinal portfolio, can ensure that the information needed to report achievements is collated in one easily accessible location. Additionally, the longitudinal portfolio enables the individual to reflect on personal strengths and weaknesses, evaluate any gaps in development, and review future goals.

To our knowledge, this is the first radiology manuscript to report the important roles played by a longitudinal portfolio from early medical school into medical practice. In this paper, we outline the benefits of developing and maintaining such a

longitudinal professional portfolio. We present readily available resources for medical learners to employ as blueprints to curate their portfolios (Table 1) and include best practices for faculty mentors to assist learners. Further, we advocate continuing the method of maintaining the longitudinal portfolio as practicing physicians.

STAGE I: AS A MEDICAL STUDENT

Currently, medical student portfolios are used in assessment, longitudinal tracking, and student skills development (1). In a recent study by Chertoff et al., it was reported that 47% of respondents from Liaison Committee on Medical Education-accredited US medical schools utilize portfolios for student assessment in some manner (8). Medical student portfolios included such varied items as reflective writing, self-evaluations and assessments, student grades, individual personal and professional plan development, presentations and research project archives, procedure log tracking, and extracurricular works (8). Portfolios engaged students and faculty (80% and 69%, respectively), and 72% of students reported a better understanding of competencies and learning objectives.

Though commonly used in today’s undergraduate medical education, portfolios are not standardized in use or format. O’Brien et al. reported their medical school’s use of portfolios in competency assessment that included faculty and peer evaluations of small-group performance, work-based clinical assessments, and objective structured clinical examinations mapped to continuous learning, communication, patient care, professionalism, and teamwork domains. They found the use of portfolios uncovered concerning behavioral ratings in 20% of students not otherwise identified in a normal grading system in their institution’s cohort (9). Whereas individual episodes of student behavior or underperformance in preclinical years might otherwise go unrecognized on a medical knowledge domain-centric student transcript, the longitudinal nature of

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TABLE 1. The Medical Learner Longitudinal Portfolio Rationales and Resources

Medical Learner Stage	Rationale for Portfolio	Portfolio Primary Blueprints
Medical student	<p>Allows students to highlight academic and extracurricular activities.</p> <p>Allows students to reflect and self-assess clinical skills.</p> <p>May be used in medical school as a means of assessing competence.</p>	ERAS applicant worksheet
Resident	<p>Provides a central repository to record numbers and types of imaging procedures completed.</p> <p>Allows residents to articulate individualized learning goals and steps to achieve them, using outcome measures to determine success of goals (e.g., in-training exams, rotation evaluations).</p>	ACGME resident learning portfolio
Practicing physician	<p>Provides opportunity to extrapolate on areas of interest, such as imaging techniques or leadership skills.</p> <p>Allows for greater detail of activities that pertain to Maintenance of Certification (CVs are often times abbreviated whereas the portfolio is more detailed).</p> <p>Helpful in the promotion and tenure process for academic physicians.</p>	<p>Academic-based: School of Medicine curriculum vitae guidelines and Department-required annual report</p> <p>AMSER teaching portfolio templates</p> <p>Academic-based and private practice: ABR Maintenance of certification guideline</p>

their student portfolios was found to uncover concerns in communication, professionalism, and teamwork likely to be problematic in a clinical setting. Early identification potentially allows for the intervention and remediation of these students (9). Nowacki et al. reported their institution's utilization of portfolios in nine broad-based competencies essential for physician investigators: medical knowledge, research, clinical skills, clinical reasoning, communication, professionalism, health care systems, personal development, and reflective practice. Medical students submitted these portfolios to a promotion and review committee to determine the student's eligibility for advancement to the next phase of the curriculum and graduation from medical school (10). Portfolios have also enabled medical students to practice self-reflection, identify stressors, and develop strategies to mitigate these stressors (11,12).

Portfolios can exist in a variety of formats or mediums (notebook or folders, computer-based files, or web-based programs); we advocate a student adopts a personal digital portfolio early, whose content may be subsequently uploaded to the Electronic Residency Application Service (ERAS) application (13) and also remains readily accessible following graduation. Early utilization of the ERAS Applicant Worksheet as a template for the medical student portfolio not only facilitates the ERAS application as a senior student, but also guides the student's efforts in becoming a desirable candidate. Even prior to reaching a decision on an intended specialty, the ERAS Applicant Worksheet serves as a checklist for experiences and opportunities to build a well-rounded application (13). Revisiting the portfolio on a scheduled or routine basis

allows the student and mentors to identify deficits in the applicant's experiences, adjusting goals as needed.

The ERAS Applicant Worksheet also contains a Hobbies and Interests section that should not be overlooked when portfolio-keeping. This section can be considered as bank of nonclinical information about the candidate to access when writing the personal statement, deemed by some as one of the most important components of a residency application (14). Hobbies and interests frequently become highly visited aspects of a candidate's application during interviews and the applicant must be prepared to converse in a detailed and meaningful way about any listed portfolio interests.

A well-maintained portfolio may play a particularly important role when gathering high quality letters of recommendation. Faculty asked to write letters of recommendation typically encounter many students on a rotating basis; the student curriculum vitae (CV), although helpful, can be an incomplete summary of the candidate. Providing a portfolio can expound on items briefly listed in a formal CV to give a more complete picture of the student. Presenting a thorough, organized portfolio itself offers additional positive attributes about an applicant that can be further expanded upon in the letter of recommendation.

An important component of any portfolio is reflective writing and self-assessment (9–12). Some portfolios allow for reflection in the form of a diary or a journal to reflect on experiences. There are other times when providing specific prompts related to a particular topic may be merited. Dougherty et al. reported examples of having students reflect on a

clinic visit that did not go well (15). Another example of reflection with self-assessment reported student self-documentation of different imaging or ultrasonography skills mapped against levels in the educational clinical competency model Miller's pyramid (16).

STAGE II: AS A RESIDENT

The prevalence of resident learning portfolios in Accreditation Council for Graduate Medical Education (ACGME)-accredited US diagnostic radiology and interventional radiology is near universal, as portfolios are required as a core educational program curriculum requirement in the ACGME Program Requirements and ACGME Milestones (17–20]. As a resident, much of the needed content of a resident learning portfolio is typically entered into institutional graduate medical education software to assure documentation to meet the requirements of the ACGME.

Deitte offered a comprehensive guide to resident portfolios following a 2-year institutional experience and concluded portfolios overcame early challenges in implementation to become a very valuable resident learning and assessment tool (7). In its most recent 2020 program requirements versions, the Residency Review Committee for Radiology offers detailed learning portfolio guidelines; these are readily adapted to a longitudinal portfolio beginning in residency year one. Each resident's portfolio must include (at a minimum) details of longitudinal resident educational experiences in each of the six ACGME competencies (patient care, medical knowledge, systems-based practice, practice-based learning and improvement, professionalism, interpersonal, and communication skills) (17,18). In addition to highlighting the parameters that must be included in the resident learning portfolio, Table 2 also demonstrates that the resident learning portfolio builds on and expands the medical student entries.

As is the case in medical students' residency applications, curating a residency longitudinal portfolio can be utilized in fellowship applications. The application process among radiology fellowships may be extremely variable; a learning portfolio provides a centralized resource to efficiently and effectively generate the necessary information required by differing fellowships. In addition, the longitudinal portfolio allows the resident to apply for varied honors and awards more readily with the information collated and available. As many external honors or local and national resident leadership positions also require different documentation, the cataloging of longitudinal accolades will aid in this endeavor. As with the medical student portfolio, each resident portfolio file should be kept in a readily accessible and retrievable location for later use.

MENTORING LEARNERS' PORTFOLIOS: BEST PRACTICES FOR ADVISORS

Adopting institutional-required portfolios and adding the ERAS worksheet offer blueprints valuable to learners'

advisors and mentors. The advantages are numerous. For medical students, Bashook et al. reported students' responses in the portfolio gave advisors greater insight into the students' thinking, maturity, reflective ability, and early warnings about potential problems; the portfolio system was reported to have a positive impact on advisor-advisee interaction and was specifically useful in developing a more individualized advising plan per student (21). Heeneman and de Grave found mentoring using the portfolio guided medical students to meaningful self-directed learning and emphasized the need for faculty development of mentor coaching skills (22). We believe student-maintained portfolios are particularly helpful for radiology educators who advise and mentor radiology-bound students in their third and fourth year. Radiology faculty typically have infrequent and delayed access to students in today's undergraduate medical education paradigm (23,24). Therefore, review of a comprehensive well-maintained student portfolio permits faculty to successfully initiate and proceed with ERAS and residency selection advising despite a later start.

For radiology residents, Deitte acknowledged the difficulties for residents and faculty alike when initiating the learning portfolio process (7). She stressed (1) the importance of an orientation session in which portfolio goals, objectives, and examples were provided; (2) active mentor interest and engagement; (3) collation of included residency-tracked data (i.e., case logs and formative evaluation test scores) by residency resource individuals rather than by the resident. Each of these actions served to mitigate concerns regarding the time required to develop a valuable portfolio (7).

STAGE III: AS A PRACTICING PHYSICIAN

As practicing physicians, specialty boards have set standards for maintenance of certification. Portfolios are recommended as a means to document activities that will meet requirements for maintenance of certification. The American Board of Pediatrics has developed a portfolio program, Cincinnati for pediatricians' use that ties to the domains of certification and begins in early career (25). Because continuous cataloging of projects and accomplishments is a requirement for board certification, thinking of a portfolio in terms of a longitudinal initiative beginning in medical school may be particularly beneficial. With the stage set for portfolio maintenance throughout medical school and radiology training, it is a natural transition to continue this as a practicing radiologist. The career portfolio enables the practicing physician to keep important documents, certificates, and continuing medical education (CME) credit in one place for reference to meet the physician's needs in a variety of scenarios: participation in the American Board of Radiology (ABR) Maintenance of Certification (MOC) (26,27), individual School of Medicine appointment, promotion, and tenure guidelines, uploads to career center and job search sites or application for achievements such as becoming a Fellow of the American College of Radiology.

TABLE 2. Longitudinal Learner Portfolio Parameters in Medical School, Residency, and Physician Practice

Longitudinal Portfolio Parameter	ERAS Applicant Worksheet	ACGME Resident Longitudinal Portfolio	Faculty or Practice Curriculum Vitae
Basic information: Name, Contact Information, Address	X	X	X
Work authorization	X	X	X
NRMP Match identification number	X		
Additional Information: USMLE, ACLS, PALS, AOA, Gold Humanism Society identification numbers	X	X	X
Biographic information: Self-identification ethnicity optional	X		
Language fluency	X	X	X
Education: Undergraduate schools	X	X	X
Graduate schools	X	X	X
Medical school	X	X	X
Membership in Honorary/Professional Society	X	X	X
Medical School Honors	X	X	X
Other awards/accomplishments	X	X	X
Experiences: Residency training	X	X	X
Fellowship training			X
Work employment	X	X	X
Research	X	X	X
Volunteer	X	X	X
Licensure: State medical license		X	X
DEA		X	X
Board certification		X	X
Publications and Presentations:	X	X	X
Peer-reviewed journal articles/abstracts			
Peer-reviewed journal articles/abstracts (other than published)	X	X	X
Peer-reviewed book chapter	X	X	X
Scientific monograph	X	X	X
Other articles	X	X	X
Poster presentation	X	X	X
Patient care:		X	
Oral sodium iodide I-131 therapy administration			
Interpretation/multireading of mammograms		X	
Participation in hands-on ultrasonographic examinations		X	
Performance of invasive procedures		X	
Medical knowledge:		X	X
Conferences/courses/meetings attended and self-assessment modules completed			
Performance on rotation-specific and/or annual objective examinations		X	X
Practice-based improvement and Learning:		X	X
Evidence of an annual self-assessment reflective process, individual learning plan			
Interpersonal and communication skills:		X	X
Formal documented assessment of oral and written communication			
Professionalism: Status of medical license, if appropriate		X	X
Systems-based practice:		X	X
Learning activity that involves deriving a solution to system problem at the department, institutional, local, regional, national or international level			
Compliance with institutional and dept policies, HIPPA, Joint Commission, patient safety, infection control, dress code		X	X

(continued)

TABLE 2. (Continued)

Longitudinal Portfolio Parameter	ERAS Applicant Worksheet	ACGME Resident Longitudinal Portfolio	Faculty or Practice Curriculum Vitae
Scholarly project under faculty member supervision, results must be published or presented at institutional, local, regional, national or international meeting		X	
Teaching activities: Course directorships			X
Formal lectures UME, GME, CME			X
Clinical teaching UME, GME, CME			X
Research activities: Grants			X
Funded clinical trials			X
Nonfunded clinical trials			X
Professional service: To discipline, national			X
To discipline, state			X
Within home institution			X
Learner evaluations: Medical students (UME roles)			X
Residents and fellows (GME roles)			X
Practicing physicians (CME roles)			X

The ABR implemented the Continuous Certification MOC program in 2012 for practicing radiologists, to ensure board certified radiologists are maintaining medical knowledge and providing quality, and to facilitate and document these essential elements (26,27). An annual MOC review includes four main areas: Part 1: Professionalism and Professional Standing, Part 2: Lifelong Learning and Self-Assessment, Part 3: Assessment of Knowledge, Judgment, and Skills, and Part 4: Improvement in Medical Practice. The Part 1 requirement is met by licensure documentation and the Part 3 requirement is completed by passing the ABR Online Longitudinal Assessment, a series of computer-based questions. The Parts 2 (Lifelong Learning and Self-Assessment) and 4 (Improvement in Medical Practice) requirements lend themselves nicely to use of a professional longitudinal portfolio. CME and self-assessment (SA)-CME documentation is necessary in Part 2; these may be compiled in a web-based or cloud-based portfolio. A completed Practice Quality Improvement project or activity within the last 3 years is required in Part 4; Practice Quality Improvement project and/or participation in safety committees, sentinel event meetings, and other departmental or group quality assurance documented in a portfolio would aid in fulfilling this requirement. Simply stated, a well-rounded and active career portfolio enables easy reference to document, retrieve, and report qualifying activities to meet ABR MOC requirements.

For those radiologists in an academic practice, annual reviews and promotion and tenure (P&T) are components of professional advancement that one strives, or may be required, to achieve for continued employment. A well-maintained longitudinal portfolio's goal is to facilitate ease of assembly of a faculty member's promotion packet when needed. Resources outlined in the AMSER Teaching Portfolio Templates include activities such as mentorship and learner evaluations (28,29). Abbreviated examples of those items easily forgotten that should be included and maintained in a longitudinal career portfolio for both academic and private

practice radiologists are illustrated in Figure 1. Table 2 illustrates the continuum nature of the academic practicing physician longitudinal portfolio and highlights those items that meet the faculty P&T requirements at two authors' institution.

The career portfolio also has the added advantage of goal setting and self-reflection, to juxtapose against the typical curated CV. While many items needed for completion of the faculty annual reviews or the P&T packets may be gleaned from an updated CV, the portfolio stipulates self-reflection during this process, vital for success. Stating 1-year or 5-year goals as part of a career portfolio practice not only enables the practicing radiologist to evaluate personal intentions and trajectories but also identifies gaps or red flags in achieving desired outcomes. Having become accustomed to self-reflection to identify strengths and weaknesses via portfolio throughout undergraduate and graduate medical training paves the path for a practicing physician to self-reflect in a similar manner.

Similarly, for the private practice radiologist, meeting the requirements for partnership and applying for executive management boards or committees may be tracked in the career portfolio. The longitudinal portfolio aids both the decision-making and the application process should a radiologist choose to pursue additional degrees or certifications, such as a Masters in Business Administration, Masters in Health Administration, or certificates of proficiency in new modalities. In the private practice setting, the self-reflection component of the portfolio ensures professional and personal goals remain in line with the current career trajectory. Many private practices have infrastructure for credentialing and a current CV is often sufficient. However, a well-rounded career portfolio can encompass volunteer, fundraising and community activities for a more comprehensive reflection on goals and professional identity. Further, periodic review of accomplishments and goals through maintenance of a portfolio may also mitigate burnout by revisiting previous goals or accomplishments and reaffirming a sense of purpose and direction.

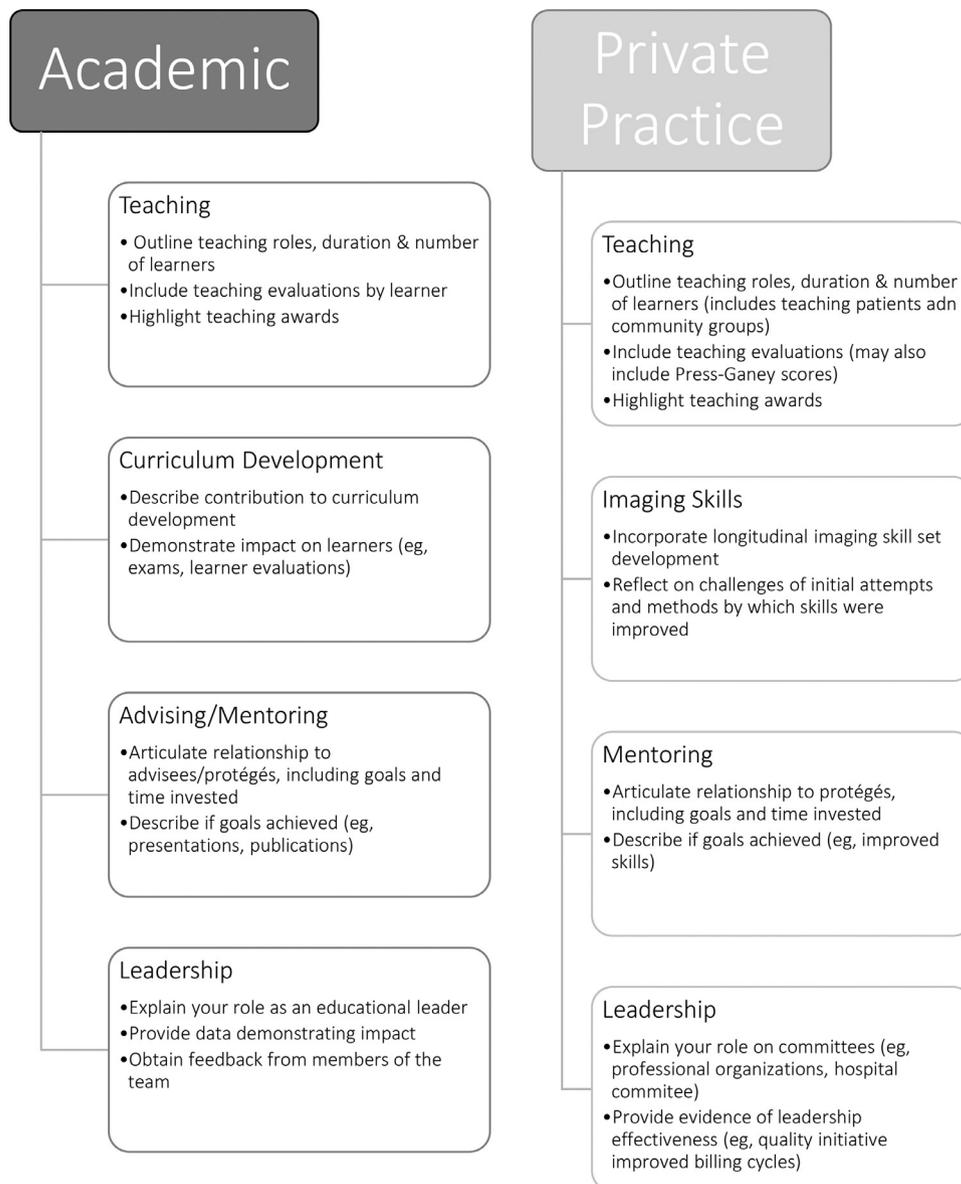


Figure 1. Storyboard academic and private practice Radiologists career portfolio examples.

CHALLENGES

The curation and maintenance of a longitudinal portfolio poses potential challenges. Expected challenges to portfolio development and management include overcoming inertia or resistance to a new idea, committing the necessary time required, and cultivating knowledge and skills required to organize and update (7). Current students and residents are likely to accept longitudinal data management and curation than established practicing physicians. Once in the habit of entering information in longitudinal manner, continuing to do so is much less of a burden. A longitudinal portfolio must be maintained in a format that carries over through the different phases of education, training and practice. Systems for portfolio creation initially used in medical school may differ from those in residency and fellowship. As the practicing physician works in different

hospital systems or has career changes, the hardware or software supporting a portfolio may vary. We advocate maintaining a portfolio on a personal cloud-based storage system to assure availability and transferability unencumbered by the practice environment. While at times this is redundant with the learner's ERAS or ACGME platforms, maintaining one's longitudinal portfolio via a personal storage system enables easy transfer, encourages curation, and facilitates efficient deployment on short notice when needed.

Computer systems and personal devices currently offer local storage and remote server-based storage and processing, the latter known as cloud-based. The sheer number of available cloud-based systems may prove daunting and pose challenges. However, commonly utilized systems — chief among them Microsoft OneDrive, iDrive, Dropbox, Box, Google Drive — are rated as to interface,

storage capability, cost, file-sharing and additional features in vetted resources that are digestible and readily available online (30).

Many radiologists may be encountering the longitudinal portfolio at a later stage in practice, having not curated one in training. Though the created career portfolio may require time and effort to accumulate contents and effectively organize in this setting, a later stage portfolio may not need to include as many early career content items.

CONCLUSIONS

All medical learners currently have both medical school and residency requirements for a portfolio, or portfolio-like, creation and maintenance. We advocate adopting an early start and longitudinal use of these existing resources by medical learners and mentors alike. The continued use of the longitudinal portfolio in fellowship and as a practicing radiologist allows for similar gains – documentation for professional advancement, self-reflection, and organization of past, current, and future projects.

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