SURGICAL EDUCATORS' HANDBOOK

Developed by
The Curriculum
Committee
and members of
The Association for Surgical Education

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PREFACE

It gives me great pleasure to present to you the "*Association for Surgical Education Educators' Handbook.*" This is the culmination of several years of work by a group of dedicated expert surgical educators who are committed to the continuing improvement of surgical education. This was truly a labor of love for all involved.

You will find this handbook helpful whether you are just starting your tenure as a clerkship/program director or have been in the position for some time. If you are just starting, the handbook contains important information, essentially, all you wanted to know but were afraid to ask. This information will help you assess and if necessary, modify your clerkship. The handbook also contains information for your own professional development.

If you have been in the job awhile, use this handbook to generate ideas for improving your clerkship or training program. Faculty members who aren't clerkship/program directors will also find this handbook useful in their professional development as surgical educators.

The handbook was designed in a "case-based" format. Rather than use a topic-based outline, the editors compiled a set of frequently asked questions that the contributors then answered. These questions were then grouped according to topic area such as Faculty Development, Research in Education, and Student & Resident Assessment.

The handbook was developed to be used in either web-based or hard copy format. The web-based version will undergo periodic updates to ensure the most current information is available. Keep this handbook at your fingertips. Refer to it for ideas as well as solutions. Feel free to provide feedback to the ASE regarding its usefulness and/or overlooked areas.

Leigh Neumayer
President,
Association for Surgical Education

HOW TO USE THIS BOOK

This handbook was written by surgical educators for surgeons, residents and all others dealing with surgical education. Rather than being an encyclopedic collection of all that pertains to the topic, it is intended to be a hands-on guide offering practical suggestions for real-life situations.

We have therefore chosen the "question" format for chapters, expecting that the practitioner will refer directly to the chapter addressing the question at hand. We have generally attempted to maintain a uniform chapter structure, including, in order, suggested approach, alternative approaches, pitfalls, and references / resources. We have also attempted to keep the chapters concise for easy access. Some topics did not lend themselves well to these limitations, and variations will be encountered.

All chapters are followed by references and/or resources. The former clarify or cite specific statements in the text, while the latter take the reader to further areas of content. In order to increase readability, references are not numbered within the text, and *verbatim* statements are followed by the author's name in brackets, with the full reference provided at the end of the chapter.

Web site URLs have been included whenever appropriate; in the web-based version of the handbook these would allow direct hot-linking to the sites. The reader must however be cautioned that web sites frequently change address or become extinct, and therefore some of the links may have become invalid even since our final review.

It is to be expected that there will be significant overlap between sections and chapters. As often as possible the reader will be referred to other sections / chapters. The index found at the end of the handbook should also be consulted for alternative sites of coverage.

We hope that the handbook will live up to its name and purpose. As such texts will always be "works in progress", we value all of all your comments and suggestions!

The Editors

SECTION I: FACULTY DEVELOPMENT

How Do I Prepare My Faculty For Their Teaching Roles?

Why ask?

Although some faculty have an intuitive gift, potentially great teachers become great teachers through the same route as all professionals who have achieved excellence in their fields: "through conditioning mind and spirit and body, acquiring skills, and practicing in respectful competition with great teachers living and dead." (Kenneth Eble)

Approach

Principles of adult learning apply to faculty as well as to medical students. Like medical students, faculty need to know why they need to learn or teach something before undertaking it. They will be motivated to devote energy to this process when they perceive it to be of value and/or if there is an earnest attempt to match faculty interests with teaching assignments. Finally, few adults (let alone faculty) are responsive to most external motivators - the most important motivators being internal pressures. Most faculty have enough inherent interest to give up their time to teach if you provide them with the basic tools to be successful. You also need the support of your chair, and preferably also of your school, since teaching takes money (a little to a lot).

Resources

There are a great many resources available. A good place to start is the Educational Clearinghouse of the Association for Surgical Education (ASE), which provides an extensive list of materials about teaching. These range from such manuals as the one you are reading, written by members of the ASE, to audiovisual materials and to relevant books by non-members.

The **Surgeons As Educators (SAE) Course**, sponsored by the American College of Surgeons, is a six-day course intended to provide surgeons with the knowledge and skills to enhance their abilities as teachers and administrators of surgical curricula. Information can be obtained on the ACS Website.

You can conduct your own **workshops or retreats** to teach skills. If you have sufficient information, you can design these yourself, or you can use the assistance of a consultant from another department or institution. You can bring courses in from outside your own institution. For example, there is a one-day course on teaching given by graduates of the SAE course, and prominent surgical educators may be brought in as Visiting Professors. Some institutions offer courses in which outside faculty may enroll. There is no central listing of these courses, so it may be difficult to find them! Keep an eye on the web sites of educational societies (see below). You might also write to the ASE Educational Clearinghouse (P.O. Box 19655, Springfield, IL 62794-9655), or email Ms. Susan Kepner, ASE Executive Director at skepner@siumed.edu.

Does your school or institution have a Department, Division, or Office of Medical Education? If so, this can be a tremendous resource. Not only may they be able to provide you with ideas and information, but they may have workshops or courses available to you and your surgery faculty at little or no cost. This has the added advantage of involving you in academic affairs outside the confines of your department and giving you and your colleagues the opportunity to collaborate with faculty on an interdisciplinary level.

Does your school have departments of Informatics, Information Technology, or Media Resources? These may be invaluable resources for multimedia and technology development and training, for you as well as for your faculty.

Do not forget that an essential element of training faculty to teach involves enlisting their interest and cooperation beforehand. Consider involving interested or potentially interested colleagues in helping to decide exactly what to do and how to do it. And be sure to include your Chair!

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FOCUS (the official publication of the ASE)

Academic Medicine (the monthly journal of the Association of American Medical Colleges)

Teaching and Learning in Medicine (quarterly journal) edaff.siumed.edu/tlm/

Whitman N. There is no gene for good teaching: A handbook on lecture skills for medical teachers. 3rd ed. Salt Lake City (UT): University of Utah School Medicine; 1986

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Barrows H. The tutorial process. SIU School of Medicine, 1992

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Web sites

SAE COURSE www.facs.org:80/about_college/acsdept/edsurg_dept/gmec/saeintro.html

ASE **www.surgicaleducation.com**

Center for Instructional Support (CIS), University of Colorado Health Sciences Center www.uchsc.edu/CIS

Clearinghouse in Higher Education www.eriche.org/resource

List Serves

DR-ED: an electronic discussion group for medical educators, sponsored by the Office of Medical Education Research and Development, College of Human Medicine, Michigan State University www.uchsc.edu/CIS/Lists.html

How Do I Evaluate Teaching By Faculty and Residents?

Why ask?

Teaching must be evaluated in order to reward it appropriately, to mentor individual faculty regarding their teaching skills, and to discover what areas would benefit from increased faculty development.

Approach

There are **two issues** here. First, what is the philosophy of your school for rewarding teaching? And second, how is teaching defined? You must have the answers to these questions in order to know how to evaluate teaching. Traditionally, many schools define teaching as the number of lectures taught or activities as a course director. In this model, teaching is a service activity, not scholarship. However, the Carnegie model (*Boyer 1990*, *Glassick 1997*) which describes current scholarship in higher education, defines scholarly teaching in a broader fashion, as the dissemination of knowledge.

The Carnegie Model

Boyer identified **4 types of scholarship**: the scholarship of discovery, the scholarship of integration, the scholarship of application (now called *engagement*), and the scholarship of teaching. Each of these four areas of scholarship is of equal weight in terms of importance to the university and in terms of promotion and tenure. Individual faculty should have their profile of scholarly activities reflect their personal strengths.

For example, one faculty member may be responsible for 30% effort in research (scholarship of discovery), 30% clinical work (scholarship of engagement), and 40% clerkship director (scholarship of teaching). Another faculty member in the same department may be responsible for 50% effort as senior scientist (scholarship of integration), 25% supervising graduate students and fellows (scholarship of teaching) and 25% as division chief (scholarship of engagement). Many medical schools in North America have adopted the Carnegie model as the framework identifying and rewarding scholarly activity.

Teachers must be learned in their field - but that is not enough. The **scholarly teacher** must present knowledge to the learner in a manner that enables growth. "Teaching is also a dynamic endeavor involving all the analogies, metaphors, and images that build bridges between the teacher's understanding and the student's learning". Scholarly teaching is the synthesis of familiarity with a field's traditions and cutting edge techniques and research, effective communication and the fostering of the learner's mastery of the material. Therefore scholarly teaching includes activities conducted while a visiting professor, clinical supervision in the OR, advising, mentoring, designing new instruction, delivering traditional lectures, peer evaluation of another teacher, being a faculty rater in an OSCE or delivering a CME workshop.

Since this is a handbook on surgical education, let's focus on evaluating the scholarship of teaching. Glassick specified **6 standards/criteria for evaluating scholarly work**, including the scholarship of teaching. There must be *clear goals* (e.g. course or lecture objectives). There must be *adequate preparation* (e.g. update the literature review to check for recent findings or mastery of new techniques). *Appropriate methods* must be used (e.g. using one-on-one teaching to refine surgical technique while using small group discussions in a journal club). There need to be *significant results* (e.g. student scores on the NBME subject exam increased 2 points every year since initiating small group teaching). There must be *effective presentation* (e.g. handouts should be logically organized and information presented clearly). The last step is *reflective critique* (e.g. review student feedback to identify areas for future development). To assess scholarly teaching, all these components should be addressed. When evaluations of teaching effectiveness address all 6 components, the complexity of teaching is more readily captured than by relying solely on student or resident evaluations. This process is most easily organized through the use of a teaching portfolio (e.g. *Simpson 1990*)

Scholarly teaching has a long-term impact that can be measured through **program evaluation and assessment** of the learner's progress. The method for evaluating the effectiveness of your teaching activities depends upon the activity. For CME, a participant rating form that addresses the 6 steps

presented above is effective. For clinical teaching, peer/student/resident rating forms addressing the 6 steps above are useful. Additionally, it can be very helpful to have rating forms from ancillary staff and patients to measure the change in the student/resident behavior that results from your teaching. Finally, program evaluation, including such outcome measures as student scores on national standardized tests, the number of students pursuing surgery as a career, the quality of the program where students match, the resident board scores, and fellowship placement are all viable indicators of successful teaching. These alternate sources of information are especially useful in conducting educational outcomes research.

Many **tools and techniques** are available. The most commonly used tool for assessing teaching is an evaluation form completed by students. This method is the least labor-intensive and the least expensive. Sometimes this evaluation is conducted by the school, sometimes by the department, often by both. Like any evaluation, results are profoundly affected by the method used and the manner in which the process is conducted. The Association for the Study of Higher Education offers regional workshops on developing effective measures to assess students.

Important decisions include:

- Who will be evaluated?
    - Faculty?
    - Residents?
- Who will choose which faculty and residents will be evaluated?
- When will the evaluation form be completed?
    - before the final examination(s)
    - immediately after the final examination(s)
    - at some other time
- Will the evaluation be anonymous?
- What format will be used for the evaluations?
    - checklists
    - Likert scales
    - multiple choice items
    - open-ended questions
    - exit interviews
    - focus groups
    - web-based forms
- Who will collect the evaluations once they are completed?
- Who will have access to the completed evaluations?
    - Individual teachers involved
    - Chairs / deans
    - Program Directors

- How will the results of the evaluations be used?
  - For promotion
  - For future teaching allocation choices
  - For awards / prizes
- Are student evaluations the only way teaching is assessed?

Other methods of evaluating teaching include self-evaluation, as well as peer evaluation by faculty members from one's own department, other departments, or by external experts. These methods require more faculty time and/or money, but, even more importantly, unless faculty are involved in and accept the decision to do this, you can expect considerable opposition. Faculty dislike being evaluated just as much as students do. It is unlikely that your department will agree to make this kind of commitment of resources unless the results are going to be used in some way, and this raises the stakes considerably. What will happen to your colleague who spends most of his/her time in the lab interacting with Sprague-Dawley rats, and has given the genetic surgical diseases lecture for the past 11 years? Not everyone is equally good at lecturing, leading small groups, or even one-to-one teaching, and faculty who lack these skills should not be unduly penalized. The purpose of evaluation must be perceived by your faculty as improving your educational program, utilizing individuals in roles for which they are best suited, and directing faculty development - not as punishing those who are not as skilled.

Finally, what are the ramifications for those faculty who are consistently rated as "poor" teachers? Are these negative evaluations routinely disregarded, is the faculty member tutored on manners in which s/he can improve his/her skill and comfort in this arena, or is the faculty member simply removed from the teaching schedule?

In formulating or choosing your evaluation instruments, use the standard approach:

Step 1: Gather information

- Talk to colleagues in other departments / schools to determine how they are evaluating their faculty, and get samples
- Conduct a literature review

Step 2: Needs assessment

- Decide what behaviors, qualities, or outcomes you want to evaluate

Step 3: Plan

Choose the format that will enable you to evaluate these factors

- select a type of instrument by adopting one that is being used elsewhere, buy an instrument, or develop your own
- decide how to evaluate the results

Step 4: Pilot - testing out the plan

- inform both evaluators and those who are being evaluated fully about the process
- administer the instrument to a select group of representative individuals
- evaluate results

Step 5: Assessment

- of the instrument itself
- of problems encountered in administration

Step 6: Revision

correcting problems encountered in Step 4

Step 7: Implementation

beginning to use your revised instrument and process

Repeat Steps 4 through 7 as necessary

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Glassick CE, Huber T, Maeroff GI. Scholarship Assessed—Evaluation of the Professoriate. San Francisco (CA): Jossey – Bass; 1997

Web sites

Center for Instructional Support (CIS), University of Colorado Health Sciences Center
www.uchsc.edu/CIS/ClinSupChkList.html

The Carnegie Foundation for the Advancement of Teaching www.carnegiefoundation.org

Educational Resources Information Center www.eriche.org

Clearinghouse in Higher Education www.eriche.org/resource/

National Council on Measurement in Education www.ncme.ed.uiuc.edu

How Do I Motivate Faculty To Teach?

Why ask?

As with participation in skills development, not all faculty will voluntarily participate in teaching (surprise!). There are those faculty in your department who will not teach unless there is some reward for doing so or some negative consequence for not participating.

Approach

Some faculty are motivated by their own intrinsic enjoyment of teaching and interacting with learners; they will usually be the backbone of your teaching program. Their own particular interests will guide how you use them; some prefer to act as preceptors, some as small group leaders, some as lecturers, some as Clerkship Directors, etc.

Most faculty are willing to teach, but may find it difficult to make this task a priority given the conflicting demands of conducting research and seeing patients. For this large group, your efforts to motivate them may be the determining factor. See below, under "What rewards should I use for faculty or residents for teaching skills?"

A few faculty are reluctant to teach. It is important to understand the source of their hesitation: a negative previous experience, discomfort with the subject matter assigned to them, or simply fear of teaching because they had never been taught "how". **Negative experiences** often just require taking time to explain how "this" teaching experience will be different. Encouraging them to "team teach" may also diffuse/lessen their discomfort. **Discomfort with the subject** matter may merely require conducting a more complete orientation to the course / curriculum, or facilitating a meeting with someone who has taught the material before. To the degree possible it is always preferable to assign faculty members to lectures or courses that are within their general level of expertise and comfort. **Fear of teaching** is frequently a byproduct of never having been taught the basics on how to be an effective teacher - the desire is there, they simply don't know where or how to start. The *Surgeons as Educators* course offered through the ACS is an outstanding program for both novice educators who want to learn basic skills, and for more experienced teachers who want to hone their skills. If the faculty member cannot get into the course or does not have the time for the course, make time to meet with him/her to describe the curriculum or course that is to be taught. Make the faculty member aware of resources that are available and encourage participation in faculty development courses that are offered at your institution or at facilities nearby. Bottom line - encourage the will to teach through any means possible!

Finally, there are those faculty who are unwilling to teach in any capacity. Although it may be possible to force them to teach through threats from the Chair, you will have to consider whether it is worthwhile to engender the resulting ill-will, and whether your students will benefit from being exposed to these individuals. It is important, however, to inform your Chair about them, as factors such as participating in teaching activities can affect academic advancement in most schools.

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Gastel B. An award program for teaching excellence. Acad Med 1991, 66(4):192-3

How Do I Recognize & Reward Faculty and Resident Teaching?

Why ask?

Positive feedback is an essential element of learning. In the absence of feedback, individuals develop their own feedback systems, which, more frequently than not are incorrect.

Approach

It is important to recognize in some way those faculty and residents who make an especially favorable impression on students; however, there is an important distinction to be made between a faculty member who has good teaching skills and one who is a lot of fun to be with. Fortunately, most students are able to make this distinction. You might nonetheless want to consider having at least one award for a faculty member and/or resident nominated by their peers.

Academic advancement can be a potent enticement for full-time faculty. Unfortunately, few schools have a well-defined "teaching track" that will enable faculty to be promoted on this basis alone. Your institution probably has some sort of Faculty Handbook describing promotion criteria and procedures.

A teaching portfolio is a very effective way of documenting teaching activities. The Educator's Portfolio developed at the Medical College of Wisconsin provides a standardized approach that is manageable. The teaching portfolio incorporates Boyer's six criteria for evaluating scholarship: clear goals (course goals and objectives), adequate preparation (sequential course syllabi that change over the years), appropriate methods (provide the CD-ROM you developed), significant results (results of AAMC exit questionnaire), effective presentation (learner ratings), and reflective critique (a brief essay about one's teaching philosophy). By presenting your appointment, promotion and tenure committee with your traditional CV and a teaching portfolio, the committee will have meaningful data that can be evaluated for scholarship, and can be rewarded with promotion.

Let's face it…**Money** talks - and is highly motivational, but it is also infrequently an option in most medical centers.

Fulfillment of obligations to the department or institution. Hospitals and medical centers, as well as academic institutions, generally require each physician to devote a proportion of their time to activities that promote the welfare of the institution, such as committees of various kinds. Some teaching activities may fulfill this "obligation of citizenship". Again, by approaching teaching as a scholarly activity where you actively disseminate knowledge and facilitate the growth of the learner, you are contributing to the overall academic mission of your institution. Finally, make sure that you document the activities and make sure that you get formal feedback about the effectiveness of your activity. Any data collected should be analyzed and formally presented in tabular form. For example, analyze the student feedback in terms of descriptive statistics (range, mean, median, and mode of responses) and then interpret your effectiveness with the target audience. When teaching is approached as an intellectually rigorous activity that is worthy of quantification, it becomes a viable scholarly activity that should be rewarded.

Titles and CV entries serve not only to expand the CV but also to establish areas of expertise. Remind your faculty to put teaching activities and awards on their CVs - many do not. Titles may designate particular broad areas of responsibility, such as "PBL Program Director" or "EBM Coordinator."

Publication and presentation opportunities are always available. Post-hoc and ad-hoc write-ups of educational projects occasionally are published. However, your chances of success are greatly

enhanced when you consult with a behavioral scientist (e.g. medical educator) prior to beginning your research or to writing up your educational innovation. See research section for basic issues to consider prior to consulting with the behavioral scientist. Many universities have Centers of Teaching Excellence where faculty will provide consultation at little or no cost regarding program evaluation, educational innovation, or teaching effectiveness (see sample web sites at end of section). Abstracts, posters, and paper presentation opportunities are available through many educational organizations such as the ASE, the annual meeting of the Association of American Medical Colleges (AAMC), the regional meetings of the AAMC's Group on Educational Affairs (GEA) and AAMC's annual and regional conferences on Faculty Develoment, The Generalists in Medical Education which meets in conjunction with the AAMC. There are many organizations that specialize in education as a scholarly discipline including: Division I of the Association for Educational Research in America (AERA), the National Council on Measurement in Education (NCME), and The American Higher Education Council (AHEC). Further available venues include the ACS, the APDS, and other national, regional, and local societies.

Letters of praise and thanks are a very nice way of recognizing the contributions of both faculty and residents. Write them a letter, and send a copy to the Chair that will go in their file. This one is almost free!

Certificates of Involvement are an outstanding way to acknowledge your volunteer faculty. These certificates should be suitable for framing (or give them to them framed) so that patients and colleagues can see that this particular individual is actively involved in your institution's teaching programs.

Awards from associations are very visible and highly valued by both those who receive them and by the institutions they represent. The Association for Surgical Education honors outstanding teachers and distinguished educators each year, as do many other associations. Check annual programs and conference proceedings to determine time frames and criteria for nominations.

Awards from the institution will usually be outside your control. They are most often given on the basis of student votes (for example, from the graduating class), but may also reward particular service to the institution. Nominate people, if you have the opportunity. If one of your faculty or residents receives such an award, be sure it is announced at faculty meetings, at Grand Rounds, and in whatever local newsletters you can find. This will please and motivate the person who received the award, and it will also publicize your department's educational program.

Awards from the department may consist of certificates, plaques, or small engraved *objects d'art*, depending on your taste and your budget. However, there should always be some tangible accompaniment to an honor, even if it is only a framable piece of paper, and all honors should be publicized as widely as possible.

Selected Readings

Case Studies

Simpson DE, Wendelberger-Marcdante K, Duthie EH, et al. Valuing educational scholarship at the Medical College of Wisconsin. Acad Med 2000; 75:930-934

Nora LM, Pomerory C, Curry TE, Hill NS, Tibbs PA, Wilson EA. Revising appointment, promotion, and tenure procedures to incorporate an expanded definition of scholarship: The University of Kentucky College of Medicine experience. Acad Med 2000; 75:913-923

Marks ES. Defining scholarship at the Uniformed Services University of the Health Sciences School of Medicine: A study in cultures. Acad Med 2000; 75:935-939

Schweitzer L. Adoption and failure of the "Boyer Model' at the University of Louisville. Acad Med 2000; 9:925-929

Viggiano TR, Shub C, Giere RW. The Mayo Clinic's clinician-educator award: A program to encourage educational innovation and scholarship. Acad Med 2000; 75: 940-943.

Teaching Portfolios

Simpson DE Fincher RM. Making a Case for the Teaching Scholar. Acad Med 1999; 74:1296-1299

Hafler JP Lovejoy FH. Scholarly Activities Recorded in the Portfolios of Teacher-Clinician Faculty. Acad Med 2000; 75:649-652

Web Sites

UTMB subcommittee report curriculum.utmb.edu/ctf/Salary_support_CTF.html

American Association for Higher Education www.aahe.org/teaching/Teaching_Initiative_Home.htm

American Education Research Association www.aera.net/

American Association on Higher Education www.aahe.org

AAHE section on Faculty Roles and Rewards www.aahe.org/FFRR/

How Do I Juggle Between My Clinical and Academic Roles?

Why ask?

However dedicated you are to teaching and running an outstanding educational program, and however successful you may be, it is still of great importance to maintain your role in your department, your hospital, and in the wider medical community.

Approach

This problem becomes increasingly more severe as academic faculty, once relatively protected against financial concerns, are asked to cover more and more of their salaries with their clinical activities at the same time that reimbursement declines.

If you are spending a significant amount of your time running a clerkship or some other teaching activity, it is reasonable for your department or school (depending upon the activity) to reimburse you for this. One good way to keep track of this is by FTEs (Full Time Equivalents), so that if you are spending, say, 10 hours a week on your formal administrative teaching responsibilities, that might be counted as 0.25 FTE and reimbursed at an appropriate level. Of course, we all know that it is unlikely that our reimbursement for teaching will be reasonably proportional to the time we spend on it. In addition, direct teaching is rarely reimbursed at all, but is rather regarded as a "responsibility of citizenship" within a clinical department or a medical center. Nonetheless, it provides a basis for comparison and for negotiation.

Use your strategic career plan to help you decide whether you are going in the direction you want. Reassess constantly.

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Schuster JH, Wheeler DW, eds. Enhancing Faculty Careers: Strategies for Development and Renewal. San Francisco (CA): Jossey-Bass; 1990

Web sites

Association of Women Surgeons Pocket Mentor www.womensurgeons.org/PktMentor.htm

Center for Instructional Support (CIS), University of Colorado Health Sciences Center www.uchsc.edu/CIS/Leadership.html#anchor1063308

Mom MD www.mommd.com/

How Do I Achieve My Own Career Development Needs?

Why ask?

Your strategic plan should integrate all aspects of your career, not just those related to teaching.

Approach

Always start by getting some idea of what your needs are.

Doing this will be much easier if you are able *to* discuss it with someone who knows the workings of your institution and is inclined to help you - your mentor if you have one. If you do not have a mentor at your own institution, there are other possibilities. First, your mentor does not have to be from your own department. Second, someone from the ASE or from another professional organization may be able to help you find an appropriate mentor at your institution or to give you advice directly.

Define both long and short term goals. Then look at your present activities and decide which ones contribute toward which goals. Are there activities that do not contribute to any goals? Are there goals that are not being addressed?

Your strategic career plan demonstrates how you have decided to achieve your goals. Once you are satisfied with it and have discussed it with your mentor, you should go over it with your division head or department chair, so they will know and approve what you are doing. Ideally, you will also be able to enlist their help in achieving your goals.

A word of advice: select a wide variety of goals, clinical, research, educational, and academic, from next week to ten years, from local to international, from easily in sight to possibly a bit beyond your grasp. Do not set your goals too low or be too narrow in your aspirations.

Do not forget that your strategic career plan must leave room for the important things in your personal and family life.

Beware of becoming overwhelmed with minutiae. This can easily happen if you are directing a clerkship or other large educational program. It is crucial to delegate as much of the routine day-to-day work as possible. Once used to the job, a competent clerkship manager can answer many questions independently and can deal with the constant little glitches that would otherwise require your attention. Other faculty can be assigned to segments of teaching responsibility, such as organizing the pre-clerkship teaching or the PBL sessions.

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Covey SR. The seven habits of highly effective people: Powerful lessons in personal change. New York (NY): Simon and Schuster; 1990

Faye L, Cullen DL. Empowering the Faculty: Mentoring Redirected and Renewed. 1996

Web sites

Center for Instructional Support (CIS), University of Colorado Health Sciences Center
www.uchsc.edu/CIS/CarPersDev.html

Medical College of Wisconsin Faculty Development www.mcw.edu/edserv/facdev/mentor.html

What Research Opportunities Are Available In Surgical Education?

Why ask?

Research activities are a contributory factor in academic advancement.

Approach

Much research is done using students, residents, and faculty as subjects. When working with students or residents, faculty often wonder how they can evaluate or teach better, more efficiently or more creatively. Unfortunately, most faculty become so entrenched in the way they do things, that they never think to ask whether theirs is a new or unique approach. First step, do a literature review. If you can't find anything on what you are doing, there is a good chance that you are teaching in a manner that is innovative and creative. Why not make this into an educational research project? If you are collecting data is there anything you can additionally look at that would translate itself into a research project? Funding is available through the ASE Foundation as well as other sources. See elsewhere in this handbook for a fuller discussion of the topic (Section II). Many institutions provide start-up funds for pilot projects. Consult with your local medical education specialist to get advice on how to frame your hypothesis, effective research methods for educational research and practical advise on data collection and analysis.

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Calhoun JG, et al. Bibliography of publications in surgical education: 1964-1985. University of Michigan, 1985

Web sites

Center for Instructional Support (CIS), University of Colorado Health Sciences Center
www.uchsc.edu/CIS/Funding.html

Which Are the "Education Friendly" Societies That I Should Participate In?

Why ask?

Participation in professional societies is a necessary part of an academic career, in education as in other areas of medicine.

Approach

First and foremost, of course, is the ASE.

The American College of Surgeons has committees on Graduate Medical Education (GMEC) and Surgical Education in Medical Schools (CSEMS).

Association of American Medical Colleges (AAMC)

Generalists in Medical Education

Association of Canadian Medical Colleges (ACMC)

Association of Program Directors in Surgery (APDS).

The websites of these organizations will lead you to many other educational sites.

Web Sites

ACS Committee on Graduate Medical Education (GMEC) www.facs.org/dept/serd/gmec

ACS Committee on Surgical Education in Medical Schools (CSEMS) www.facs.org/about/committees/csems

Association of American Medical Colleges (AAMC) www.aamc.org

Association of Program Directors in Surgery www.apds.org

The Generalists in Medical Education www.thegeneralists.org

The Association of Canadian Medical Colleges (ACMC) www.acmc.ca

Center for Instructional Support (CIS), University of Colorado Health Sciences Center www.uchsc.edu/CIS/Organizations.html

Society for Medical Decision Making www.gwu.edu/~smdm/

American Association of Higher Education www.aahe.org

American Education Research Association www.aera.net

What Are the Common Political and Administrative Errors, and How Can I Avoid Making Them?

Why ask?

Certain common errors and problems are worth thinking about in advance - and worth avoiding.

Approach

The worst problem is not to have the support of your Chair. If you do have your Chair's support, it will help you overcome other obstacles in the school and in the department. Your Chair's support will reinforce your efforts to enlist Surgery faculty in attaining your educational objectives. Keep your Chair informed of what you are doing and involved in your educational projects, to the full extent they are interested and willing (and maybe a little beyond).

Another major problem is becoming isolated, both within your department and within the medical school. You can avoid this by discussing educational issues with your colleagues, getting them involved in the planning as well as the implementation of the curriculum and in other projects. Participate in whatever school-wide initiatives seem worthwhile. Develop and participate in interdepartmental educational and research projects.

***Do not underestimate your need for secretarial and administrative support*.** If you are overwhelmed with the paperwork and other minutiae of running a teaching program, you will have more trouble recognizing and dealing with the larger problems that inevitably develop. You will also have trouble finding time for your other activities. Your efforts should be reserved as much as possible for those aspects that only you can handle.

Make a constant effort to keep in touch with the needs of your faculty, the medical school, and the students. Talk to them in person, send out questionnaires, use evaluation forms… Any method of doing this will work if your stakeholders know you are doing it and if they believe you are responsive. The Office of Medical Education Research and Development at the Michigan State University College of Medicine has a listserv that frequently provides topics/issues of great interest. They discuss topics in medical education, including faculty development. Participants may address any question to the list; answers tend to be informed and thoughtful.

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Master of Health Professions Education (MHPE) leadership program, University of Illinois @ Chicago
www.uic.edu/com/mcme/mhpeweb

University of Southern California Educators in Medicine/Health Professions Fellowship
www.usc.edu/hsc/medicine/med-ed/program.html

DR-ED Listserv www.uchsc.edu/CIS/Lists.html

What About the Teaching Portfolio?

What is a teaching portfolio?

A teaching portfolio is a collection of materials documenting a faculty member's teaching performance. The contents of each portfolio are highly diverse. They are generated out of that faculty member's own instructional activities and reflect his/her personal interests and emphases. At any given time, the portfolio contains multiple items of evidence a faculty member brings together to document that s/he is a competent or excellent teacher. *A faculty member constructing a portfolio does so continuously, entering materials and information into the portfolio as they are generated*. Teaching portfolios can serve both a formative purpose—to improve a faculty member's teaching—and a summative purpose—to provide a basis for promotion and/or tenure decisions. A teaching portfolio is a means to an end rather than an end in itself. The contents of even the most complete portfolio must be carefully reviewed by qualified evaluators, usually a panel of peers, to determine each faculty member's level of achievement as a teacher.

What is the purpose of a teaching portfolio?

The teaching portfolio should be the basis for establishing "excellence" and "satisfactory competence" in teaching for promotion and tenure decisions. The portfolio would contain a comprehensive and authentic set of materials and data available to support a rational and consistent evaluation of a faculty member's teaching. All faculty members in the promotion pathway will maintain a teaching portfolio since all will need to document at least a basic degree of achievement in teaching in order to be promoted and/or receive tenure. Other faculty members will use excellence in teaching as one of the areas on which their case for promotion primarily rests. For these faculty members, the portfolio contents would be more extensive and the criteria used in their assessment would be more exacting.

The multiple pieces of information and documentation in a complete teaching portfolio will help ensure that each faculty member's teaching is evaluated fairly. Each faculty member will have the opportunity to participate actively in the process, building a case in support of the quality of his/her teaching. The criteria for excellence and adequacy in teaching will be clearer than they are at present. Use of multiple information sources will help ensure that evaluations of teaching effectiveness are not reduced to assessments of popularity. The ongoing maintenance of the portfolio will ease the periods of intense documentation (often in search of information that is very hard to find) that immediately precede promotion decisions.

What are the key elements of the portfolio?

Documentation of Teaching Activities

A core element of all portfolios will be a listing, with a measure of extent, of all teaching activities (including traditional instruction, teaching in a clinical and lab context, advising, workshops and continuing education, etc.) The School of Medicine will create a comprehensive guide to help faculty members report these activities for each academic year—such a report should be completed annually by all faculty members.

Reflective Statement

The reflective statement will contain the faculty member's philosophy and goals as a teacher, an assessment of his/her success as a teacher over a specific time period, areas needing improvement, and plans for improvement. This part of the portfolio allows the faculty member to explain how the portfolio is tailored to personal interests, departmental priorities, and the types of teaching that are customary in his/her discipline. The reflective statement is designed to put the contents of the portfolio in a meaningful context.

Peer and Learner Evaluations of Teaching

This includes evaluations of the faculty member's teaching by learners (undergraduate and graduate students; residents; fellows) as well as evaluations of the faculty member's teaching by peers who have

observed the faculty member. While evaluation by both peers and learners is required, the extent and format of the data that are required will be determined by the faculty member's department. These evaluations will derive from ongoing teaching evaluation efforts established within each department. Data collection and maintenance is usually a departmental function. Typically, the department will select appropriate, representative pieces of this information for incorporation into the teaching portfolio at that time of consideration for promotion and for discussion at the annual review.

How is the portfolio used in the promotion process?

Faculty members' portfolios will be formally evaluated at the time of promotion/tenure decisions. For this purpose, the faculty members and his/her chair will select the most important elements of the portfolio for submission to these committees, creating a "reduced portfolio." Promotion committees will use the reduced portfolio as the primary basis for their decisions about the excellence of a faculty member's teaching. They may, of course, consult the full portfolio and request additional materials as necessary.

Teaching is required of all faculty and should comprise a significant component of each faculty member's efforts. In general, promotion is based on excellent performance in two of the following four areas: teaching, research, clinical activity, and administration.

How is excellence in teaching judged?

There are six broad areas in which a faculty member's teaching may be judged to be excellent, satisfactory, or less than satisfactory.

- **Leadership of educational programs** (broadly interpreted to include programs in Medical/graduate/allied health/undergraduate/dental/pharmacy/nursing/public health, initiation of new courses or seminars, course/clerkship/residency/graduate Program Directorship, directorship of continuing education programs, etc.).
- Quality of teaching as judged by peers, including peers who have directly observed the faculty member.
- **Quality of teaching as judged by learners** and as collected by routine departmental procedures that respect the confidentiality of the learners.
- **Innovation/scholarship in education** (introduction of innovative ideas and techniques, creation of instructional materials, initiation of/participation in funded projects relating to education, publications and presentations about teaching).
- **National reputation as a teacher.**
- **Extent of participation in teaching, mentoring, and/or advising.**

How can these portfolios be used to document excellence in teaching?

Contributions to the educational mission of the institution

Recognition by peers and learners for excellence in teaching:

- Teaching awards
- Superior evaluations by learners
- Superior evaluations by peers

Leadership and participation in educational programs based on:

- Number of years involved in each course or clerkship

- Number and type of students and hours of interaction
- Special accomplishments and recognitions

Development and implementation of innovative and successful educational methodology:

- New courses, new curricular content
- Important teaching materials, videotapes, CD-ROMs, instructional web sites
- Measures of learner achievement:
- Performance on local or national certifying/recertification exams
- Publication of student work in which faculty member served as mentor
- Course tests, written cases, simulated patient cases
- Effectiveness of students in succeeding courses

Contributions to the teaching mission outside the university

- Leadership and/or active participation in continuing medical education at the local, regional, or national level
- Service as a visiting professor or lecturer
- Letters of recommendation for exceptional educational contributions to other institutions and organizations
- Superior evaluations arising from participation in other teaching programs

Contributions to the teaching profession

- Published reports that involve the development or evaluation of teaching methods and/or new programs, or that define important and useful changes in medical education
- Editorship or authorship of textbooks, reviews, multimedia materials, or curricula that are adopted by other institutions
- Service on institutional educational committees
- Membership and/or leadership in national educational organizations
- Certifying boards
- Accrediting bodies

How can the portfolio be used to document excellence in research?

Recognition by peers as an independent, original, and substantive investigator:

- Publication of original research in rigorously refereed journals
- Strong record of national grant support awarded through peer review
- National or international prizes and awards
- Delivery of endowed lectureships or service as research visiting professor
- Written testimonials of research excellence

Contributions to the field:

- Editorships or participation on editorial boards of research journals
- Participation on national study sections and scientific advisory boards
- Leadership roles in national or international scientific societies
- Leadership roles in major national or international research meetings

Contributions to the institution:

- Leadership or active participation in the development of research programs
- Active participation in research-related administrative/committee activity
- Leadership in program projects, training grants, graduate programs, or postdoctoral training

How can the portfolio be used to demonstrate excellence in clinical activity?

Recognition by peers, patients, former residents, institutions, etc.

Patient referrals from other physicians and patients taking into account:

- Geographical distances of referral area
- Percentage of new patients seen referred directly to the physician
- Number and complexity of patients referred

Professional contributions to patient care:

- Introduction of new techniques or instruments
- Possession of special competencies that enhance clinical care

Development and maintenance of new clinical programs, taking into account:

- Impact of the program, based on number of patients, adoption of similar programs in other settings, influence on related programs
- Innovations that improve the efficiency of patient care: cost, resource utilization, length of inpatient stay
- Productivity, as measured by volume of inpatients, outpatients, procedures, and operating room minutes
- Qualitative excellence in patient care, as measured by complication rates, legal challenges, letters of commendation from patients and referring physicians

Authorship of retrospective clinical studies and case reports, including:

- Publication in standard journals
- Presentations at scientific meetings
- Leadership in clinical care, e.g., directorship of a clinical laboratory, development and leadership of clinical programs

How can the portfolio be used to demonstrate administrative excellence?

- Administrative contributions to clinical services
- Contributions to management of academic departments by recommending, developing, implementing, and evaluating policies and procedures

- Directorship of institutional programs and centers
- Directorship of a course or residency program
- Directorship of a clinical laboratory

How can the portfolio be used to demonstrate participation in university, medical school, hospital, state/province, and national committees?

- Community-based service, professionally related
- Identification and coordination of responses to health needs in surrounding communities, state, and nation
- Coordination of public service efforts
- Leadership in national and international groups dealing with health care policy, health care planning, health care reform, or health care legislation
- Organization of programs at national or regional professional meetings

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ASE Faculty Development Committee. Teaching dossier. 1989

Web sites

The Teaching Portfolio sheridan-center.stg.brown.edu/publications/TeachingPortfolio.shtml

Designing a teaching portfolio www.psu.edu/celt/portfolio.html

Preparing a teaching portfolio www.utexas.edu/academic/cte/teachfolio.html

Teaching portfolio bibliography www.ilstu.edu/depts/CAT/tpbiblio.htm

SECTION II: RESEARCH IN EDUCATION

Why Should I Think About Educational Research?

Introduction

We all know that we need to "do" research. But the question is: how do we find time? The answer is to do **research in the context of our daily lives, that** is in the crucible where critical research questions and pragmatic methods evolve.

Evaluation has become a daily part of our lives, whether of students, residents, staff or faculty. Innovation is the hallmark of academic health science centers. These two forces provide a fertile environment for research in education. Research is the only way that we can get meaningful answers to questions such as "What is the learning curve for doing a laparoscopic hernia repair for second year residents?" or "How do I respond to the ACGME's demand that all residents' proficiency in the core competencies be measured?" or again "Can I measure professionalism or system-based practice"?

In their classic text, Handbook in Research and Evaluation, Isaac and Michaels beautifully described the relationship between research and education. "In educational assessment and decision-making, it is the only way to make rational choices between alternative practices, to validate educational improvements, and to build a stable foundation of effective practices as a safeguard against faddish but inferior innovations."

Why do I need to do research?

This is a very reasonable question, especially given the tremendous demands on an academic clinician's time. Here is the answer. "No discipline can call itself a profession that does not give top priority to research. More specifically, the status of a given profession depends on the adequacy of the research activities, and the application of research findings to routine professional activities." (Mouly *1978*) The imperative to conduct well thought-out research becomes even more relevant as we strive to gain recognition for educational activities in the context of appointment and promotion in academic health science centers.

Glassick and colleagues studied scholarship in all its forms. Traditionally scholarship has been defined as research, which was defined as bench research. However, Boyers and Glassick expanded the concept of scholarship to include the scholarship of teaching and the scholarship of engagement (e.g. clinical work). Approximately ¼of the medical schools in the United States and Canada have adopted the **Boyer model**. The American Association of Medical Colleges (AAMC) Group on Educational Affairs (which encompasses undergraduate medical education) has initiated a formal project to encourage all medical schools to explore the definition of scholarship, and to consider scholarly teaching as an equal to research. The key to making teaching scholarly is documentation. And the documentation is exactly the same as for true research. There are six steps in documenting scholarship:

1. *stating clear goals (statement of a hypothesis and an alternate hypothesis)*
2. *adequate preparation (review of the literature, pilot testing)*
3. *appropriate methods (self-explanatory)*
4. *significant results (meaningful findings)*
5. *effective presentation (journal article, abstract, workshop)*
6. *reflective critique (thoughtful discussion, development of next steps)*

If we think of educational research as driven by the process for documenting the steps of a project, it becomes less daunting. Whether the research is in doing basic bench science, in studying different teaching methods, or in comparing different ways to measure student attitudes, the same process of documentation should be followed. By focusing on the scholarship of education (of teaching) we describe

and document the transmission of knowledge and competency. Carefully studying why one method works when another doesn't turns a craft into science, and science into better practice.

The essence of research is to ask a question and look for an answer in a systematic, thoughtful manner. If teaching is to be scholarly, we should routinely be asking ourselves questions about our daily educational activities.

- "Why does small group teaching work in situation *x* and not in situation *y*?"
- "How long does it take senior surgeons to master use of the robotic surgery system for open cholecystectomy?"
- "How can our department attract the top students into surgery?"

Research is nothing more than systematically answering a question. To turn research into scholarship, you disseminate the results for peer review. It is really a formal and elegant way of answering a simple question. As you ask yourself a question, you clarify it, creating clearly specified goals (hypotheses). You prepare adequately by reading the literature, calling colleagues, going to conferences. You specify the techniques or interventions. You test out the different methods and ways of measuring your impact. You pilot test the process and refine it as necessary. You select the most appropriate methods to answer your questions. You do the study. You capture the data and analyze it. You interpret the findings to determine the significance of the outcome. Negative results can be meaningful – it depends on how you frame the question. You think about the implications of the findings, and thoughtfully prepare the next step. Finally, you disseminate the findings in the most appropriate format.

What differentiates good research from bad research?

There are many factors that distinguish "good" research from "bad" research. It is probably fair to say that traditionally, most educational researchers regarded **empirical research** as the most valid source of information. It should be pointed out that many would argue against this position, and all researchers should appreciate that there are many other forms of research (e.g., **historical, phenomenological, introspective, qualitative**, etc.), which contribute greatly to, and are essential for, a thorough understanding of issues relevant to education.

Empirical research is characterized by: direct observation, objectivity, falsification, replicability, parsimony and quantification (i.e., the scientific method).Within the realm of empirical research, educational research methodologists generally speak of two broad sets of criteria for evaluating the quality of a study. These criteria indicate the degree to which a study has internal validity and external validity. Most factors that determine the quality of a study can be conceptualized as specific elements of one of these two types of validity criteria.

Internal validity refers to the extent to which a study actually addresses what it purports to address. When attempting to judge the internal validity of a study, we must ask ourselves questions such as:

- Did the authors actually study what they thought they were studying?
- Are there other factors, that were not eliminated, controlled for, or studied, that can account for the obtained results?

There are many **threats to internal validity** that are commonly problematic in educational research. These have been described in detail by several authors and it is useful to be familiar with them. In addition, each study contains its own specific threats to internal validity, which may be unique to the specific environment within which the study is carried out. A primary challenge for researchers is to design studies in such a way as to maximize internal validity. Consulting with an expert in research design and statistical measurement is very helpful as one designs a study and sorts out what threats are likely to impact the validity of the study.

External validity is related to the extent to which the results of a study are likely to **generalize** to other situations, the extent to which the results are interpretable with respect to existing knowledge and **theories** concerning its subject matter, and the appropriateness of the statistical criteria that are used to draw conclusions.

In considering the external validity of a study, we must ask ourselves questions such as:

- Are the authors' conclusions consistent with and supported by the results of the data analyses?
- What is the likelihood that the obtained results would be found in other settings?
- Does the study build upon existing knowledge?
- How do the results relate to those of previous studies?
- Do the results of the study contribute to a greater understanding of the subject matter?

The ability to answer these kinds of questions requires knowledge of research methodology and of theoretical and practical issues related to the subject matter of the study. As is the case with internal validity, it is useful to be aware of numerous threats to external validity, which commonly affect educational research studies and have been well described in the research methodology literature. Once again, consulting with an expert in research design can be very helpful at this point in developing the project.

In addition to these scientific criteria, reality dictates that practical issues must also be considered in judging the quality of a study. It is not all that unusual to discover researchers grappling intensely over theoretical problems that may never have any practical significance. Conversely, there are those who conduct study after study addressing practical issues without any theoretical basis. Such efforts can produce a large collection of unrelated and unexplainable - but well-proven - facts that may only have utility within a very limited set of circumstances. Striking that delicate balance between these two extremes is an ongoing challenge for researchers who wish to earn a living.

During the past decade, many authors have written extensively on the topic of **Evidence-Based Medicine** (EBM). This literature provides an excellent framework for physicians to evaluate the quality of clinical research. Though not focused on issues specific to educational research, the EBM literature provides useful criteria for different categories of research, such as studies on treatment efficacy, accuracy of diagnostic tests, clinical guidelines, prognosis and risk, as well as overviews and **meta-analyses**. Many of the concepts are applicable to educational research and should be familiar to all educational researchers.

Educational research poses specific challenges that are not encountered as frequently in other kinds of research. Most of these relate to **measurement** issues, which arise from the fact that the subject matter of educational research usually involves some form of human behavior. When humans attempt to study the behavior of other humans, a wide variety of **biases** and **individual differences** come into play. Very frequently, we must know a great deal about not only the behavior of the subject, but that of the researchers as well. Furthermore, unlike the **variables** frequently studied by physical scientists, the variables of interest to educators can, and usually must, be conceptualized from a wide variety of vantage points. For example, educators are often interested in studying knowledge acquisition - perhaps comparing different teaching approaches or materials. Before one can study knowledge acquisition, one must first define the knowledge **domain**. At one extreme, the knowledge domain may be conceived as a list of facts that must be memorized. At the opposite extreme, it may be conceived as a complex network of concepts, principles, algorithms and facts that must be applied in the face of a wide variety of stimuli and situations.

The complexity inherent in educational variables points to a need for researchers to possess knowledge of some key concepts in the areas of educational theory (which must often be synthesized from the fields of education, psychology, sociology, anthropology, etc), psychometrics, sociometrics and statistics.

It cannot be over-emphasized that **educational research should always begin with a research question** that is clearly stated**.** Yet just as in clinical practice an empirical approach may occasionally be the most reasonable course of action, so in research there are times when a practical question must be solved – time is critical, not theory. The difficulty with this situation is that one cannot understand why something worked. So, while it may be pragmatic to conduct a study, it is unlikely that the results will be generalizable to other situations, and there is a negligible contribution to the knowledge. We are perpetuating the craft, not the science of education, and reinforcing that pejorative maxim, "those that can - do, those that can't - teach." If teaching and education are to merit respect as an academic enterprise, we must conduct meaningful, theoretically sound research that contributes to the practice of education.

A theoretically significant research question is different from other types of questions. It is useful to consider what *it is not.* Generally speaking, a research question is *not* simply a question of fact (e.g. "How many residents passed the Qualifying Exam on the first attempt in 1999?"). It is *not* a question about a specific sample of subjects (e.g. "Do my students perform better on open-ended rather than multiple choice questions during my course on anatomy?"). It is also *not* a question about things that cannot be measured (e.g. "Do residents with good karma have more success than those with bad karma in removing the evil spirits from their patients?").

So, what is good research? A "good" research question is one that seeks new knowledge and can be addressed through the application of scientific methods (e.g. "What is the best lecture format for teaching students about metabolism?"). The new knowledge should build upon the existing scientific knowledge base. The question should pick up where the existing theories and empirical data leave off, and it should lead to specific **hypotheses** which can be tested. The answer to the research question is **deduced** from the results of the hypothesis tests and should provide information that applies not only to the specific **sample** of subjects that were studied or the particular setting in which the study is done. Rather, it should provide information of relevance to a broad, definable **population** of subjects and settings.

For example, psychologists, educators, sociologists, biologists, computer scientists, and anthropologists, among many other categories of scientists have studied knowledge acquisition. These disciplines provide a diversity of theories, explanations, predictions, techniques and questions that need to be addressed relative to knowledge acquisition in a variety of contexts. To address a question such as "What is the best lecture format for teaching students about metabolism?" in a theoretically significant way, a researcher should become familiar with key concepts from these other fields. In doing so, one will often find useful research designs, measurement techniques and perhaps most importantly, explanations for both the expected and unexpected results, which find their way into every study.

Assuming that a significant question has been clearly articulated, the quality of the study will ultimately depend upon the research design, data analysis and interpretation and reporting of results. More information about these topics is found in the appendices.

Why should I do a survey and how do I start?

The merit of a particular research design is simply a function of whether or not the methodology employed is that which is best suited to answer the research question being posed. Survey design has fallen into disrepute among editors, reviewers and consumers of medical research…and much of this criticism is deserved. Many surveys are poorly designed, developed, administered and/or analyzed. Such poorly executed research only serves to reinforce the preconceived notion that surveys aren't worth the paper they are printed upon. Individuals often engage in survey research because they think it is simple as well as a quick and dirty way to get information, and ultimately, a publication. This is not the case—like experimental research good survey research is very systematic and rigorous. The bottom line is that good data collection is good data collection and the same principles apply regardless of the method.

Step 1: Where do you start?

Like all other forms of research, the purpose of the study must be supported by a review of the literature. Once you have reviewed the literature and solidified your understanding of the problem, develop research questions. These research questions will then guide the development of the content. If an item does not help you answer a research question do not include it on the survey. For example, demographic information is frequently asked of survey groups. If knowing someone's age, gender, or marital status isn't going to help you understand the problem or answer a question, don't ask it.

Step 2: What kind of information is being sought?

What information do you want from survey respondents? Do you want to know about:

Respondents' attitudes/beliefs?

Respondents' knowledge?

Respondents' behavior?

Respondents' attributes (demographic characteristics)?

Step 3: How will you structure the question?

This is an important step because how you ask the question will determine the type of statistical analyses you can perform. The main types of questions: open-ended, close-ended with ordered answer choices, close-ended with unordered answer choices, and partially close-ended questions, each have their strengths and weaknesses with regard to the type of information you can obtain and the sophistication of analysis that can be performed. Unless the sole purpose of your survey is to solicit suggestions, probe memories, clarify positions and or vent frustrations you will want to limit the number of open-ended questions. Open-ended questions make it difficult to construct meaningful variables for statistical analysis, they are extremely difficult to collate, and illegible handwriting poses problems.

Step 4: Be aware of common wording problems

Ask yourself:

- Will the words be uniformly understood?
- Do the questions contain abbreviations, acronyms, or unconventional phrases?
- Are the questions too vague?
- Are the questions too precise?
- Are the questions biased?
- Are the questions objectionable or will they encourage the respondent to respond in an ideal vs. real manner?
- Are the questions too demanding (e.g. asking the respondent to rank order 15 items)?
- Are you asking a double question?
- Do the questions have double negatives?
- Are the answer choices mutually exclusive (normally found when asking respondents to select from among categories of numbers e.g. <10, 5-10)?
- Have you assumed too much knowledge (e.g. assuming that respondents are up to date on current legislative motions)?

- Has too much been assumed about respondent behavior (e.g. assuming respondents vote for president)?
- Is the question technically accurate?
- Is an appropriate time referent provided (e.g. how many times have you played golf—ever? The current year? In the past 2 weeks?)
- Are the questions too cryptic?

Step 5: Questionnaire format

The questionnaire and cover letter are the main sources of information that the subject will refer to in deciding whether or not to complete it. Gall, Borg & Gall do an excellent job of providing tips and outlining common questionnaire problems in their text Educational Research: An Introduction.

The basics…the questionnaire should:

- Look attractive/appealing to complete
- Have questions laid out and organized in such a manner as to make them as easy to complete as possible
- Be organized with items appearing in some logical sequence
- Begin either with those questions that the respondent is likely to see as useful to the purpose of the study, or with those that are easy to answer and non-threatening
- Place important items that are key to the study near the beginning

Remember: items that are interesting and clearly relevant to the study will increase response rate; length has a small effect on response rate.

Step 6: Pilot the content

Pilot the content of the questionnaire with peers and colleagues. This will give you, as the researcher, a better understanding of whether the questions are understood and are successfully measuring what they were intended to assess. Specific questions that should be asked of those involved in pilot testing are:

- Are all the words/questions understood?
- Does each close-ended question have a response choice that would apply to each respondent?
- Does the questionnaire create a positive or even controversial impression—one that motivates people to respond to it?
- Does any aspect of the questionnaire suggest bias on the part of the researcher?
- Ask how difficult/lengthy questions were interpreted

Step 7: Letter of Transmittal (or cover letter)

This is perhaps the single most important factor in determining how successful your survey will be. This letter should:

- Explain what the study is about
- Convince the potential respondent that the study is useful
- Convince the potential respondent that his/her response is important

- Promise confidentiality (if an identification number is used for follow-up it must be explained to respondents in a straightforward manner)
- Reemphasize the basic justification for the study
- Be printed on letterhead

If your study is well-designed and deals with a significant problem, it is usually possible to have someone who exerts favorable authority to endorse it. Request that the questionnaire be returned by a particular date. Most surveys will request a return within 1 ½ 2 weeks.

Step 8: Obtain Institutional Review

The institutional review boards at your institutions will require:

- A copy of the survey's cover letter
- You to address issues of confidentiality and anonymity
- You to obtain informed consent
- Remember that you may not proceed with survey distribution until you have received IRB approval!

Step 9: Pilot the instrument

The first pilot should be done with conveniently located people. The second pilot should be done with 5-6 randomly selected individuals who would be participating in the study. This pilot will tell you whether or not the survey seems to flow logically, ease in completion, etc.

Step 10: Pilot the procedures

At this point you are actually piloting the entire procedure of sending out your survey and analyzing the results. In addition, you are making sure that you are sending this to the people who can actually answer the questions. In this phase you will be developing a codebook. This codebook will help you determine how data should be entered and analyzed. You will want to determine what mailing supplies you will need (will you need additional postage due to the weight of the survey?). Debrief those who were piloted (similar to Step 5)—ask if questions were redundant, offensive, difficult to answer, did they feel pigeonholed, was the order of the items logical? Finally, you will enter the data and perform basic statistics.

Step 11: Mailing

If all goes well with your pilot…print it up and mail it out! Survey participants should not have to pay for anything so you will need to insure that you have included return envelopes that are complete with postage and return address label.

Step 12: Follow-up

One-two weeks after the initial mailing a postcard reminder may be sent to all potential respondents. This serves both as a thank-you to those who have responded and as a reminder to those who have not. Three weeks after the initial mailing a new cover letter and replacement questionnaire should be sent to non-respondents. This will look nearly the same as the original mailing but has a shorter cover letter that informs non-respondents that their questionnaire has not been received, and appeals for its return. If necessary, a final plea to subjects for response can be sent ~7 weeks after the initial mailing**. An acceptable response rate in survey research is 75%.** If this marker is not achieved it is very likely that study findings could have been altered considerably. It is therefore desirable to check a portion of the non-responding group even though this checking usually involves considerable effort. Follow-up methods have been well described in the Gall textbook Educational Research (as noted in Step 5).

References

Fink A. The Survey Kit. Sage Publications, 1995 (includes: How to Report on Surveys; How to Sample in Surveys; How to Ask Survey Questions; How to Analyze Survey Data; How to Design Surveys; The Survey Handbook; How to Conduct Interviews by Telephone and in Person, James H Frey, Sabine Mertens Oishi; How to Conduct Self-Administered and Mail Surveys, Linda B Bourque, Eve P Fielder; How to Measure Survey Reliability and Validity, Mark S Litwin)

Gall MD, Borg WR, Gall JP. Educational Research: An Introduction. 6th ed. Boston (MA): Allyn & Bacon Press; 1996

Mouly G. Educational Research: The Art and Science of Investigation. Boston (MA): Allyn & Bacon Press; 1978. *(this is a classic book that provides all the basics in a readable format)*

Locke L, Spirduso W. Proposals that Work: A Guide for Planning Research. Teachers College Press. Teachers College, Columbia University; 1976 *(another classic that has great advice)*

Isaac S, Michael WB. Handbook in Research and Evaluation. EdITS publishers: San Diego (CA); 1978

Web Sites

Questionnaire design tips www.surveysystem.com/sdesign.htm

What are the ethical issues in educational research?

Truth telling, informed consent, autonomy, professionalism, competence, and confidentiality are bioethical principles that are inherent in every physician-patient interaction and including those of educational or clinical research. Surgical educators may regularly encounter bioethical situations such as those listed below.

- Informed consent and patient autonomy: e.g. refusal of care
- Confidentiality: e.g. HIV status
- Student and resident teaching: e.g. practicing procedures on deceased patients
- Clinical research: e.g. testing new ICU technology, clinical trials.

Confidentiality

The principle of confidentiality refers to the right of subjects to determine who shall have access to their personal information. Subjects have a right to privacy and to confidentiality in matters pertaining to their participation in a research project. Information about a specific subject may be shared with others only with the explicit permission of the subject or the subject's surrogate if the patient has lost decision-making capability. *There are no exceptions to this principle*.

The concept of informed consent is based on the principle of autonomy and the assumption that truth telling has characterized the patient-physician interaction. Respect for the patient's cultural values will shape the conversation about informed consent. As mentioned earlier, in societies where knowledge of a terminal illness is viewed as harmful, patients may waive their right to informed consent. Informed consent also includes informed refusal to participate. The principles of informed consent are described below.

Principles of Informed Consent

- Assess the subject's ability to understand consequences of the decision.
- Explain how the subject would be affected by the benefit, burdens and risks of the intervention.
- Document the decision and who was present for the decision.

Without informed consent, most Institutional Review Boards (IRB) will not approve a research protocol. And in virtually all educational institutions, **all** research protocols must have IRB approval. The core issue with regard to ethics and educational research focuses on informed consent. The issues that hold for obtaining patient informed consent apply equally to educational research. If the subject is capable, autonomy is the guiding principle. If the subject is incapacitated, the guiding principle in reaching a decision or in creating a plan of action is beneficence, defined as weighing the benefits, risks and burdens of an intervention in the context of the individual.

What do I need to know about research involving human subjects and the role of the Institutional Review Board?

Since the 1970's, federal regulations (through the FDA) have carefully stipulated how the rights of human subjects will be protected when they participate in research. The "Institutional Review Board" (IRB) is a generic term used by the FDA and the Department of Health and Human Services to refer to a group whose function is to review research involving human subjects and assure their rights and welfare. IRBs are frequently based in healthcare institutions and serve the local needs of researchers at that institution, but IRBs may also be independent entities without direct institutional affiliation

FDA regulations stipulate the appropriate composition of an IRB and define its responsibilities. The record-keeping functions, the ongoing monitoring of study compliance, the review of new study requests and the handling of expedited reviews are but a few of the issues this important committee handles. Generally, retrospective patient chart review for research purposes will require IRB approval as well. It is

the responsibility of the investigator to obtain the IRB approval before proceeding with research, to comply with the requests of the IRB for ongoing monitoring of studies, and to report in a timely manner any changes in the study protocol or design that are made after initial study approval.

The IRB's purpose is to assure, through initial review and periodic review, that appropriate measures are taken to assure the rights and safety of humans participating as research subjects. This is accomplished through a group process of protocol review, informed consent review and review of materials distributed to subjects as they consider participation. This group has the responsibility of oversight to assure that ethical standards are maintained, and that adherence to the three quintessential requirements for the ethical conduct of human subject research, respect for persons, beneficence and justice, is assured.

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Guidance for Institutional Review Boards and Clinical Investigators, U.S. Food and Drug Administration.

http://www.fda.gov/oc/ohrt/irbs/

Institutional Review Boards: The Emergence of Independent Boards, Department of Health and Human Services, Office of the Inspector General, OEI-01-97-00192; 1998

http://www.os.dhhs.gov/progorg/oei/summaries/b275.pdf

IRB Guidebook. Office of Research Protection, Dept. of Health and Human Services.

http://ohrp.osophs.dhhs.gov/irb/irb_guidebook.htm

Levine RJ. *Ethics and Regulation of Clinical Research*. 2d ed. Baltimore (MD): Urban and Schwarzenberg, 1986 (*See* especially Chapter 14, "The Institutional Review Board.")

Beauchamp TL, Childress JF. Principles of Biomedical Ethics, 2nd ed. New York (NY): Oxford University Press; 1983

Drickamer M. Ethics in Clinical Practice. In Principles and Practice of Geriatric Surgery. Rosenthal RA, Zenilman ME, Katlic MR, eds. New York (NY): Springer-Verlag; 2001

Engelhardt HT. The Foundations of Bioethics. New York (NY): Oxford University Press; 1986

What resources are available to help me do educational research?

Resources for help in conducting educational research can be found in several places. As is the case for most endeavors, other people are generally the best resource. ASE members are famous for being friendly, accessible and helpful to those interested in conducting surgical education research. Perhaps the best place to start is with the **ASE's Educational Research Committee**. This is a very active standing committee of the ASE. Its members include some of the most productive and innovative researchers in the field. The major purpose of this committee is to promote research by ASE members. The chair of this committee is always open to inquiries from members seeking research advice. In addition, this committee usually conducts one or more workshops during the annual ASE conference, which are designed to introduce members to various facets of educational research.

Another place to seek help is at your own institution. **Departments of Medical Education** often house individuals with considerable expertise in educational research. Likewise, individuals with appropriate expertise can often be found in university departments of psychology, education and/or sociology. In addition, it is often advisable to get help from a biostatistician, since educational research often involves some pretty fancy statistics.

For those with a serious desire to include educational research as a major activity in their career, the ASE sponsors the **Surgical Education Research Fellowship Program (SERF)**. The SERF program is an intensive introduction to the world of surgical education research. Fellows participate in two full-day workshops, which aim to provide a foundation of knowledge in research methodology. Fellows are assigned to mentors – established educational researchers – with whom they work on a research project. Graduation from the program requires the fellow to pass a written examination on research methodology, write and present a research proposal, and complete and present a research project at a scientific forum.

There are numerous **textbooks** and on-line tutorials (see attached) that teach research methodology and statistics. In addition, it is very useful and instructive to read **journals** such as Academic Medicine, Teaching and Learning in Medicine, Medical Education, The American Journal of Surgery, Current Surgery, Focus on Surgical Education, Surgery, and Evaluation & the Health Professions, all of which publish reports of research in medical and surgical education

It is important to keep in mind that research in surgical education, like research in any other field, is very time-consuming and labor-intensive. There is a specific body of knowledge and skills that are required in order to be successful. In addition, because the subjects of most surgical education research studies are students, residents or faculty, or some combination of the above, there are numerous political and ethical issues to which the researcher must be very sensitive. Research in surgical education often takes place within the context of health care delivery and requires the investigator to exert some degree of control within that environment. It is therefore essential to establish relationships with colleagues, students and trainees (and at times patients, ancillary staff and administrators) that will facilitate your efforts. Support from the department chair is also absolutely essential.

How can I obtain funding for educational research?

Most surgical education research is conducted without the benefit of research grants - which again reinforces the importance of establishing positive relationships with colleagues and most importantly, gaining the support of the department chair. The **ASE Foundation** has a research grant program, administered through the **CESERT program** – the Center of Excellence for Surgical Education Research and Training. Grants are available for up to $100,000. The ASE website (www.surgicaleducation.com) provides all the necessary details. There are other sources of funding for educational research, such as the National Board of Medical Examiners and the Emergency Medicine Foundation, but these sources are not specific to surgery. In addition, there are numerous **government agencies** (e.g. the Agency for Health Care Research and Quality), **specialty societies** (e.g. SAGES) and foundations that will fund certain kinds of educational research. In those cases, the project may have to be related to a particular clinical entity and/or procedure. The American College of Surgeons website (www.facs.org) also lists funding agencies for surgical research, some of which may be willing to fund educational research.

How can I turn my work into publication?

Publication of surgical education research is not unlike publication of other types of research. Ultimately, studies with the greatest likelihood of success will be those that are original, important and conclusive. Publication of surgical education research has become more popular in recent years, largely as a result of efforts by the ASE and the Association of Program Directors in Surgery (APDS) to promote high quality research and to establish relationships with appropriate journal editors. The quality of the published research in surgical education has improved dramatically during the past 10-15 years. The number of multi-site studies has increased, as has the frequency of collaboration between surgeons and individuals with Master's and doctorate degrees in fields such as education, psychology and sociology.

Submission of abstracts of completed research projects for presentation at the annual ASE conference is a wise step in the right direction. When an abstract is submitted for presentation at the ASE conference, it undergoes a thorough review by a program committee. If the abstract is rejected, the author will receive feedback as to how the research could be improved. If it is accepted, the author is required to submit a full manuscript, which will be assigned to a discussant that will provide feedback before and during the conference. The manuscript is reviewed by the discussant and by one additional ASE reviewer, then returned to the author for revisions prior to submission to the **American Journal of Surgery** - which then conducts its own review. This process provides numerous valuable opportunities for constructive criticism that can greatly enhance a manuscript's probability of publication. The annual meeting of the Association of American Medical Colleges (AAMC) provides another forum for presentation of educational research, which offers lots of constructive feedback for authors. Papers accepted for presentation at that conference may be published in the association's journal, **Academic Medicine**. Papers accepted for presentation at the APDS conference are published in the journal **Current Surgery**.

References

Statistics – Websites

Rice University Virtual Labs in Statistics – provides user-friendly on-line interactive instruction in statistics www.davidmlane.com/hyperstat

American Statistical Association – offers professional development, meetings, classes, videos, publications and links amstat.org

Getting Started with SAS software – A tutorial website for SAS. www.sas.com/software/tutorials/base/main_toc.htm

SPSS Basic Statistics and Free Tutorial Download www.spss.com/software/spss/base/stats101.html

Statistics – Journals

The American Statistician **www.amstat.org/publications/tas/**

Journal of the American Statistical Association www.amstat.org/publications/jasa/

Journal of Agricultural, Biological, and Environmental Statistics www.amstat.org/publications/jabes/

Journal of Educational and Behavioral Statistics jebs.uchicago.edu/

Psychological Methods **www.apa.org/journals/met.html**

Grant/Proposal – Websites

The Foundation Center – provides information on obtaining funding, writing grant proposals, and beginning your research. (pertains to philanthropic grant proposals) www.fdncenter.org

Proposal Writing – Books

Greever JC, McNeill P. Guide to Proposal Writing. The Foundation Center; 1997

Online Medical Research – Course

Online Medical Research Course – Learn how to find information on clinical trials, case studies, medical journals, and more. www.csuchico.edu/~csu/Promo/Promo.html

Writing Guides

Barrett E. Hints for Writing Successful NIH Grants. chroma.med.miami.edu/research/Ellens_how_to.html

Proposal Writing Short Course - The Foundation Centre http://fdncenter.org/learn/shortcourse/prop1.html

The original how to write a research grant application - The National Institute of Allergies and Infectious Disease (NIAID) http://www.niaid.nih.gov/ncn/pdf/howto.pdf

A Guide for Proposal Writing - National Science Foundation
www.nsf.gov/pubs/1998/nsf9891/nsf9891.htm

"Art of Writing Proposals" - Social Science Research Council www.ssrc.org/artprop.htm

Proposal Development Tools – UCLA Electronic Research Administration

www.research.ucla.edu/era/tools

How Do I Know That I'm Doing the Right Thing?

Below we've listed some key steps that will guide you through the critical elements of a research project. These suggestions are liberally adapted from Isaac and Michael's Handbook of Research and Evaluation.

1.) Do a pilot study. The point of a pilot study is to check out the practicality of the proposed protocol. The pilot is essential to confirm that the methodology works the way you want to (or think it will). This includes checking out the instrumentation, the availability and characteristics of subjects, the variability of the events of interest (to confirm your power estimates). The pilot will provide you with preliminary data that you use to support your application to the IRB and for funding. The pilot should cover all aspects of the final project, including writing a prototype report.

2.) Murphy's Law is irrefutable! Remember: anything that can go wrong will, and it will be at the worse possible time. As you are preparing your research plan, try to anticipate difficulties that would jeopardize your study. Think of things such as subject attrition, electrical outages, floods, slow return rates on surveys, equipment failure, and lack of cooperation in recruiting subjects or in implementing new techniques or protocols.

3.) Figure out how to do the data analysis before you start. A statistical consultant is invaluable. If you have completed your pilot study, you will have a solid base when you speak with your consultant, IRB committee, etc.

4.) Data analysis—Understand what assumptions you are making about the data *(use your consultant).*

- Normal distribution?
- Random and independent selection?
- Linear relationship of variables?
- Homogeneity of variance among groups (or homoscedasticity for regression studies)?
- Independence of sample means and variances?
- Dependent variable is measured on a ratio scale?

5.) If #1-4 sound impossible, retain an **educational research consultant**! Prior to talking to your statistical consultant provide information summarizing the basic concepts about the "content domain" (i.e. your area of expertise)

- Understand your audience – that is, what does your consultant, IRB, funding agency, etc. Give them the information they need about your area so they can provide you with useful recommendations.
- Provide a concise review of history and current state-of-the-art.
  - provide a preliminary estimate/description of alternative research designs that might be appropriate.

6.) Know the basic language of research. Read a basic textbook in behavioral research (Gall or Dawson and Trapp are excellent). Make sure to let your consultant know if you are uncertain about a concept. Have them explain. Remember, there are no stupid questions! You both need to have the same understanding of the basics if the consultation is to be worthwhile:

- Central tendency (mean/median/mode) and variability (standard deviation, variance)
- Distribution models (normal, skewed)
- Statistical significance.

7.) Define what you want to do.

- Define the independent variables.
- Define the dependent variables.
- Define the intervening variables.
- Know the measurement scale of each variable (nominal, ordinal, interval or ratio).
- Know reliability and validity data for each instrument/procedure used to produce a 'score'.
- Know the population distribution for each variable.
- Determine what difference between dependent variables has practical significance.
- What are the monetary, safety, ethical or educational risks involved if a Type I error is made?
- What is the nature of loss if a Type II error is made?

8.) Have a good time! Use your research projects as an opportunity for collaborative and collegial connections, as well as an opportunity to make a meaningful contribution to the profession and science of surgical education.

Selected Resources

Stillman R., ed. A Manual for Researchers in Surgical Education, 2nd ed. Association for Surgical Education, 1987

Isaac S, Michael W. Handbook of Research and Evaluation, 3rd ed. San Diego (CA): Edits, 1995

Gall MD, Borg WR, Gall J. Educational research: An introduction. 6th ed. White Plains (NY):Longman, 1996

Dawson-Sanders B, Trapp RG. Basic & Clinical Biostatistics. 2nd ed. Norwalk (CT):Appleton & Lange, 1994

SECTION III: ESSENTIALS FOR RESIDENCY PROGRAM DIRECTORS

How Do I Select Residents Appropriate To My Program?

All Program Directors must ask questions about how to select residents. Most often these questions are something like: "How do I get the best residents?" or "How do I make my program competitive so that residents will match here?" or again "What can I do to ensure that I do not match "duds"?"

The key point in the title "How do I select residents appropriate to my program" is in the word "appropriate". The diversity of residency training programs in many instances reflects the diversity of applicants. Sometimes we tend to think of residency programs in a good/bad sense just as we often consider resident applicants in a best/worst spectrum. These extremes are rarely the case as most applicants are solid individuals and most training programs do a good job.

What type of applicant then am I looking for? The applicant must have sufficient knowledge on which to build future surgical training. S/he must be a self-directed and energetic learner, and an able problem-solver. We all want to work with people we enjoy being around, so recruitment of those who are positive, upbeat and likable is always a bonus. Finally, I want to recruit an individual who is realistic about what our program can offer to fulfill his/her goals and expectations.

If I am to select residents appropriate to my program, I must not only know what my program uniquely has to offer, but **what our mission is**. Are we primarily training practitioners for our region? Do we have an emphasis on trauma? Is a research period required of all of our residents? Do we expect our residents to pursue advanced fellowship programs? How early do we advance independent operative skills? Such questions allow us to put our program in context with other training programs. We then need to send out a message or broadcast our reputation. All candidates need to understand our philosophy, our standards, and our ground rules. *"This is what we hope to accomplish in our training. These are our research expectations and our types of teaching programs. Here is our performance track record by our past residents."*

We constantly ask ourselves, **"Why do we have a training program?"** Residents are stimulating to have around and help us in patient care. But that is not enough. Residency training programs are graduate educational institutions. The primary motivation is to provide surgical education in a stimulating academic environment, with guidance and supervision by surgical educators. It is best to pick residents who are compatible with the philosophy and achievements of our institutions. The more compatible they are to our program, the better we can advance their personal goals during the training period. Most medical students, even in the mid-range of performance, have the qualities to be excellent residents and physicians. It is our job as Program Directors to seek out applicants who will best fit our program and, more importantly, determine how our program will best fit their educational needs.

So **what can you do to help insure a fit with our program?** Read students' personal statements, Dean's letters and their letters of recommendation to determine what they are looking for in their training and in their future careers. Study their medical school transcript to determine whether they have the intellectual capacity to stand the rigors of training. Be wary of students who have had to remediate or repeat fundamental courses. Look for continuity and insure that they have not been "missing in action" without explanation for periods of time. Look at the language in the Dean's letter—is this a student who has been enthusiastically endorsed, or through cryptic, non-descript language do you get the distinct feeling that this is a student who has had some repeated problems? Use the interview to confirm or deny questions or problems that arose through reading the students' documents. Careful consideration of qualifications and an extensive interview process is usually sufficient to identify candidates with potential.

Too often programs weigh heavily the reputation of the medical school of the applicant and their USMLE scores; these are important factors, but personal qualities and motivation have greater sustaining power. It is also important to have diversity in a resident class; diversity adds interest and keeps us broad in our appreciation of what the future of medicine has to offer. After all, our job is to train surgeons who will fulfill the future needs of society.

References

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Edwards JC, et al. The interview in the admission process. Acad Med 1990; 65:167-77

Edwards JC, et al. Surgery resident selection and evaluation. A critical incident study. Eval Health Prof 1993;16:73-86

Papp KK, et al. The relationship between criteria used to select residents and performance during residency. Am J Surg. 1997;173:326-9

Sachdeva AK, et al. Variability in the clinical skills of residents entering training programs in surgery. Surgery 1995;118:300-8

Weingarten MS, et al. A pilot study of the use of the analytic hierarchy process for the selection of surgery residents. Acad Med 1997;72:400-2

"So You Want to be a Surgeon". American College of Surgeons, 2001 www.facs.org/residencysearch/

What Should I Know About the Residency Application Process?

First you need to be aware of the materials that are used by students to generate impressions about your program. Most students will gather information about your program through a variety of sources: The Graduate Medical Education Directory, published annually by the AMA (AKA "**The Green Book**"); AMA **FREIDA** (an online interactive data base generated from data provided in the AMA Annual Survey of Graduate Medical Education Programs), the book *So You want to be a Surgeon . . . a Medical Student's Guide to Surgery Residencies;* brochures and annual reports published about your residency program; websites, match results from the previous year (available through the NRMP Program Results Listing of Filled and Unfilled programs), and by word of mouth.

Once students have gathered program information and filtered down the number of programs to which they will apply, they submit their materials to **ERAS** (the Electronic Residency Application Service) from the Association of American Medical Colleges (AAMC). ERAS is a service that transmits residency applications, letters of recommendation, Dean's letters, transcripts and other supporting credentials from medical schools to residency programs. Through ERAS, programs can review, sort or print application data using criteria established by the program. Programs can make decisions about whom they want to interview efficiently and economically.

Along with the ongoing ERAS application system, programs will need to determine when they will be interviewing applicants. Dean's letters are not available until November 1st and many programs will elect not to make final interviewing decisions until a complete student profile is available. Most programs will elect to **interview** candidates on select interview days. This format allows a program to involve a maximum number of faculty and residents on a limited number of dates, thus decreasing Program Director and faculty burnout and limiting costs. Many students will build an interviewing month into their curriculum. For most, this month is January. The mean number of programs in which students actually interview is 9.

Most programs develop their own criteria for what constitutes an acceptable candidate. It is appropriate and desirable for programs to weed out unacceptable candidates, those who do not fit their criteria, before the interview. Interviewing is a costly experience (a recent study documented that 70% of students applying to specialty fields spent >$1000 interviewing); students who are not suited to a particular program should be informed ahead of time so that time, money and energy can be focused appropriately.

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Graduate Medical Education Director, 1999/2000, American Medical Association, 1999

AMA FREIDA, www.ama-assn.org/freida

Heimbach D, Johansen K. So You Want to be a Surgeon… a Medical Student's Guide to Surgery Residencies. 9th Edition. ASE Education Educational Clearinghouse; 1998

NRMP Program Results. Listing of Filled and Unfilled Programs. National Resident Matching Program (distributed annually)

Anderson KD, Jacobs DM, Blue AV. Is Match Ethics an Oxymoron? Am J Surg 1999; 177:237-239

How Do I Evaluate and Rank Applicants?

A good residency selection process should provide **content validity.** This characteristic suggests that the traits that are valued by surgical faculty and residents are the ones incorporated into the selection process. Secondly, a strong selection process should demonstrate **concurrent validity**. This is measured by evaluating the relationship between the National Residency Matching Program (NRMP) rank for your applicants and their final match location if not with your program.

The screening process

It is critical that the surgical faculty provide a consensus for the Program Director as to the criteria and weighting of criteria to be utilized to select applicants for interview. This would include items such as class rank, clinical honors, AOA status, scientific publications, Step I USMLE score, letters of recommendation, Dean's letter, and extra-curricular activities. There is certainly no consensus in the literature as to which of these items or groups of items provide the greatest predictive validity of future resident performance.

One approach is to look at this process in two stages. In **Stage I** all applicants are first given points based upon objective items that can be obtained from the applicant's file by administrative personnel (academic profile, see algorithm). This includes class rank (if obtainable), honors in Surgery, AOA status, Step I USMLE score and a score for their medical school of origin with senior faculty ranking *a priori* the strength of all U.S. and Canadian medical schools. After this score has been entered into the database, the applicant's file is reviewed by a surgical faculty member with completion of an evaluation instrument looking at five criteria: letters of recommendation, personal statement, Dean's letter, research experience, and extracurricular / community involvement. A Likert scale is used with anchored criteria. After this second score is entered into the database all applicants are ranked and a decision made as to how many applicants will be interviewed. The decision as to the number of applicants to be interviewed should take into account not only how far into the rank list previous years have gone, but also the need for "marketing" of the program, particularly if there have been recent changes and improvements. Prior to the applicant interviews a, Stage II faculty review is completed by the Program Director utilizing the same evaluation instrument rating the five criteria as in Stage I initial faculty review.

The interview process

The interview day generally begins with an initial program overview by the Program Director. This presentation focuses particularly on unique strengths or characteristics of the program. In this session applicants have the opportunity to ask questions and clarify perceptions. These sessions also offer programs a unique opportunity to observe applicants' skills at interacting with others and to formulate initial impressions of their interest in the program. Many programs utilize a blinded interview process. In a blinded interview faculty are not provided with the applicant's file and thus know only their name and institution of origin. They are then asked to rate applicants on such issues as appearance, communication skills, maturity, self-confidence, apparent ability to work effectively with others, and compatibility with the program. In addition to interviews with 2-3 faculty members, applicants should be rated by housestaff who interact with them during campus tours. While there are clear advantages to a blinded process (namely formulating impressions based solely on the applicants' conduct at the interview), the blinded process can leave an applicant feeling as if the effort put into their application was for naught because no one discusses it. An open interview process offers the advantage of letting the faculty member or resident clarify any concerns in the application materials and actually use the applicant's background as a recruiting tool. Regardless of the system used (blinded or open), the residency selection process should be well organized, understood by all faculty, be perceived as fair for the applicants, and utilize broad input from as many faculty as possible for each individual candidate.

The ranking process

After interviews are completed, all data are collected and may be weighted using such criteria as: academic profile, faculty review, and interview. After all scores are entered, applicants can be ranked in preparation for a single final match meeting. In the final match meeting, all applicants and their final rank

are reviewed. It is important to note that *not all applicants should be ranked!* If someone was interviewed who leaves faculty and residents with significant concerns they should not be ranked. There is always the chance that a program could go very low on their list and it is frequently better to take chances with the post-match scramble than with matching someone who did not impress the program from the start.

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Robin AP, Bombeck CT, Pollak R, and Nyhus LM. Introduction of bias in residency-candidate interviews. Surgery, 110:253-258, 1991

Friedman CP, Helm KP, Trier WC, et al. Predictive validity of a houseofficer selection process at one medical school. Acad Med 66:471-473, 1991

Kron IL, Kaiser DL, Nolan SP, Rudolf LE, et al. Can success in the surgical residency be predicted from preresidency evaluation? Ann Surg 202:694-695, 1985

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What are the important components of applicants' interview and visit?

The interview and visit of perspective candidates for surgical residency programs have been part of a ritual for decades. In almost all residency programs, candidates will not even be considered unless they have had interviews with members of the perspective Department of Surgery. This process is very expensive for candidates - and also for departments in terms of faculty time, as well as meals and occasional accommodations for such visitors. Since this is such an important part of the application process, the questions are raised: "*What is the prospective department looking for?*" and "*What is the prospective house officer looking for?*"

Interviews are granted by residency programs following the initial screening of many applications. This process includes a review of academic performance, public service, letters of recommendation, and other interests. Most Program Directors will tell you they are looking for residents who will enrich the program through their special interests, background and personality. If we are to be together for at least five years, it should be interesting and enjoyable for the faculty as well as the resident.

Applicants who have been well mentored will be looking at four essential issues: (1) academics; (2) leadership of the program; (3) work environment; and (4) lifestyle issues. Issues related to **academics** include the following: conference schedule/who attends, what is its priority in the program; graduates of program—board certification rate, what are they doing, fellowships?; how many residents haven't completed the program? reasons? what are they doing now?; research opportunities/requirements; how are residents evaluated? teaching environment. When looking at **leadership**, applicants will want to know a program's accreditation status, stability of program leadership, vision for the program, faculty involvement in research, and residents' role in providing input to program leadership. The most important issues to most applicants will be issues related to the **work environment** and lifestyle issues. Specifically, they will want to know what they can be expected to do at each level of training; who will interns work with most closely; what is the clinic schedule – how is it run and supervised? What is the case-load at each level and the breadth of operative experience? What is the call/vacation schedule and how does it change from year to year? How are the ancillary teams in the hospital? What is the general opinion of the nursing staff? What other residencies are at the institution and what is their accreditation status? **Lifestyle issues** include satisfaction/happiness of residents; camaraderie among residents; satisfaction/happiness of residents and of their spouses/significant others; cost of living; availability/affordability/location of housing; safety; maternity and paternity leave; marital status of residents; number of women and minorities currently in program.

Time spent one-on-one with the residents in an informal setting is typically viewed as one of the best parts of the interview process (from both the candidates' and the residents' perspective). Some programs host cocktail parties or receptions the night before the interview to get to know applicants, others arrange for residents to take applicants out for dinner. Most programs host at least a breakfast or lunch to facilitate informal communication between applicants and residents.

The **goal of any interview day** is to insure that applicants leave the interview with a clear picture of the program, no unanswered questions, and feeling that it was an experience that was well worth their time and effort. Even if the program is not a good fit for an applicant, the applicant should leave with a positive enough impression about the program that s/he will talk it up to students along the "interview trail" or at their home institutions. To the degree possible, applicants should follow tightly organized schedules where their time is maximally used and minimal time is spent waiting around. Horror stories abound about students who have waited for 10-12 hours to just meet the Program Director.

Programs should **monitor their interview process** by sending candidates questionnaires about the experience after they have interviewed. Ask them what they liked and disliked about the interview and visit - and if themes emerge, be willing to act upon them.

What are the Dos and Don'ts of the Matching Process?

First things first - gather the information. **First**, make an appointment to meet with the Director of Medical Education (DME) at your institution. Find out how the DME's office has been involved and what his/her role is in the process. Ask for a historical perspective of how your program has done in the match and what, from an institutional perspective, can it do to improve. Review materials that are distributed to applicants. Get a schedule of dates relevant to the match. Ask about becoming a member of the Graduate Medical Education Committee. **Second**, get a hold of the *National Resident Matching Program Handbook for Institutions and Program Directors* that is distributed annually. This handbook will walk you through the entire match process - what it is, how it works, and what your responsibilities are. **Third,** become familiar with federal guidelines regarding legal and illegal questions in the interview process. Title VII is a federal law that prohibits employers from discriminating against any person on the basis of sex, age, race, national origin, or religion.

Specifically, an interviewer may *not* ask about an applicant's:

- religion, church, synagogue, parish, the religious holidays an applicant observes, or his/her political beliefs or affiliations. The interviewer may not ask, for instance, "Does your religion allow you to work on Saturdays?" But, the interviewer may ask something like: "This job requires work on Saturdays. Is that a problem?"
- ancestry, national origin, or parentage. In addition, an applicant cannot be asked about the naturalization status of his/her parents, spouse, or children. The interviewer cannot ask about the applicant's birthplace. But, the interviewer may ask whether the applicant is a U.S. citizen or a resident alien with the right to work in the U.S.
- native language, the language spoken at home, or how the applicant acquired the ability to read, write, or speak a foreign language. But, he or she may ask about the languages in which an applicant is fluent, if knowledge of those languages is pertinent to the job
- age, date of birth, or the ages of his/her children
- maiden names or whether an applicant has changed his/her name, marital status, number of children or dependents, or spouse's occupation.

There is only "one cardinal rule" in the match that both programs and applicants must observe: **"neither must ask the other before the match to make a commitment as to how one will be ranked."** (NRMP Handbook). Both programs and applicants may express varying degrees of interest in one another, but "references to how one will be ranked should be avoided and definitely should not be solicited." It is not a violation for an applicant or a program to tell the other how one will be ranked. The problem with this whole concept of "violations" is that there are no NRMP repercussions for breaking the rules of the match or for engaging in unethical behavior. In a recent study we found that students are routinely being asked to make, and are being given, commitments that have no legal protection but may have bearing on their ability to match (Anderson & Jacobs).

Programs, specialties and institutions are urged to develop clear **policy statements** regarding the program's pledge to abide by match rules and fair practices. This code of conduct will set the tone for professional interviews that represent the best interests of programs and students alike.

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How Do I Orient New Surgical Residents?

Sachdeva and others have shown **wide variability** in the clinical skills of beginning surgery residents. To date, the apprenticeship model has been the standard, with little time for structured learning or orientation. Beginning residents are expected to learn "on the job" - despite evidence that residents will learn more from experience when the expectations are clear and when they are prepared.

One solution to this problem is to develop a technical and problem-solving **skills training program** specifically for incoming surgical residents. Information obtained from needs assessments that are completed by attending surgeons, surgical residents, and experienced surgical nurses can guide the curriculum development process - with emphasis placed upon the most common PGY-1 level duties, responsibilities and encounters. The **orientation program** could utilize didactic lectures, simulation, and technical skills training sessions (as outlined in Table I),all of which would serve to reinforce basic decision-making algorithms and to emphasize the team concept of surgical patient care.

TABLE I: PGY-1 Surgery Resident Orientation Curriculum

SESSION TITLE	*DESCRIPTION*	*FREQUENCY*
LECTURE SERIES	Didactic lectures covering a broad range of topics, including surgical radiology, pre-operative work-up, ventilator management, etc.	1 lecture/topic 1 - 2 lectures/day
MANAGEMENT	Simulation sessions using a computerized full human patient simulator. Scenarios included tension pneumothorax, cardiac arrest,etc.	3 scenarios/ session 1 session/day
TECHNICAL SKILLS DEVELOPMENT	Skills development utilizing inanimate and animal models. Skills taught included central venous catheter placement, suturing, knot tying, etc	1-2 skills/session 1 session/day
CLINICAL CALLS	Simulated nurse to resident clinical calls. Scenarios included hypotension, dysrhythmia, postoperative pain, etc.	5 scenarios/ session 1 session/day
ORIENTATION	Tour of hospital/operating rooms (OR), review of OR instruments, scrubbing, etc.	1 session /day
DOCUMENTATION	Review of patient charts, computer system, request forms, etc.	1 session

Evaluation of the course should be conducted using pre- and post-course **confidence surveys**. These surveys (completed by all trainees) would reflect a trainee's confidence in his or her technical aptitude, clinical management skills and knowledge base.

Taking time to specifically prepare PGY-1 residents for their salient duties and responsibilities will assist them as they begin their formal surgical training. Results of such an effort could include increased resident confidence levels, and opportunities for team and relationship building prior to beginning clinical duties.

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What is the role of residents as teachers?

The role of the resident, especially that of the chief or senior resident, mirrors but also exceeds the role of the faculty. The senior provides leadership, manages the team, teaches both students and junior residents, and undeniably can, and should, be a role model. As a **role model**, the resident must first and foremost be a **physician.** This encompasses all that is inherent in that role, and incorporates the ongoing professionalization process. It includes, but is not limited to, decision-making, maintaining the dignity and comfort of patients, listening and showing compassion, and interacting with colleagues and staff in an effective and respectful manner.

As team **leader/manager**, the senior balances patient care, assignment of tasks and learning priorities. Delegation of responsibilities is key. The non-participating learner must be drawn in, while the student/junior who dominates must be gently reined in.

The senior resident is also a **teacher/educator.** Balancing this role with the others can be extremely challenging. The senior must constantly be aware of the different learning priorities of the various team members. Assignments of students to new patients and to operative cases must take into account both learning needs and the efficient function of the service as a whole. Teaching factual knowledge, clinical assessment skills, and technical skills is expected. The ability to ask effective, clear, open-ended questions is a skill in itself. The development of critical thinking is a primary goal, and guiding students and juniors in this should be a goal of all educators.

These varied roles always overlap, and require a remarkable juggling act on the part of the senior resident. Some come by this naturally, some do well with minimal guidance, and some require formal training. If a resident has never been on a team with a senior who served as a good role model, she/he may require some guidance in assuming the position of both leader and educator. Some simple **guidelines** should focus on three areas: orientation, rounds and consults, and the operating room.

Orientation of the team on the first day of the service is invaluable. Orientation should include the following:

- defining expectations;
- explaining the functions of the various members of team;
- delineating the purpose, structure and content of patient presentations;
- giving guidance on how to prepare for the OR.

During rounds, the leader/manager and teacher roles are intimately intertwined. On the wards the following activities represent learning opportunities:

- **Presenting patients**: requires the learner to prioritize and focus on pertinent aspects of patient care.
- **Evaluating patients**: this is an opportunity for bedside teaching of clinical assessment skills, such as the interpretation of data, physical examination, evaluation of patient complaints, understanding the postoperative course, and overall patient care.
- **Decision-making**: decisions regarding fluid management, antibiotics, analgesics, diagnostic studies, wound care, management of drains and tubes, and operative or non-operative intervention are all teaching opportunities.
- **Utilizing resources**
- **Planning daily tasks**: delegation of work responsibilities must take into account learner needs. On evening rounds, the next day's operative cases must be assigned so that students and juniors can prepare with reading, chart review and patient assessment.

In the Operating Room the senior can maximize learning opportunities in the following ways:

- **Starting points:** a guided discussion during the "down time" before the case actually begins will help the student review the clinical problem, imaging studies, pathology, the planned procedure and the indications, risks, benefits, and possible intra- and postoperative complications.
- Acting as **facilitator:** the resident often serves to facilitate relationships between students and the nursing and anesthesiology personnel.
- **Teaching:** during the case, both the attending and the residents function as teachers. Topics range from fund of knowledge to technical skills. Postoperatively, both junior and senior residents assist the student in writing the operative note. It is an excellent exercise for the student to write her/his own set of orders and then review them with a resident or attending.

It has been said that medical students on their clinical rotations receive up to 80% of their teaching from residents. Common sense supports this: students spend the great majority of their time with residents, not faculty. Therefore it is incumbent upon the chairman, the residency Program Director, the Clerkship Director and the faculty as a whole to nourish each resident in this vital role: teacher.

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How Do I Motivate Residents To Teach?

Most new Clerkship Directors understand that it is not possible to have a high-quality clerkship learning experience for students without an involved and capable housestaff. While faculty may provide some of the more didactic learning experiences in the classroom and operating room, the residents serve as daily role models in their interaction with patients and in their teaching at the bedside and in the clinic. While most housestaff have a desire to be considered good teachers, the long hours and heavy patient responsibilities often result in a low priority for teaching. It is also clear that residents need both exposure and practice in teaching skills in order to be effective teachers.

Providing Incentive and Motivation

The process of orienting housestaff to their teaching responsibility begins during applicant interviews for the training program. The process continues during new **housestaff orientation** with strong messages from the Department Chair and the Residency Program Director that medical student teaching is a high priority and will be part of their overall evaluation. At the end of each surgical clerkship, medical students should be provided the opportunity to **evaluate the residents** they have worked with on the wards. This should include at least an overall teaching effectiveness score and comments for the resident. These should be collated by the Clerkship Office and within two to three weeks after the end of the clerkship sent as a report to each individual resident. The report should summarize the number of evaluators, the mean and range of evaluation, and all of the unedited comments. It is very effective if the Program Director reviews these reports prior to dissemination to add his or her own positive or negative feedback regarding resident teaching performance. This again emphasizes the importance of this activity in the residents' overall performance. This end of clerkship teaching performance data should subsequently be summarized and included as part of the portfolio for evaluation of the housestaff at the **annual resident evaluation session**. It should be discussed as carefully as medical record performance, professionalism, or developing technical skills.

The final component, providing motivation for resident teaching, can be achieved through an awards program. **Teaching awards** should be presented in a public forum to housestaff for their teaching excellence. Since the goal is to provide incentive to as many residents as possible, awards can be given to "intern teacher of the year", a "junior house officer teacher of the year", and a "Chief Resident teacher of the year". Another option would be to provide public recognition and rewards for <u>all</u> housestaff who have achieved a certain teaching effectiveness score over the clerkship year. All of these measures combine to send a strong message to housestaff that the teaching of students is a valued and expected component of their daily activity. The results of such a program benefit the residents, the clerkship students and the reputation of the training program.

Providing The Skills for Residents as Teachers

The skills necessary for effective teaching can be incorporated into housestaff activities in two ways. **Ongoing feedback and evaluation** of their teaching skills provides an important method to reinforce good teaching behaviors and correct errors of commission or omission. In addition, a **formal program of instruction** regarding basic and advanced teaching skills is necessary. One effective model for achieving this goal is through an annual 1-2 day course for PGYII and PGYIV residents near the end of the academic year. This course can provide instruction for junior residents as well as those residents about to assume the role of chief resident. This session should require mandatory attendance and be given by the Program Director and perhaps a visiting professor. The topics covered could include:

- setting expectations at the beginning of a rotation/clerkship
- resident as coach: microskills of teaching
- evaluating performance
- teaching psychomotor skills
- teaching in the clinic using good questioning skills

- feedback skills
- bedside teaching
- leadership skills

The sessions should be short on didactic material and long on active learning with opportunities to practice the skills. A "Residents As Teachers Program Instructors Manual" and a syllabus for a Residents As Teachers course are available through the Clearinghouse of the Association for Surgical Education.

Along with good clerkship leadership, strong program organization, and enthusiastic and interactive faculty teaching sessions, it is critical to assure that the surgical housestaff are strongly motivated and equipped to provide the expected day-to-day interactions with clerks that will stimulate their learning and professional development. This effort requires strong coordination between the Clerkship Director and the Program Director so that teaching is seen as an important component of daily resident activity and one that is both valued and evaluated.

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How Can I Access Resident Performance?

Resident performance evaluation serves a number of purposes. It is important that the evaluation system employed by the faculty be designed and implemented with these multiple purposes in mind.

- Educational –providing feedback on progress, motivating learners, and for instructional purposes
- Administrative – meeting accreditation requirements and providing external information (e.g. letters to specialty societies, professional organizations, and hospitals)
- Research – including, for instance, resident selection studies, impact of new curricula
- Internal information – program evaluation, performance comparisons, conference impact
- Responsibility to the public
- Decisions on promotion and retention – supporting decision-making
- Legal – ensuring due process and proper documentation

Steps in developing a sound resident performance evaluation system

1.) Outline what should be evaluated. Create a list of those traits, behaviors, and skills which the faculty feel residents should be evaluated. This is easily accomplished through a brainstorming session with faculty or with the resident advisory committee.

2.) Determine how you want to evaluate. For each item on the list, decide which methods you will use to evaluate. Options might include faculty ratings, case presentations, logbooks, in-service clinical evaluations, oral and written examinations, OSCEs, OSATS (Objectives Structured Assessments of Technical Skills), or chart reviews. The method must be appropriate to what you are trying to assess, feasible in terms of cost and time, and represent a valid and reliable measure. Multiple measures are preferred to ensure adequate representation of the trait/skill being assessed.

3.) Decide who should evaluate. Systematically collect evaluation data from people who are in a position to directly observe those behaviors, traits, etc. being evaluated. This may include nurses, physician assistants, senior residents, patients, or medical students. Whoever is involved should be educated about the system, understand its purpose and use, and if in a subordinate position should have their anonymity protected.

4.) Outline when to evaluate and summarize findings. Data should be systematically collected on a regular basis. Decisions must be made about the frequency with which data will be entered into a database, when it will be summarized for reporting purposes, and when the reports will be distributed as feedback to the residents, faculty, and Program Director.

5.) Ensure timely performance feedback to the residents. Formal feedback sessions with the residents by designated mentors, the Program Director, or rotation education coordinators are essential. A faculty member should be designated to provide formal feedback to each resident at the end of a rotation.

6.) Determine how the data will be summarized and used. Sample performance reports should be drafted and reviewed at the start of the system.

7.) Document the performance evaluation system. A written document that explains how the system works, what decisions it supports, and who is responsible for distributing forms, etc. is useful to orienting new faculty and residents to the system. It clarifies faculty responsibilities and highlights the importance of a well-organized and orchestrated system.

8.) Periodically review the evaluation system. The faculty should regularly review the resident evaluation system and should include input from the residents.

9.) See also corresponding sections in Section IV: Student & Resident Assessment.

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What is the Role of the Absite In the Residency Program?

The American Board of Neurological Surgery devised the in-training examination concept as a result of their concern over failure rates on their certifying examination. Since 1972 the American Board of Surgery in-training examination (**ABSITE**) has been administered to general surgical residents. In 1990 the ABSITE became the in-training/surgical basic science examination (**IT/SBSE**) with the exercise heavily weighted toward basic science in an effort to better prepare the surgeons of tomorrow.

The **stated goals of the examination** were to define a content domain of knowledge necessary for competent practice, to assess individual resident's strengths and weaknesses, and to identify weaknesses and deficiencies in the residency program itself. This examination does not have a defined passing grade and was not intended to be the sole determinant of resident promotion or dismissal. It is just one component of the total evaluation of resident performance. It has always been known, however, that performance on the in-training examination, particularly in the final year, correlates well with performance on the qualifying (written) examination of the American Board of Surgery.

Classification of the questions using a **thinking skills taxonomy** revealed that 15% of questions required recall, 25% required analysis and 60% required inferential thinking. Entry-level residents did much better on recall questions, less well on analysis, and least well on questions requiring inferential thinking. By the time residents reached their fifth year they all did better in each category, but inferential thinking improved most. Therefore, in addition to assessing knowledge, the examination is able to measure the kinds of thinking required and to demonstrate improvement throughout the course of the training program.

The **current role of the IT/SBSE** should be the same as the original concept: for resident self-evaluation, for the Program Director's evaluation of each resident's progress, and for the evaluation of the strengths and weaknesses of the residency program itself. Residents can evaluate their progress in comparison to their peers nationwide. Some programs provide relative rankings within the program, giving residents an idea of how they compare to their classmates. Finally, residents may use their individual reports to identify specific areas of weakness on which to focus in the coming year.

Program Directors clearly use the IT/SBSE to evaluate residents. However, it should be just one component of the evaluation process. Some Program Directors arbitrarily designate a passing "threshold," for promotion to the next level of training or, in some cases, for dismissal from the program. *This was never the intent for the ABSITE and the exam should not be used in this manner.* The exam can and should be used to identify residents in need of academic assistance. **Remediation programs** that provide some structure and motivation, and re-focus the resident on continued self-education have been implemented by some Program Directors with good results. In an example of this type of curriculum reported by Pemberton *et al*, residents were administered a questionnaire to identify why they performed poorly, faculty mentors were assigned and the residents enrolled in a structured study program, including courses, textbook reading, conference presentations and test-taking.

Program Directors can also identify **deficiencies in the training program curriculum** using the key words/phrases report. This report lists key words or phrases from all questions on the examination and lists the number of residents answering incorrectly by level of training. Many programs use this report to guide the content of weekly conferences, tailoring the curriculum to cover topics missed by the majority of residents. Program Directors can also identify areas of weakness by level of training and direct conferences or rounds to that specific topic and group of residents. The surgical faculty and residents at Michigan State University annually publish an **ABSITE Review Manual** that can be used by residents to assist in their preparation for the exam.

In summary, the ABSITE (now IT/SBSE) is a tool for evaluating both individual residents and the residency programs. Results are useful to both individual residents and to the Program Director. Exam results should not be used as a sole criterion for promotion or dismissal. Structured education programs for those with low scores are helpful in improving scores and, presumably, in expanding the residents' knowledge base. Program deficiencies can also be identified and adjustments made to the curriculum to target the areas identified as deficient.

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SECTION IV: STUDENT & RESIDENT ASSESSMENT

What Are the Issues in Student and Resident Assessment?

Background

Why spend precious time, limited energy, and endure endless headaches to formally assess students or residents? Learning theorists specify **three reasons**: accountability to society; determination of whether or not educational goals and objectives have been met; and most importantly, educational decision-making (Mehrens and Lehman). Scholars who study decision-making define a "good" decision as one that is based on all relevant information. Therefore, by implication, the information used to make an educational decision should be comprehensive, reliable (consistent), and valid (meaningful).

The expectations of reliability and validity are crucial to the assumption that the test is a useful measure of performance. **Reliability** refers to *reproducibility*. If you gave the same student the same test on a different day, without any additional education, would the student's performance be similar? **Validity** refers to the *meaningfulness* of the test or the *accuracy* with which it measures the attribute of interest. Take for example a resident who obtained a poor score on a multiple-choice test designed to measure how much a resident knew about suturing. The test would be considered a valid assessment if later the same day, the resident had difficulty in the OR when asked to close a wound. For a test or rating to be a useful indicator of a learner's proficiency, the assessment measure must have both reliability and validity.

This section will address some questions that are frequently asked by Clerkship Directors and residency Program Directors with regard to assessment. **Assessment** is the process of measuring competency or learner achievement. Although the term evaluation is frequently used in this context, **evaluation** refers to measuring program effectiveness, not student learning. This section will address questions such as: What methods are feasible for testing the knowledge base of students and residents? How can I assess clinical skills? What are the strengths and weaknesses of the various methods? How can I get faculty to return clinical rating forms? What can be done to ensure that clinical ratings are accurate? What are some novel methods for assessment? Is peer/self assessment worthwhile?

Algorithm for testing

Questions about testing can be addressed by the following algorithm:

What ® Why ® How ® When

"What" refers to the content that is to be assessed. "Why" refers to the purpose or goal of the assessment. "How" refers to the methodology of assessment. And "When" refers to the timing of the assessment.

WHAT: The first step in assessing a learner is to figure out what you want to test (or measure). Are you interested in a demonstration of skill, knowledge and synthesis, or attitude? Do you want to see how the resident completes the pre-operative patient assessment for a patient with chronic, symptomatic biliary colic or do you want to know how well the resident understands the relationship of various laboratory studies in confirming a working diagnosis of obstructive biliary disease?

WHY: Next, figure out why you want to test the student or resident. Do you want the students to identify areas where they are deficient, or do you want to determine their overall functioning so you can assign the top 10 students an honors grade? If your goal is to give the students feedback to enhance their efficiency and effectiveness in learning a topic, such assessment is called **formative assessment**. Formative assessments include: pretests, practice exams, self-assessment, faculty observation with feedback, and mid-rotation review of ward ratings. Such assessment is not used to formulate a grade. Formative assessment always involves the use of feedback and typically occurs before or during a course.

However, you may want to make final decisions about the student, such as assigning a grade, or determining mastery. Whenever you compare learners to one another so that a 'final' decision is made about the learner's performance, this is a **summative assessment**. Summative testing frequently is more formal and less flexible.

HOW: The next step in determining your assessment plan is to decide how to assess the area of interest. You've already decided *what* attributes (skills, knowledge, attitudes, etc) you want to assess. You've decided *why* you want the information (feedback vs. decision-making). Now you need to decide *what kind of information* you will be gathering – how do you want to assess the learner? For example if you want actual observations of students obtaining a pre-operative history, the methods may include faculty ward ratings, resident ratings, peer (student) assessment and standardized clinical examinations. You've also decided that you want summative ratings that will contribute directly to the student's grade. At this point, feasibility enters into the algorithm.

Feasibility is determined directly by the availability of resources in terms of money, time, facilities, and personnel. Do you want to have an expert observe a student performing a focused patient history? There are several options: Objective Standardized Clinical Examinations (OSCEs), faculty observation of the student obtaining a history from a patient seen in the office, etc. The **OSCE** consists of a series of clinical situations that are standardized so that each examinee encounters the same situations. Examination variables such as time allotted, task to be completed, and clinical scenarios are exactly the same for each examinee. Frequently standardized patients who have been trained to present a clinical scenario are used instead of actual patients. Since each examinee encounters the same situation, the examinees can be rank ordered in terms of competence and they can be given explicit feedback about their skill set. However, OSCE are resource intensive. Several issues need to be considered. Do you have the resources to conduct an OSCE, such as: patient cases that have been standardized, trained standardized patients, trained raters, clinic space? Do you have access to consultants if you need help in developing the components of the OSCE?

If resources are problematic, an alternative assessment method that has excellent face validity, but is less reliable, are **faculty ratings**. With faculty ratings, the assessment challenge focuses on providing the faculty with training to assure that everyone is using the same indicators of excellence when they rate student attributes. "You know it when you see it" isn't sufficient to guarantee that if everyone rated the same student, they would have the same outcome. The bottom line in feasibility is to determine what method uses the minimum amount of time and money to provide you with the most reliable and valid assessment.

WHEN: Once you know the "what", "why", and "how", the "when" becomes self-evident. For example, if you want faculty to observe students and give feedback, the assessment should occur early enough in the rotation in order to allow students sufficient time to get additional practice in the areas identified. Whether the observation occurs on a Saturday morning when the clinic is closed, or on a Tuesday afternoon in the cafeteria that has been converted into a mock OR, depends on your resources and flexibility.

Case scenarios

The next section of this section will present frequently asked questions in the form of case scenarios. Each case is followed by brief comments on relevant issues, possible options, and references or resources for additional information.

Is My Grading Algorithm Fair and Meaningful?

CASE I: You are a new Clerkship Director. For the last several years you calculated grades by the following algorithm: 30% NBME shelf exam, 50% clinical observation, 20% clinical exam. Is the grading algorithm fair and meaningful?

In general grades are expected to reflect the learner's proficiency in knowledge, skills and attitudes that are relevant to the discipline. For each of the areas to be assessed, it is useful to develop specific goals and objectives that will drive the rating process. By anchoring grades to the educational goals and objectives of the program, all participants know what is to be learned and the relative importance of the activity. The relative importance of the individual objectives indicating mastery of knowledge, acquisition of skills, and reflections of attitude, is determined by the overall grading algorithm.

In this example, knowledge is weighted as being worth 30% of the grade. One could argue that the remaining 70% of the grade reflects skill acquisition. It is not immediately obvious that attitudes are being assessed. Whether or not that is 'fair' is open to debate. If attitudes were determined to be an important part of the grading process, explicit ratings would need to be developed, or components of the existing ratings could be separated into an attitude assessment.

The most straight-forward way to determine **fairness** is to add the components together and see if they are consistent with the explicit and implicit goals and objectives of the clerkship. In this example, 70% of the final grade is generated from local clinical experiences and the remaining 30% reflects knowledge as measured on a national achievement test. Ultimately the decision about the usefulness of the grading algorithm is a political decision that must reflect the realities of your department, medical school, and national standards of medical education.

If your grading policy had been thoughtfully developed, is consistent with the goals and objectives of the clerkship, and reflects the breadth and depth of your curriculum, then it is meaningful and defensible for your institution. Additionally, it is useful if your local grading standards are consistent with **external standards of excellence** such as nationally administered examinations. For example, students graduating from a school that has a pass/fail grading system may feel disadvantaged when applying for spots in competitive residency programs if the residency program considers class rank as an important selection criterion.

When determining a grading policy, one of the challenges is to identify the areas of competence and the **relative weight** (importance) assigned to each area. For example, if your top resident received excellent clinical ratings from demanding attendings, yet obtained single digit scores on national in-service examinations, what end-of-year overall rating should be given to the resident? Were there extenuating factors? Are the end-of-year resident ratings consistent with the formal grading policy, or do the ratings ignore the formal policy and emphasize the national exam? Fairness in grading means that grades are consistent with your policy—you do what you say you are going to do. When final grades are given, there should not be any surprises. If your grading algorithm is anchored in published goals and objectives that are measurable, the residents may disagree with your assessment, but they will know upfront how their grade is going to be determined and the relative importance of the components of the grade.

Finally, the old maxim "life ain't fair" applies here. There is no grading policy that everyone will think is fair. At best, grading policies are defensible, meaningful, and honorable. If the faculty are in agreement on the standards and expectations, the learners are fully informed of the standards and expectations, and the grading policy reflects the standards and expectations, that is the most that can be asked.

What Are Common Assessment Methods?

***CASE II**: We have several components in our formal assessment of students at the end of the clerkship. We use the NBME Subject Exam, an OSCE that we developed, and an oral exam that senior faculty members administer. The faculty want to switch from the Subject Exam to an internally developed multiple choice exam and use clinical ward ratings instead of the OSCE. What do we need to think about as we consider these changes?*

In general there are three ways of developing an assessment method: professionally developed tests, teacher-made tests, and self-assessment. **Professionally developed tests** are usually the most reliable, but they may not address the specific curricular objectives that you have in mind. **Teacher-made tests** usually assess explicit curricular objectives, but are less reliable since the items are often designed in a way that students with little knowledge and good test-taking skills get high grades. **Self-assessment** is only as useful as the individual is insightful and honest. However, tests developed by any method can be excellent methods for formally assessing a student's progress.

In considering the method of testing to be used, the **reliability and validity** of the assessment method are paramount. Currently, in the measurement literature, the notion of '**authentic assessment'** is a core concept. Authenticity is closely related to face validity. Authentic assessment describes a philosophical and methodological approach that promotes the use of measurement tools best reflecting the attribute being measured. For example, in surgery, one would test directly the elements involved in patient care through actual or simulated patient encounters. A multiple-choice examination is less authentic than an OSCE, which is less authentic than a complete history and physical examination of a real patient. Although authentic assessment is intuitively appealing, such measures often require more subjective evaluation on the part of the examiner. Moreover, the actual assessment exercise itself is generally not the same from one examinee to another, resulting in considerable problems with reliability. Authentic assessment can make an excellent contribution to formative assessment, and is a laudable goal in summative assessment.

Written exams (i.e. paper-and-pencil format) frequently use **multiple choice** (MCQ) items. Written exams can be standardized, implying that the examination has met explicit criteria for test development, reliability, and validity. Examples of standardized written examinations include the **NBME Subject Examination** or "shelf exam", so called because it is literally pulled off the shelf and delivered to the purchaser. The Subject Examination is developed by the NBME as a means of testing general knowledge in a medical discipline. Content experts from around the country submit items that are reviewed and edited by the NBME. The items are placed in an item bank and calibrated for difficulty level. Blueprints for the exams specify the content areas to be covered and the number of items in each area. The exams are then created by compiling the required number of items for each examination so that the important concepts are tested.

In essence the same process should be used for **teacher-made tests**. The areas to be covered in the examination need to be specified. The number of items in each area should be specified. The items should be written and reviewed by someone other than the author, and then piloted with a couple of examinees to check for cueing or other inadvertent clues. Finally the exam is administered, and a grading algorithm is established that reflects the purpose of the exam – assessing mastery or ranking of the examinees. A major difficulty with teacher-made tests is the amount of time required to write items, maintain an item bank, create the test, and score the tests. Frequently the professionally developed MCQ's are so much more efficient, that the loss of curricular specificity is more than compensated for by the savings in faculty and staff time.

Practical Exams such as OSCEs or oral exams provide invaluable information about students' abilities to handle actual clinical situations. In the development of these examinations, the same issues that were described above apply with regard to reliability and time.

How Can I Improve the Accuracy of Clinical Ratings?

***CASE III*: Some of our faculty always give Honors and others never give Honors. How can I improve the accuracy of ward evaluations?**

Accuracy refers to **reliability**. The statistical meaning of reliability is replicability or consistency. Inconsistent grading is the bane of the students or residents as well as of the Clerkship Director or Program Director. Every department has 'hawks' and 'doves' - the demanding graders and the easy graders. The discrepant grades reflect differences in expectations, in standards, in actual time spent with the student, as well as personality differences.

The only way to increase the likelihood that faculty will give similar grades for similar performance is to involve the faculty in the process of establishing the performance standards. This involves periodic training sessions where the faculty review examples of student or resident performance, discuss the salient attributes, and share their individual rating for each examinee. When this process occurs on a consistent basis, the participants develop a coherent method for assigning grades. When there is an open discussion of grading standards, discrepancies in standards can be identified and resolved. When faculty participate in periodic standard setting sessions subsequent grading discrepancies are likely to reflect an unusual student situation, rather than a discrepancy in grading standards.

In addition, many faculty have had the experience of giving a student an accurate, but not stellar grade - only to endure hostility, or numerous entreaties for a more 'accurate' (and incidentally higher) grade. Even if the faculty do persist and give the grade that realistically describes the student's performance, the rating may not be reflected in the final grade, so all the grief endured by the faculty is pointless. Finally, even if the final grade is the 'undesirable' grade, it seems like there is no consequence for the student. If a failing grade is given, then the faculty must deal with the student during the repeat of the clerkship, a situation that is frequently uncomfortable, at best.

With a consensus among the faculty about the standards for grades, and administrative support for faculty to assign grades in an accurate and meaningful way, grades should be reliable and valid assessments of student or resident performance.

How Do I Get Faculty to Complete Evaulations in a Timely and Meaningful Way?

***CASE IV*: When they are rating students, some of the faculty just run their pen down a single grading column and give an overall grade without any comments. And to make matters worse, it can take literally months for the grades to be submitted. How do I get faculty to complete evaluations in a timely and meaningful way?**

Everybody is busy, and according to another Farmer's Almanac maxim, the more you do, the more you are given to do. It is easy to relegate student ratings to the middle of the "to-do" stack. There are no simple answers. However, you can enhance the likelihood of timely and meaningful submission of grades by making sure that your rating form has two essential characteristics: **simplicity and brevity**. Assuming that your forms are easy to read, easy to score, and as succinct as possible, the next step involves the **ease of submitting** the form. Some programs have found that placing the rating form on the web is effective. Whatever the mechanism for submitting the forms, once again, simplicity is the key. Extra steps are guaranteed to add time and frustration to the task.

Enroll the students in the loop. Give them the rating forms and tell them that their grades will not be submitted until all the faculty ratings are received.

Finally, use the methods described in the previous case. Make sure that all the faculty understand the grading process and have the same framework for rating students. Make sure that the faculty ratings are included in the final grade. Faculty are not going to spend time completing rating forms if they suspect that their input is optional or disregarded. The faculty ratings must be essential and valued.

Another technique that has worked is to distribute a **graph/plot of the time** it takes for every faculty member to submit their grades. For each individual faculty member identify his or her location on the plot, while keeping all other names confidential. This approach taps into the competitive spirit that is so generously present among surgeons!

One final vexing and time-consuming issue is when students or residents have **concerns about fairness** of an exam or contest a grade. It is useful to establish a policy that requires a timely, written request and that specifically preclude any other type of requests. It is recommended that a brief time frame be specified (e.g. 24 hours). Following the appropriate investigation, a written response is returned to the requestor. The whole process of communicating with the requestor is handled on paper. Although there is the possibility that such a process can be time-consuming, in general it drastically reduces the number of spurious complaints. It also produces a paper trail that documents the process and the findings. As part of the process, written complaints can be referred to an executive committee for deliberation. It is useful to know the policies and procedures for your institutions with regard to due process.

How Do I Use Peer & Self-Assessment?

CASE V: In problem-based learning, there is an emphasis on peer and self-assessment. Are peer and self-assessment worthwhile, and how do I use them?

Peer and self-assessment are hallmarks of the **adult learning theory**. In medical education, Malcolm Knowles has adapted adult learning theory and communication theory into an approach called 'andragogy'. Problem-based learning (**PBL**) is based on the principles of adult learning theory, the core of which is that educational needs are determined by the learner(s). Self-assessment and peer assessment are core components of PBL that drive the student's search for knowledge and understanding.

Self-assessment is frequently used in continuing medical education (CME) as an efficient means of disseminating new information to practicing physicians.

The use of a specific type of peer/self-assessment, **"360° assessment**", is also an essential component of an assessment method used in many Fortune 500 businesses and in dynamic technology and consulting firms. 360° assessment refers to the practice of comprehensively assessing all aspects of an individual's performance as part of performance improvement and career planning. Consequently, the "circle is completed" by gathering information from experts/superiors, from clients or recipients of service (such as from teacher's students), from peers and colleagues, and by self-assessment.

In the context of surgical education, self-assessment or peer assessment is probably most feasible as an element of formative assessment. There are many ways to incorporate self-assessment into a grading algorithm. Students can be required to maintain and regularly review clinical log-books with their faculty preceptors. The curriculum can include participation in evidence-based surgery small group case discussions that include peer and self-assessment. Students can be encouraged to use curriculum goals and objectives to guide their studying.

Incorporating self-assessment into curricular goals and objectives reinforces the ultimate goal of medical education, life-long learning.

What are Some Novel Assessment Methods?

CASE VI: I've heard that businesses and other professional schools are using some novel assessment methods. What are they?

Three assessment methods are currently garnering a lot of attention: 360° assessment, assessment centers, and portfolios.

The **360° assessment**, as discussed in Case IV, refers to an assessment method that "closes the circle" by incorporating feedback or assessments from every facet of the individual's professional life: clients, superiors, peers, and self-assessment. Assessment centers originated in Germany prior to World War I as a military selection mechanism to identify officers for the Kaiser. The US military adopted assessment center techniques in World War II, and Bell Telephone introduced assessment center methods to US business in the 1950's. Initially assessment centers were used as a selection method to fast-track potential managers. The majority of the top businesses in the United States now use assessment center methods in some form.

The **assessment center methods** are based on several premises. The first premise is that a job can be analyzed into component skills. Secondly, each skill can be assessed in an 'authentic' manner that is a replica of a real situation that is likely to be encountered by the employee. Thirdly, an individual's performance during the assessment center process is predictive of future success and also prescriptive for optimal career planning. The 360° assessment is an abbreviated version of the assessment center method.

Candidates are sent to a site where they participate in an extensive assessment that can take days. A classic situation is the 'in-box' scenario. Candidates are presented with a scenario where they had just returned to the office after being out of town. The in-box is overflowing. They are given a brief amount of time to review the information, and then told to respond to the messages. The optimal response is to review all messages, prioritize the messages, and respond as needed by direct contact, delegation, or deferring action.

Within the medical community, assessment center methods are currently being explored as a means of recertification and also as a mechanism to develop remediation plans for physicians who are returning to practice after an absence or who have encountered difficulty in their practice.

The **portfolio** is a self-assessment method that developed in the fine arts as a means for capturing the work of artists that was more meaningful than a CV or resume. For exactly the same reasons, the portfolio method was adopted by colleges of higher education in magnet schools as a means for elementary school students to capture and present what they learned. Rather than reading about the development of a legal system in ancient Mesopotamia, they would draw pictures of Mesopotamian courts, write a script for a play about a difficult legal decision, download pictures from the internet history sites, and so on. Student portfolios were so successful that the method was adopted as a means of assessing student teachers. The potential for presenting faculty work was quickly perceived by college faculty, and portfolios became a part of appointment and promotion packages in most colleges and universities of higher education.

Portfolios are now used throughout higher education and graduate education. Recently several medical schools have also adopted portfolios as part of the appointment and promotion application. Typically the portfolio is a 5-8 page document that includes a statement of educational philosophy, samples of educational materials designed by the faculty member such as a syllabus, summaries of assessments by students and others, awards or honors, and a description of educational activities and responsibilities.

Resources

For further information on using portfolios to document faculty scholarship, see the Section I of this handbook: Faculty Development.

For further suggestions on developing an assessment system for residency see Section III of this handbook: Essentials for Residency Program Directors.

For further suggestions on developing an assessment system for clerkships, see Section V of this handbook: Essentials for Clerkship Directors.

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SECTION V: ESSENTIALS FOR CLERKSHIP DIRECTORS

So You Want To Be A Clerkship Director?

On behalf of the multitude of surgical Clerkship Directors that have preceded you, **welcome** to the fold! We believe your experience will be a challenging and rewarding one, both for you and for all the students whose impressions of surgery will be positively influenced by your dedication to their education. Our purpose is to define some of the questions we've asked along the way, and to help focus your questions in order to avoid some potholes previously encountered *en route*.

As eager junior faculty, the Clerkship Director's position is often one's first opportunity to make the mark on academic medicine. Some have stayed on and cultivated the position as a **career**. It's helpful to have some long-range career plans. If being a department chair or dean is on your 20-year agenda, you're not going to have 10-15 years to fine-tune this position before taking on other types of responsibilities. If your intent is to build an active clinical practice or establish a funded lab over the next 3-5 years, it would be prudent to negotiate the time necessary for these endeavors in addition to your responsibilities as Clerkship Director. We wear many hats but are still issued only one head so keeping the position in perspective is important.

If you have the luxury of picking the brain of the person that held the position before you, go for it! Otherwise seek out **advice** wherever you can. Collectively, Clerkship Directors from other courses at your institution may have the best insight into the bigger picture at your university level, whereas other faculty members within your department may have a clearer perspective on issues relevant to the department of surgery.

The **basic format** of this section consists of topics related to the position of Clerkship Director, administration of a clerkship, program structure and evaluation, resources, and potential pitfalls. Many of the topic areas are covered in more detail under individual content headings throughout the manual. Some excellent resources are available in print as well as online. Your best resource remains the other dedicated educators that you'll find throughout your institution, and nationally at specialty organizations such as the ASE & the AAMC.

Resources

Centre for Instructional Support www.uchsc.edu/CIS/

Medical Education Online www.med-ed-online.org/

Fincher RME: The Clerkship Director, in: Fincher RME, ed. Handbook for Clerkship Directors. Washington DC, Association of American Medical Colleges, 1996

What is the Job Description and How am I Compensated?

Defining the position of Clerkship Director may be the most challenging task at hand. There is a certain amorphous character to the job and the real *versus* ideal may vary significantly between institutions. Do your best to define ALL potential responsibilities up front. Link these to your direct and overall supervisor and determine how much of your time and energy should be invested in each pursuit. Your job description as a Clerkship Director and as a member of the department/faculty may not begin to unearth the nuances of implied jobs that go with the title. Most importantly, you need to make sure the job requirements are in sync with your personal and departmental resources available. Negotiating your role can be very challenging—especially if there is no institutional or departmental policy. Try consulting the faculty or staff handbook (if one exists…). If there is no official policy, then speak with mentors, friends, and colleagues holding similar positions. The references highlight job descriptions and time studies compiled for Clerkship Directors in Medicine, Psychiatry and Ob/Gyn.

There is no general rule about what these responsibilities consist of within a department, within an institution, or from one institution to another. Begin by devising a **strategic plan**. Decide what you would like to do and delineate what proportion of your time you would like to devote to each activity and each specific project area listed above. It is often useful to discuss this with friends, colleagues and mentors within and outside your department. Your department chair will then be your first stop, whether you are taking on an additional responsibility or beginning a new job entirely. You will need to know what your chair expects and compare this with your strategic plan - if they are incompatible, consider negotiating with your chair or restructuring your plan.

Presently, there is no standardized national surgical Clerkship Director **job description**. Teaching and administration are two obvious components of the job, but in some institutions neither of these activities plays heavily on your ability to be promoted. Part of any fair job analysis would include the criteria upon which you will be judged. Is there a formal job description on paper? If so, consider taking this to the person currently in the job or others you know in similar positions to see if paper meets reality. Demands for clinical productivity, increased pressures to provide adequate student and resident supervision, and competition for diminishing research dollars all impinge on your ability to be a full-time Clerkship Director. Unrealistic expectations, demands that outstrip resources and lack of tangible goals are a sure prescription for failure.

A **needs assessment** can help you focus both on your present resources and on your short- and long-term needs. These include personnel (faculty, staff), money, equipment, expertise, and departmental support. Much of the job early on is building relationships with voluntary faculty, basic science faculty, other Clerkship Directors at your institution and nationally, students and medical school administration. Seek out assistance with the parts of your job where you feel less secure.

Administrative responsibilities are part of the "citizenship" of academic medical institutions. Everyone is expected to participate, and these activities are generally not compensated. However, taking administrative responsibility for a program such as a third year clerkship can take a great deal of time. If this is not accounted for, you will have difficulty meeting your responsibilities in other areas. The Clerkship Directors of internal medicine have estimated ~ 25% of your time is required to administer a clerkship. If faculty members are expected to bring in an amount of money equivalent to their salaries by their clinical activities and grants, for example, your income could be affected if appropriate compensation for your administrative component is not arranged. These matters must be discussed or negotiated with your chair. It is sometimes possible for part of your salary to be provided by the medical school, depending upon your responsibilities.

It is imperative that you tease out all the components of the job before you start negotiating **compensation**. It's probably not necessary to point out that it's your responsibility to know how much you will be paid, and for what. Clarifying this with whoever controls the checkbook will ease the tensions that develop when role expectations exceed compensation. To negotiate your own situation, you need to know both your official institutional policy, as well as have some idea what is actually done in practice. It is not possible to make good decisions without knowing what the consequences will be.

Your **salary** may be contingent upon clinical activity, grant acquisitions, and a university salary/stipend. If 90% of your salary comes from clinical activity, you may find it very difficult to devote the amount of time it takes to administering a clerkship without the help of a good clerkship coordinator or administrator. Because many Clerkship Directors leave the job secondary to time demands, you should consider negotiating up front for salary support and protected time for running the clerkship. Available pots of money at your school might include state support, Dean's office (usually garnered from taxes) department or division taxes, or endowments. Consider negotiating for other support as well – secretarial staff, nurse educator, skill stations, and teaching space. Remember: if you don't ask, you won't receive!

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What Do I Need to Know to Get Started?

As Henry Wadsworth Longfellow stated *"it takes less time to do a thing right than it does to explain why you did it wrong"*…Loosely translated: **prepare**! You wouldn't proceed blindly in an important operative procedure, nor should you enter into the role of Clerkship Director without knowing what you are getting into and what is expected of you. For many students the 3rd year surgery clerkship will be their only exposure to surgery. You need to ensure that students understand common presentations of surgical patients, the principles of diagnosis and management, and appropriate timing of surgical consultation. This means that, as Clerkship Director, you have an essential role in ensuring that the goals and objectives of the clerkship are met.

You need to know what the job and the job expectations are. Start with **the clerkship**. Make sure you know or get the answers to these basic questions:

- How long is the clerkship?
- What constitutes the curriculum of the clerkship?
- Where are students based—in-hospital or in the clinic? If both, what % or how much time is spent in each setting?
- Are there didactics (e.g. lectures, problem-solving sessions)? How often, who presides over them?
- Are there labs or skills stations (e.g., suturing skill station, anatomy lab)? If so, who runs them?
- To whom are students assigned and who makes the assignments?
- Are students expected to complete logbooks or patient write-ups? Who reviews them?
- What texts do students use?
- How are students evaluated?
- How is the clerkship evaluated?
- Are faculty paid or volunteer? What are their responsibilities?
- What type of support staff is available? What is their role in the clerkship?

Next you need to find out about your role and the expectations of you. This information may come from your predecessor, but you still need to meet with your department chair to solidify the details. Specifically ask:

- To whom do I report?
- What are my day-to-day responsibilities in the clerkship?
- How am I evaluated?
- How am I compensated for these responsibilities?
- What meetings am I expected to attend as part of the Clerkship Director role?
- What role do I have in evaluating the clerkship and in implementing changes—both curricular and programmatic?
- Who can help me?

If you can, you should make every effort to meet with the previous Clerkship Director to get **oriented** to your new role. If this is not possible, talk with Clerkship Directors in other specialties to see if there is any overlap in your roles. If there is an administrator who oversees the curriculum for all the clerkships

s/he will be able to orient you to college expectations. Finally, join the ASE. ASE's annual meeting will provide you with a wealth of personal and written resources to assist you in your role.

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How Long Should I Keep the Job?

Some people know in infancy that they want to be surgeons when they grow up. Perhaps the same is true of academic medicine. For those of you who have not sat down and mapped out your life for the next 40 years, you may want to consider **two potential career tracks**.

1.) I ultimately want to be a surgical chair, dean, associate dean, or some other leadership position in surgery. What do I need to map this out? The first thing is a good mentor or advisor that can help you see beyond the first 4-5 years of your academic career. There is a lot to be gained from a stint as a Clerkship Director both organizationally, and professionally.

2.) I think I might like to be a Clerkship Director as a career. Again, having a good relationship with a mentor will help you set out a timeline for advancing within that role. Since few institutions have a full faculty of long-term Clerkship Directors, you might benefit from some advice from individuals in professional education societies such as the ASE and the APDS. The first few years will be spent learning and refining the clerkship. Thereafter, an educational research focus will help guide you in molding the mid-life of your career. Active participation in the ASE and AAMC will allow you to meet other educators on a national level and participate in projects and committees that will enhance your portfolio for academic advancement.

Being a Clerkship Director can be either a short term ($\leq$ 5years) or a **long-term commitment**. To accept the position for less than 5 years would only give you time to maintain the status quo. What your commitment is depends on your career goals and probably also on the goals of your department chair and your medical school. Department chairs have varying levels of interest in the surgical clerkship ranging from benign neglect, to palpable support, and finally to micro-management. The chair's involvement may impact on your level of commitment.

Most Clerkship Directors in surgery keep the job for more than 5 years. Most give up the job because of other added responsibilities, rather than lack of interest. Understanding your department chair's interest in and support of the clerkship will help you determine your commitment. Understanding your long-range career goals will help you to fashion your role and focus on tangible goals during your tenure. Consider scheduling a regular meeting with your chair, especially if he/she tends toward benign neglect of the clerkship. **Communication** is a key component in keeping the chair involved and engaged with the students. Discuss with the chair any plans you have for changes in the curriculum, research ideas, or problems with the clerkship. Getting things accomplished within your institutional bureaucracy may take a much different political savvy than somewhere else. Take some time upfront to learn the stakeholders and the background of your surgical clerkship before you try to institute change.

The chair should receive feedback on the faculty's teaching evaluations by the students. This should be presented in both an summary form and with individuals identified. Specific problem areas or individuals should be identified and plans for faculty development structured. Your success depends largely on your ability to identify ongoing clerkship needs, articulate necessary resources, and negotiate for these needs with your chair, curriculum committee or dean.

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What Opportunities Exist for My Professional Development as a Clerkship Director?

"Although the central mission of medical schools should be the education of students, teaching has traditionally been accorded less importance than research and clinical activities." (Sachdeva) Teaching efforts have been reluctantly and sparingly rewarded when it has come to promotion and tenure. In an effort to acknowledge the importance of formal teaching, several authors have developed systems or models to reward these efforts.

Universities frequently offer **lectures or seminars** on research skills, computer skills, teaching, evaluation, time management, and dealing with administrative issues. Even though many of these courses may not directly relate to medicine, attend as many of these seminars as you can. These courses will help develop new skills (or refresh those skills you already have), will expose you to content experts who can help you along the way, and may foster the development of relationships with those who can collaborate with you on projects. Outside of the university there are a number of programs that offer 1-2 week **courses** (e.g. ACS *Surgeons as Educators* course, AAMC new Clerkship Directors course, Harvard Macy Institute programs for physician-educators and leaders) to develop your skills. There are a range of Master's Degree programs in the health professions or medical management whose foci are as varied as your personal and professional needs. Many of these programs are now offered on-line. In addition, there are numerous faculty development **fellowship programs** that individuals can take advantage of.

The opportunities to be engaged in **educational research** are limited only by your imagination! Talk about ideas with those who have an interest in education. What interests you? Review the literature and see how others have gone about investigating the topic. Subscribe to journals that are focused on medical education (*Academic Medicine* and *Teaching and Learning in Medicine*). Become a member of the ASE. By attending the ASE annual meeting you will be exposed to the surgical education research that is on-going worldwide; you will also have the opportunity to be an active member of committees that are of interest to you. If you don't know how to get started, the ASE also offers an excellent fellowship that helps you develop research skills in surgical education (*Surgical Education Research Fellowship* - SERF).

How do I make this role count towards **advancement/promotion**? Numerous articles have been written about this very issue. You need to obtain a copy of your college's promotion and tenure guidelines. Be familiar with the criteria necessary to be promoted and force yourself to complete an annual report outlining what you have achieved professionally. Talk with your chairperson! If you have a passion for education and have embraced this career path you need to know (and have documented in writing) how these efforts will be acknowledged when it comes to promotion. You may be able to negotiate protected time for scholarly efforts related to education.

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Surgeons as Educators Workshop www.facs.org/about_college/acsdept/edsurg_dept/gmec/saeintro.html

Master of Health Professions Education (MHPE) leadership program, University of Illinois at Chicago www.uic.edu/com/mcme/mhpeweb

University of Southern California Educators in Medicine/Health Professions Fellowship www.usc.edu/hsc/medicine/med-ed/program.html

How Should I Organize My Clerkship?

It has been said that the road to success is always under construction - the same is true of clerkship curricula. In order for a clerkship to be effective it must respond to the nuances of the environment in which it is being taught, the needs of those responsible for its implementation, and the changing landscape of medical education. Anyone can develop a great clerkship, but if it can't be effectively implemented, it is as worthless as the paper on which it is written.

One of the keys to a successful clerkship is appropriate **organization**. Organization allows you to concentrate on the task at hand, i.e. educating medical students. The goals of organization should be to standardize (as much as possible) the educational experience of students rotating on the surgical services. The length of the clerkship, the number of students, the locations of the clerkship (single *vs*. multiple sites), and the resources available will vary among institutions. However, certain aspects cross institutional boundaries – objectives, grading policies, and due process. An organized clerkship will prevent many of the problems associated with educating junior medical students.

The length of surgery clerkships typically varies between 6 and 12 weeks. Based on the number of students per rotation, decisions regarding whether or not students rotate on subspecialty services, what sites they rotate at, the number of students on each clinical service, etc. will need to be made.

University of South Alabama: an example

The third year students spend eight weeks on the surgery clerkship. There are approximately 65 students per class; there are 6 clerkship rotations of approximately 9 to 13 students. Students spend 4 weeks on a general/surgical oncology service, general/trauma service, general/cardiovascular and thoracic service, or a general surgery service at a smaller suburban hospital in the university health care network. After 4 weeks the students switch to another service. Each service rotates through the call schedule and students take call with their teams.

Didactic teaching is comprised of case-based discussions and lectures that occur most afternoons. The topics for discussion are based on the ASE's *Manual of Surgical Objectives* and *Manual of Clinical Problems in Surgery*. This is "sacred time": students are expected to attend the lectures, and this is known and expected by the faculty. In my four years as Clerkship Director, there has been only one case where a student missed a lecture due to "an interesting case". Each student also prepares a case presentation based on a patient they have cared for during the clerkship. Case presentations begin approximately 3 weeks into the rotation and occur on one or two afternoons per week. Each student is assigned a preceptor who helps guide each student toward appropriate resources, etc. Students also attend Surgery Grand Rounds, the Vascular Conference, Trauma Conference, and Critical Care Conference. Students do not attend the Morbidity and Mortality Conference or the Resident Basic Science Conference at our institution.

There is an **education office** that also coordinates resident education. A secretary and a residency education specialist staff the office. They coordinate the lecture schedule, distribute and collect evaluation and grading forms to faculty, residents, and students, and troubleshoot problems.

One very useful component is the **mid-rotation feedback session**. At this session the evaluation forms from the first half of the rotation are reviewed with the individual students. Students also provide feedback regarding problems on the clerkship. Approximately twice per year, there is a meeting with student representatives to discuss ways of improving the clerkship.

There are numerous **impediments to the success** of any clinical clerkship. The most important key to success is an active and interested **faculty**. If too much of the teaching load is placed on a small number of faculty, the rotation will suffer. We avoid this by having faculty members responsible for only two to three hours of formal instruction during each clerkship. There must also be a departmental commitment to teaching.

Another potential impediment to success is the conflict between **clinical service** and educational responsibilities. Students are more interested in spending time on the ward and in the operating room than listening to a lecture or discussing a case in conference. We avoid problems by limiting formal educational activities to one to two hours in the afternoon to minimize conflicts with rounds and the OR. Also the expectation for attendance at these activities is made clear at the beginning of each rotation. The educational requirements are well known and adhered to by the faculty and residents.

A fair **grading policy** that is articulated at the beginning of the rotation avoids headaches later. At the orientation to our surgery clerkship, the students are provided with the grading scale. We use criterion-based grading. A feedback session is held halfway through the clerkship. This avoids the situation where a student feels that he/she is doing well in the clerkship only to receive a lower than expected grade. An extension of fair and open grading is a system of due process. These conflicts are handled through the Dean's office.

The final impediment is a lack of **flexibility**. The clerkship will be shaped by previous experiences of faculty and residents and the local environment. Twice a year several members of the faculty meet with student representatives to discuss ways of improving the clerkship. Clerkships are changing across the country to meet the needs of a dynamic health care environment. There are numerous medical schools with examples of their clerkship syllabus on their websites. Join the ASE listserv and you can query programs to find a structure that best suits your institution.

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Manual of Clinical Problems in Surgery, ASE Clearinghouse
http://www.surgicaleducation.com/educlear/index.htm

Internet links

ASE Clearinghouse http://www.surgicaleducation.com/educlear

Liaison Committee for Medical Education www.lcme.org

American Association of Medical Colleges www.aamc.org

DR-ED listserv list@msu.edu

What are Special Considerations for Programs with Multiple Sites?

The most significant challenge in implementing an off-site clerkship lies in the buy-in of the site's Clerkship Director to the curriculum. You can hold meetings and develop guidelines and fact sheets, but unless the **site director** understands and embraces the curriculum and feels supported in his/her role, it will not be implemented as designed. It is essential to keep lines of communication between site directors and central administration open. These individuals must be part of the clerkship education committee and must have a voice in whether or not curriculum, as outlined, will work in their setting. They need to be empowered to make decisions independently so they don't feel like cogs in the machinery, but vital leaders in the success of the clerkship. Since site directors are also members of the staff at these sites, it is also important to remember that they are generally opinion leaders among the volunteer faculty. If site directors are treated as integral parts of the decision making process, the curriculum will be owned by those entrusted with its implementation.

In many cases, faculty located off-site will be **volunteers**. While it is important to have expectations about teaching and evaluation, it is also important to remember that if things don't work out, you may have to remove individuals from the teaching staff. Keep volunteer faculty involved and engaged by making their jobs easier. Faculty development workshops on teaching and evaluation, textbooks, certificates, and simple letters are always appreciated by those who want to teach.

Each site should have a staff person whose job it is to ensure that students are expected. This individual should be responsible for the master list of all participating faculty as well as the students' clinical and educational schedules.

It is vital that everyone involved with the clerkship have written copies of the goals and objectives of the clerkship. The easiest (best?) way to ensure **consistency** is to require students to complete certain tasks or skills and to document their involvement. Students may keep running logs of their encounters with patients in the clinic, operative and/or hospital setting. Logbooks are only as useful as what you do with them. If you require students to log their operative experiences, you must do something with the data. This is an ideal way to document what students are being exposed to in various sites. Another option are required write-ups or case presentation cards that students have signed by evaluating faculty. The cards can also be used to audit content exposure faculty grading patterns and clinical experiences across sites and services.

The type and volume of cases and patients with which students are involved offers important information about their clinical experiences. End-of-clerkship data gleaned from shelf or internally generated exams, clinical performance evaluation forms, OSCEs, and Performance Based Assessments offers validated measures of students' performance. Students' evaluations of the clerkship and of the faculty and resident instructors will tell you how well the curriculum is being implemented. Feedback from the site director will lend insight into students' experiences and faculty issues that either enhance or impede progress.

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How Should I Enhance Faculty Involvement in the Clerkship?

Including other faculty in organizational and administrative decisions will enhance their feelings of involvement and encourage greater participation in teaching activities and faculty development. Additionally, they may have good ideas, may know things you don't, and may think of things that for some reason slipped your mind.

Ask, ask, and ask. Circulate proposed changes and new programs to your faculty prior to their implementation. Buy-in is always easier to obtain when individuals feel that they were a meaningful voice in the process. Be responsive to feedback by giving serious consideration to all suggestions and by responding appropriately to the faculty who made them.

Capture your strengths. Some faculty members are extraordinarily gifted in specific skills: finance, negotiation, curriculum development, assessment, getting residents involved in student education, socioeconomic issues etc.. Team building is extremely important in an era of increased demands and dwindling resources. Many faculty are willing to contribute their expertise but less inclined to take on entire projects. If your institution functions best within a committee structure, make sure all involved parties have representation in the decision-making process. Include students and residents whenever possible. Short meetings can sometimes be tacked on to grand rounds or another centrally located conference in order to keep faculty periodically informed of updates or significant curriculum changes. A departmental web site is ideal if available and utilized in your area. Teaching faculty listserves can be developed to establish workgroups so that face-to-face conference time is better utilized. Keep your department chair informed and engaged. If you want your faculty to actively participate in the educational mission, top-down leadership is most likely to have the greatest impact.

Consider **focused retreats** with specific goals in mind: faculty development, student or resident assessment, curriculum development etc. Find someone outside your department to serve as a facilitator and structure the time needed to address the issues. If you're uncertain of the impediment to your organizational success, seek out a good diagnostician. This is likely to be someone outside your department or institution. Take advantage of regional and national resources such as the ASE, APD, etc.

References

See Section I: Faculty Development.

Which Student Assessment Methods Should I Use?

Student assessment should be multifaceted, balancing objective and subjective evaluations. There will be some differences among institutions that use a pass-fail grading system instead of traditional letter grades. Almost every clerkship uses **subjective evaluations** (i.e. ward evaluations). There are a number of problems with subjective evaluation forms that affect their validity and reliability. In general, subjective evaluations are more effective if they measure skills that are directly observed. There should be specific topics as well as a global rating. Items should be scored on a Likert-type scale.

Objective evaluation tools include written examinations, NBME subject examinations, oral examinations, and objective structured clinical examinations (OSCEs). The choice of objective evaluation devices will depend on local resources. In general, it is difficult to develop written examinations with high validity and reliability. Therefore, most clerkships utilize the NBME Surgery Subject Examination. Oral examinations and OSCEs require much greater expenditure of resources, especially faculty time.

An example

At the University of South Alabama 50% of the grade is based on subjective evaluations. Subjective ward evaluations by the chief residents and surgery faculty account for 40% of the final grade. Students are evaluated in four categories (Communication Skills, Problem Solving and Clinical Reasoning, Interpersonal Skills, and Professional Attributes) and also receive an overall rating. Each of the categories is graded on a 4-point Likert scale (Outstanding, Above Average, Average, Unsatisfactory). Each category accounts for 12.5% of the final subjective grade; the global assessment accounts for 50% of the subjective grade. The additional 10% of the final grade is from a case presentation given by each student and graded by a faculty member.

The final half of the student's grade is based on a written departmental exam and the NBME Surgery Subject Examination. The departmental examination is approximately 50 questions in length. The question types are single best answer multiple choice and extended matching. Students are occasionally required to provide a listing (e.g. diagnoses, etiologies, etc.). The examination is based on topics from the lectures, the student case presentations, and Surgery Grand Rounds. The departmental examination accounts for 25% of the final grade. The NBME Surgery Subject Examination accounts for 25% of the final grade.

The main **impediments to success** are issues relating to the reliability and validity of the testing methods chosen. Subjective ward evaluations generally have the lowest reliability and validity. Most homegrown examinations also have a lower reliability and validity.

The NBME Surgery Subject Examination is a standardized test that has undergone extensive psychometric testing. It has a high reliability and validity. The content sampled may not reflect the local curriculum offered, but prepares students for the type of questions they'll encounter on part II of the Board exam. It can substitute for or complement a locally developed examination.

OSCEs and oral examinations are excellent evaluation tools. However, developing these can be a daunting task. The main impediment to success with these evaluation methods is the time and resource requirements. Collaborating with multiple departments at your institution may be more cost effective and less labor intensive for an end-of-year III OSCE assessing multiple subjects.

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See Section IV: Assessment.

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Internet links

National Board of Medical Examiners www.nbme.org

How Do I Deal with the "Student in Difficulty"?

Troubleshooting may be one of the most challenging aspects of the job. Despite what the word on the street is about surgeons, few cherish the opportunity for daily confrontation. Successful students reflect successful teachers but do not always imply a cause-and-effect relationship. Determining at-risk students without somehow biasing their performance is a concern at many medical schools. As we struggle as educators to define and evaluate those competencies integral to the practice of medicine, we also strive to determine a minimum level of proficiency that will enable forward progress.

Subjective evaluations on one rotation may not necessarily capture the essence of performance and a MCQ final exam may not accurately reflect clinical deficiencies. In a dynamic training environment it is difficult at best to a) identify a deficiency, b) develop a strategy for improvement within a given rotation, and c) apply these strategies in a standardized fashion. Eight or 12 weeks if you're lucky is concord pace to achieve meaningful feedback & subsequent remediation. We rely heavily on day-to-day ward **feedback** for improvement in clinical skills, and quizzes or mid-rotation exams to identify cognitive deficiencies. I encourage all students to seek out feedback daily and encourage residents and faculty to provide that in a non-confrontational fashion. Creating a combination of evaluation techniques that can best assess all aspects of clinical performance is ideal.

If there are defined performance inadequacies we prefer to counsel students mid-rotation and develop **structured programs** for improvement. For example, if a student is having difficulty with quizzes but doing OK on the wards, negotiating reading time with the student and site director might be appropriate. If presentation skills are weak, providing the opportunity for focused presentations with faculty experienced in helping students master this skill might be useful. Students that fail to meet the minimum competencies in multiple areas are required to repeat the clerkship at my institution. Students find this not only demoralizing but also impacting negatively on their graduation timeline and residency pursuits. I believe our failure lies in impediments to the timely identification and communication of student deficiencies.

Remediation strategies

Problem-focused strategies: presentation skills, technical skills, attitudinal issues can all be addressed with behavior modification and organizational skills. The key is mutual acceptance of the deficiency and a plan for improvement. Prescriptive course recommendations for year 4 might enable specific deficiencies to be addressed.

Time management: work on structured organization strategies, reading schedules, clinic/OR time or breaking the curriculum down into focused weekly objectives. This requires significant coordination between students, residents and faculty, but can be done.

Test taking: practice exams, computerized learning packages, and frequent mini-oral exams by resident/attending staff can help students overcome some testing issues. Some institutions will allow students to retake component exams until a minimum score is achieved.

Global deficiencies: these may require repeat of the entire clerkship or a structured remediation of some sort. For instance, inability to pass written exams but adequate clinical performance might warrant a month-long focused reading schedule with practice exams. Students with marked deficiencies across clerkships may require repeating the clinical clerkship year or may not meet the minimum requirements for progression through the school.

Appeals processes exist in some form at every institution. Departmentally there should be a documented policy that students are appraised of with their orientation. A fair timeline for submitting appeals and an impartial process should be devised. Problem-focused issues such as dispute over test questions, alleged subjective evaluation concerns, or issues with perceived personality clashes can be dealt with at the Clerkship Director level .High stakes appeals (pass *vs*. fail,) may need to be funneled through the chair person who reviews the students record and makes recommendations. Academic

promotions committees or ethical standards committees may address issues outside of the immediate clerkship domain.

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How Do I Recruit and Motivate Faculty?

Not only does it involve the participation of many to teach and mentor students, it is also of benefit to students to be exposed to a heterogeneous population of surgeons during their clerkship. Students benefit from exposure to surgeons in different kinds of practices as well as different subspecialties. Community surgeons may feel less equipped to teach students (whether they are or not). The changing demands of clinical practice are constantly eroding the time and resources voluntary faculty have to contribute to student and resident education.

It is important to keep in regular contact with **off-site faculty** participating in your teaching efforts, to keep them involved and on track with the clerkship as it is envisioned. Feelings of alienation and disenfranchisement can cause resentment in off-site faculty and interfere with your educational mission. Academic appointments acknowledge the commitment and participation of voluntary faculty. The title itself is of value. Find out the policy at your institution regarding criteria for academic appointment and promotion. Discuss such appointments with your chair. Make sure the voluntary faculty are aware of clinical promotions criteria and offer your assistance in gaining these appointments.

Professional development opportunities will require careful preparation in order to meet the needs and diverse schedules of your faculty. In considering activities, find out what your faculty need and contact well in advance to arrange a time that will meet the needs of the majority of participants. Consider combining faculty development workshops with other conferences or CME activities that may attract off-site faculty. Keep the faculty informed of conferences and meetings of interest to surgical educators.

Regular or ad hoc **meetings** may be held for teaching faculty to discuss program changes, problems and projects. Invite off-site faculty to participate in these meetings and other faculty development opportunities. When scheduling meetings, be sure to ask participants about time requirements and be cognizant of the diverse needs of the group. On-site faculty may prefer to meet during regular working hours whereas voluntary faculty and off-site faculty need to arrange these meetings around other clinical responsibilities and travel constraints. Be as considerate as possible in choosing locations and meeting times. Include as many sites and teaching venues as possible in your educational research programs. This may enlarge your subject pool and increase the generability of your findings to your entire program.

It is important to **keep in contact** with off-site faculty and regularly involve them in curriculum updates. Essentially, you have two choices in meetings: go to them or have them come to you. It may be best to alternate or combine these two. If they come to you, seize the opportunity to showcase facilities and innovative clerkship changes. Take them to lunch. Include them in activities on their visit days. Be respectful and appreciative of their efforts, and responsive to their needs. Take the time to communicate your needs and try to work through the problems that inevitably arise. If you go to them, seize the opportunity to see first-hand what they are doing and specifically take note of feedback you've received from students. Don't make arrangements entirely through your secretary. Personal contacts can be helpful in eliciting feedback and closing any existing communication gaps. It also demonstrates that you are approachable and willing to exert the extra effort. There exists a rich heritage of dedication to surgical education by voluntary and full-time faculty across the nation. In these times of economic and healthcare volatility, recruiting and retaining dedicated faculty remains paramount.

Removing someone from the teaching faculty or attempting to improve teaching skills in the disinterested is another story. For full-time faculty your chair or their division head is the best option, as top-down support is most likely to have an impact. How your institution values teaching effort in the big department picture will also come into play. There is a fine line between need for voluntary teachers and negatively impacting teaching performance. Feedback is helpful and sharing student evaluations that reflect constructive feedback may work. Not every surgeon strives to be the best teacher, but few want to be known as the worst! Faculty development courses or workshops that focus on refining particular teaching skills may help. Ultimately, you have to preserve the quality and integrity of the clerkship for all students and this may require faculty "debridement" periodically…

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SECTION VI: CURRICULUM / TEACHING

How are Learning Objectives Developed?

Any well-designed educational curriculum should begin with a comprehensive list of the objectives to be achieved by the end of the specific curricular interval. There are a number of published curricular objectives that are available at both the student and surgical resident levels. The Association for Surgical Education has published a "***Manual of Surgical Objectives***", which represents a comprehensive outline of objectives for the third year student clerkship. Medical students and surgical educators may benefit from a booklet published by the American College of Surgeons Graduate Medical Education Committee entitled, "*Prerequisites for Graduate Surgical Education, A Guide for Medical Students and PGY I Surgical Residents*". This 40-page booklet specifically details what every surgical intern needs to learn during the course of internship. Additionally, any standard surgical textbook may serve as a well-thought out inclusive list of topics for a surgical curriculum. The detailed list of objectives found in the aforementioned texts will require adjustments to make them suitable to the time allotted for surgical clerkship. The objectives may also be further amended to complement the strengths or fill-in for the weaknesses of a particular surgical faculty.

If you decide to develop your own objectives for your clerkships there are several outstanding texts (Mager & Yelon) that will walk you through the "nuts and bolts" of creating measurable objectives; that is, insuring that the learner knows what s/he should be able to do, under what conditions s/he should be able to perform it, and how well it must be done. However, that being said, if you want the objectives to be meaningful and to serve as a map for what you feel is important for students to learn, then they need to not only be well-written, but doable, and somehow students must be held accountable for achieving them.

There are several principles that should guide the development of your own institutionally based objectives.

1. Work from data. Look at logbooks, review lecture and didactic schedules, and look at patient encounters. What are students actually being exposed to? If students take the NBME Shelf exam at the end of their experience, look at the key phrase descriptors describing exam items—what are they being tested on? How well are they doing? Are there areas where your students are consistently falling below the national mean? What do faculty and residents feel about what students are being exposed to?
2. What are the most common complaints that bring a patient to a surgeon's office—the complaints that students absolutely have to know about by the end of the experience?
3. Operationalize the "Embarrassment Principle". What would you be embarrassed for your students not to know about surgery at graduation? What are the most important principles of surgery that every student should know—regardless of residency choice?
4. Decide how you want the objectives to be used. What do you want the objectives to accomplish? What problems have existed with previously used objectives? How (or will you) hold students accountable for achieving or completing the objectives?
5. Ask yourself: Are those who say that specific objectives must be met really the people who will see to it that the objectives are being met? Are the objectives obtainable given the time and resources available in the clerkship?
6. Can the objectives pass the litmus test of being used as teaching tools and then as evaluation tools?

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Accreditation Council for Graduate Medical Education www.acgme.org

How is a Surgical Curriculum Organized?

Introduction

An **educational curriculum** is absolutely essential for a "framework for learning" in surgical education, both for faculty and learners. The curriculum should be truly only a framework - too rigid or dense a program might preclude much of the spontaneous teaching process in surgery. Flexibility and focus on capturing all teaching opportunities should be employed to optimize the variability in surgical caseload and faculty. With the proper underlying framework, the trainee is much more likely to receive the fundamental important principles of surgical care.

A well thought out curriculum provides a set of goals to faculty and learner, informs both *what* will be expected, *when*, and even *how*. One must proceed necessarily backwards, constantly asking how to achieve the desired result keeping in mind...

- the content: needs of institution and department relative to training program
- the overall goals of training program
- what skills and attitudes should actually be taught
- how the content should be organized
- what teaching strategies are realistically available
- the resource support: money, time, political, manpower
- the ongoing evaluation of curriculum and learners.

Planning

Curriculum planning, whether *de novo* or revision, includes some form of **needs assessment** as to what the learner will know or demonstrate competence upon completion. This can, and often does, involve critical reappraisal of existing curricula, literature searches, interviews / surveys of colleagues, faculty and learners. In a broad sense goals of surgical learning are well established and include the time-honored "tripartite goals" of excellent cognitive knowledge base, technical skill, and clinical judgment. If the needs assessment suggests curricular change, goal(s) become self evident (e.g. residents need to be more facile with laparoscopic technique, or clinical clerks need more instruction in surgical nutrition). The final planning step is to outline the curricular change needed to implement the desired goals.

CAVEATS, THINGS TO CONSIDER

- team approach: it's a big job, get all the help you can;
- think "systems": how will it work in your institution, in the flow of the day, with the learner/faculty daily schedules etc.;
- time: everything takes longer than you think; more conferences may not mean more education;
- consider strategy: e.g. positive reinforcement, awards, cash, books, "bragging rights".

Implementation

Most curricula are pre-existing and change represents revision and fine-tuning. Less often an entirely new curriculum is implemented. In an ideal world, pilot projects would be useful to test new and improved programs. In the surgical world time is precious, faculty and students are overextended, and curricula are often implemented "on line".

In order for pilot or "on line" curricula to be successfully implemented, flexibility and communication are key. Early, frequent, and critical **evaluation** with learners and faculty can identify weaknesses, strengths and aspects that must be changed immediately. Usually more involvement, frequent evaluation promotes "buy-in", smoother implementation and reduced tinkering later in the academic year.

CAVEATS, THINGS TO CONSIDER

- don't work in a vacuum, get feedback / evaluation early and often;
- be critical, always refer back to goals;
- get "buy-in" and help - it's a big job;
- don't overextend: be conservative - there's always *less* money, time, support, and help than you think.

Evaluation

Ideally, evaluation of curricula should be multifactorial and include learners, faculty and the program itself. Evaluation would thus cut across the aforementioned tripartite goals of surgical education or whichever goals the curriculum identified. The methods of evaluation vary tremendously and include both subjective and objective means in both directions (i.e., learners should evaluate the faculty and program, faculty should evaluate learners and program). More evaluation is always better!

EXAMPLES OF EVALUATION TECHNIQUES

- faculty, resident evaluation
- qualifying, certifying board exam performance
- ABSITE performance
- OSCEs
- written tests
- standardized tests, patients
- delineated levels of skill competence

Conclusion

A well thought-out curriculum is flexible and loose enough to respond to and accentuate the various and many teaching experiences during the surgical clerkship and residency. It provides clear understanding of the expectations and goals to faculty and learners. The well-constructed curriculum will, like any good framework, suggest and guide its own development and implementation, which can be tailored to one's own educational environment, desired strategies, and needs.

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What are Challenges to Curricular Change?

You are a surgical faculty member interested in the surgical curriculum. You have a new idea for improving the student curriculum. Remembering the adage that "it is easier to move a cemetery than to change a medical school curriculum", it may be helpful to consider the following…

1. **Students should be seen and heard.** Nearly every medical school sends out end-of-clerkship evaluation forms to students. If your clerkship is true to form with most, you tend to hone in on the numbers. If the numbers are in the acceptable range, we call it "good enough" and pass all pejorative comments off as students blowing off steam. But the fact of the matter is that student comments can be extremely helpful in curriculum reformation. Students will whine, but just as often as not, a review of their comments will reveal problematic themes. Look for the positive and negative themes in evaluations. While it may seem discouraging to only see a few things that are evaluated as "good" you've got to remember that this really isn't the forum that students use to talk about the positives. They want their voices heard on issues that are frustrating them. They aren't going to take a lot of time giving the clerkship administration positive feedback, particularly when they don't think anyone reads the evaluations anyway. To get a complete picture of what students think is going well, you may just want to gather small groups together and ask them. These "**focus groups**" are run by faculty or staff who have no role in students' grading and who are trusted or, at the very least, considered neutral parties, by students. You now have a problem list to guide curriculum revision.

Next, survey graduates who are currently in their internship years—dividing responses between those in specialties and primary care. You want to know…

How well-prepared they thought they were for their residencies

What did we do that was right on target?

What do they feel they are unprepared to do?

These responses will be summarized and placed on the problem list. But I don't stop there! Talk with your faculty and residents. Ask them what's working, what's not? Or, in the words of Ed Koch, former New York City Mayor…"how are we doing?" What is a source of frustration to them? What can be done to help them fulfill their roles as teachers?

Finally, how are students doing on the end of clerkship exam and how are they performing on the USMLE (or the NBOME)? Are there content areas that students are routinely missing? All of this information gets put onto the master list that will be used with faculty in the curriculum revision process.

2. **Just because you can change it doesn't mean you should.** Look at the list of grievances with a critical eye.

   What's noise in the system?

   What can reasonably be changed in a relatively short amount of time?

   What are those issues that need some long-term attention?

   What are those problems that will require significant change in the system? (which means problems you may just have to live with—for a while anyway…)

Think about alternative methods of supplementing the curriculum. If your students are not being exposed to certain important conditions use cases from books, teaching files, real life, and from the Association for Surgical Education's Manual of Surgical Objectives to help teach students about problems.

3. **All things are not equal.** We can't cover everything in the clerkship and not all elements will carry the same weight in the clerkship. Unless your medical school does a complete curricular overhaul it's nearly impossible to alter the number of weeks you have allotted to your clerkship, so you work with what you have. The embarrassment principle will help you make these important determinations - that

is, what would you be embarrassed for your students not to know about surgery at graduation? Or, put another way, if a student were going to be involved in the care of someone you loved, what would you expect them to know? What are the most important principles of surgery that every student should know?

4. **Don't reinvent the wheel, but make sure it fits.** Read conference proceedings and "how we do it" articles. Look at the models followed and see if there is anything that fits what you are doing. Don't assume that forms you adopt from other institutions or programs will automatically work in your environment! You may need to make subtle or even significant changes in forms or policies to help them fit your culture. Learn from the "war stories" of others.

5. **Ideas that look good on paper frequently aren't in real life.** Are those who say that objectives must be met, really the people who will see to it that the objectives are met? Is the curriculum doable, and what will impact its successful implementation?

    - Don't look at curriculum in isolation. Look at other clerkships that are being offered and ensure that there isn't overlap in content, resources or preceptors.
    - Involve residents and staff in the design process. These are frequently the individuals who will be responsible for implementing the objectives. They tend to be more front-line and will tell you what is doable and what isn't.
    - Remember that external forces are always out there and may impact what is a great curriculum—key personnel leave, leadership changes, as do agendas, hospitals merge, etc.

6. **Curriculum revision doesn't really cost money - faculty time costs money.** Curriculum development takes a lot of time and typically more meetings than you can stomach. Successful curriculum implementation is utterly dependent upon buy-in from faculty. They need to feel ownership in the process and product. What sounds like a good idea at the beginning, quickly loses its appeal when the process drones on and on. Understand that if you become involved in this process you may have to cancel clinics, office hours and/or OR time.

Remember that you and you alone are the content expert. Ph.D., Master's Degree, and nurse educators can take the content and write objectives and put things in the appropriate educational format but only you as the surgeon can determine what is truly important.

7. **Junk in, junk out.** If your sole purpose in developing curricular objectives is to fulfill accreditation and governing board requirements, use those that have already been developed in textbooks. If you want the objectives to be meaningful and to serve as a map for what you feel is important for students to learn, then they need to be doable, and somehow students need to be held accountable for them.

8. **Square pegs don't fit into round holes.**

- If you want to evaluate students' clinical performance, don't give them a written test. Watch them perform.
- If you want to insure students have had a well-rounded experience, look at their logbooks and ask them questions about their patients.
- If you want to test their book knowledge give them a test.
- If you want to see if they can apply their book knowledge to a clinical situation, conduct a performance based assessment, or give them an oral exam.
- Finally, if you're going to require students to do certain tasks, e.g. complete a logbook, write focused or complete case histories, etc. – ask yourself, "What am I going to do with it?" Will it just sit and collect dust or am I going to put the information to use?

Bottom line, if you're going to evaluate it, make sure the means and the end are congruent. If you aren't sure what you're evaluating and what you are trying to accomplish with the evaluation, you'll never know if you achieved your goals.

9. **Make it count twice.** If you're going to go through all of this effort to develop, measure and evaluate, then develop your curriculum and its components with a research question in mind. Questions may include…

- Are there differences in student performance based on the experience of the preceptor?
- Are there differences in student performance based on site?
- If you teach breast examinations to first and second year students, how well do they remember this information in their third and fourth years?

In academia we all have the expectation to "publish or perish". Use this significant curricular effort to get your name and your department's name out there!

10. **Once it's fixed it doesn't mean it will stay fixed.** If you don't continue to make adjustments in your curriculum based on student, resident and faculty feedback, on changing market forces and practice patterns, and on innovations, you will be faced with reinventing your entire curriculum every 5 years.

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How are Lectures Best Used?

Definition of Question

Lectures are a commonly used teaching method and imply a unidirectional, non-interactive method of teaching. Historically, they have been viewed as a fundamental way of disseminating knowledge. They are utilized to "cover" a great deal of basic information felt to be vitally important. However, more than any other training method, the lecture has been "cussed and discussed." (Eitington)

Approach to the problem

Is a lecture format the best teaching method to present the material? Lectures are best when:

- There is a large group of learners
- The audience has mixed levels of knowledge and experience
- Clinical examples or statistical analyses (charts and graphs) need to be demonstrated
- Key concepts or crucial points need to be emphasized on a subject
- The lecturer has compiled background from a wide variety of sources - information that is not available in a single reference
- It is the most convenient and cost-effective means to disseminate material

The lecture will be most efficacious if it is:

- **Entertaining** - use humor, clinical anecdotes, examples, analogies
- **Pertinent** – "Tell them what you're going to tell them - tell them - tell them what you told them"; use personal examples of misdiagnosis, examples of written/oral surgery board problems; tell audience why this is important to them
- **Well-prepared** – practice; don't read from a manuscript; be extemporaneous—don't memorize; know your audience—their interests, perceptions, expectations, background
- **Timely** - a clinical situation recently encountered, a related procedure soon to be performed
- **Visual** - anatomical references, graphic representation of data, movie clips, lecture notes provided.
- **Well-delivered** – use voice variation, gestures, movement and pauses; vary the tempo; walk away from the lectern; maintain eye contact; use everyday language; speak in a conversational tone of voice; avoid "uh's" and "ah's"; emphasize significant points; tell them when you're making a transition; pause to let points sink in; if you're using slides (or the PowerPoint equivalent) don't read them—use them as cues; orient your audience to your visuals—show them what you are looking at on x-rays, CT scans or graphs
- **Responsive to the audience** – assess and reassess your audience in the course of your presentation and make adjustments as necessary; if it is clear that your audience is confused or wants to respond to what you are saying entertain questions at that point
- **Started strongly and ended strongly** – engage interest at the onset; watch your closure—that is the last message they will remember; quit on time even if it means that all of your material hasn't been covered.

Lectures can be most effective when you supplement them (before or during the presentation) with participatory activities

- Give pre-reading and discuss it before the formal presentation

- On arrival, elicit from audience areas of special interest, problems, or concerns they hope will be covered in the lecture.
- Give cases, incidents or problems that relate to lecture and have small groups briefly discuss the issues
- Ask each audience member to write down a real life incident, problem or event that relates to your presentation
- Give a thought stimulator—as soon as people sit down have them respond in writing to several incomplete statements
- Stop midway through the presentation and ask for feedback, reactions or questions
- Turn a question back to the audience

How do I use the "Question and Answer Period" Effectively:

- Build in time for this activity—if you have been assigned 60 minutes for your presentation insure that you have 15 – 20 minutes for questions
- Provide 3" x 5" cards or a question form to participants to encourage the posing of questions
- Respond to the questioner by name if possible
- Anticipate lags in questions by asking the audience a question
- Don't let one person monopolize the question period. Select questions from different parts of the room.
- If the room is large, rephrase the question that was asked of you
- Positively reinforce the "questioner" for his/her question
- If you can't answer a question admit it
- Avoid "windy" responses

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Web Sites

Improving Lecturing Skills: Some Insights From Speech Communication, University of Indiana www.indiana.edu/~teaching/lectskills.html

Improving your lecturing, UIUC **www.oir.uiuc.edu/Did/docs/lecture.htm**

Problem-Based Learning (PBL): What is it and How can I Use it in Surgery

Problem-Based Learning (PBL) is an innovative technique used in education to enable students to learn by teaching themselves in a group setting with the help of a facilitator. This method allows students to learn to work with each other and start to think through problems without being given the information immediately, as in didactic presentations. Students are enthusiastic about this mode of learning because they have time to analyze problems in a less pressured atmosphere and gain confidence in their problem-solving abilities.

Our approach to the problem

Third year medical students rotating through a six-week general surgery clerkship are divided into groups of 5-7 students. Each group reviews three out of four PBL cases chosen to represent common surgical issues (acute abdomen, breast mass, pulmonary module and trauma). Each case has 2 two-hour sessions with the same facilitator. The first session (Thursday) follows a strict PBL format with the students developing learning issues and discussing problem with faculty facilitation. The second session (the following Monday) begins with five-minute presentations by each student reviewing the selected learning issues followed by the completion of the case. At this point, any new learning issues, areas of confusion, details of surgical procedures or remaining questions are addressed by the facilitator, now in traditional didactic mode.

Optimal Settings for Achieving Objectives

Cases work best when group size is kept small. Students need two sessions so that they can develop learning issues and research them between sessions. **Facilitators** must be asked not to become "teachers" until the very end of the case (if at all), so as not to interfere with the group dynamics and thought process. The cases may need adjustments with respect to time allotment, organization and/or content; re-evaluation after a few sessions is important. **Evaluations** by the students and facilitators are important but do not drive the process for our PBL program. Students are not graded for PBL, but are made aware of the similarities between the PBL cases and their final oral examination.

Pitfalls

PBL is time consuming both for the students and faculty. At the beginning of the academic year, students who are unfamiliar with PBL may take time adjusting to this style of learning. Faculty must be trained, although we have found that it does not take more than one or two hours to do this. The commitment of four hours for each case is difficult for faculty. Therefore, the larger the number of faculty and house staff involved, the easier it is to retain them.

An alternative approach

The same information could be transmitted to the students with a case-based format. This would allow larger groups to be exposed to the material, but would not allow for group interaction or the intensity of "thinking" which occurs in the PBL format.

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How Can I Teach Students in Ambulatory Settings?

Setting

The significant migration of health care provision away from inpatient and towards ambulatory setting has raised multiple challenges in integrating medical education in the new environment. These **challenges** include time & space constraints, organizational issues, brief teacher-learner interactions, limited learner observation & feedback, narrow/unpredictable clinical spectrum, and lack of continuity.

Description of Setting

Strategies for teaching in ambulatory settings include planning activities (patient scheduling, student orientation to the clinic and to each patient), specialized teaching methods (in-room case to each patient), specialized teaching methods (in-room case presentations, "one-minute teaching", and out-of-clinic teaching), and reflection time (teacher self-assessment and teaching scripts). Some of these strategies are detailed below.

Patient-Specific Orientation

Orienting the student to each patient to be interviewed can significantly enhance the effectiveness of both the learning process and the clinic. This orientation might include reviewing the patient's medical background, directing the trainee which complaint to focus on, setting guideline for physical exam., and setting a time limit for the initial encounter.

The One-Minute Teacher

This is based on Neher's "Five Microskills Model", which includes; getting a commitment from the learner; probing the learner for supporting evidence for their statements; teaching general rules; reinforcing what was done right; and correcting mistakes.

Out-Of-Clinic Teaching

DaRosa's group identified several opportunities for out-of-clinic teaching, such as: ambulatory case of the week; clinic exit rounds; am/pm rounds; ambulatory care journal club; independent learning modules; ambulatory question banks; home & community visits; and population-based projects.

Pitfalls

Irby provided in his landmark paper on ambulatory education a good summary of the key warnings (suggestions) for teaching in ambulatory settings:

- set clear & realist expectations;
- model & teach to learners' needs;
- supplement clinic instruction with readings, conferences & mentoring;
- create a positive learning environment;
- reflect upon & improve teaching; and
- strengthen assessment & feedback.

Annotated References

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Is There Still a Place For Bedside Teaching?

The patient's bedside is the **ideal setting** for teaching physical examination, medical interviewing and developing interpersonal skills. While "demonstrating physical findings" is the most commonly reported objective for bedside visits, difficult parts of the interview can also be demonstrated. Teacher, trainee and patient thus participate together in an educational encounter where professionalism and humanism can be role-modeled.

The absence of this component is particularly evident in many surgical services where large numbers of patients and time spent in the operating room impose severe restrictions on time for bedside teaching. During their surgical rotations, residents and medical students focus on technical aspects of surgical procedures, overlooking the significance of clinical judgment and decision making which is best learned at the bedside.

Actual teaching at the bedside, with emphasis on history taking and physical diagnosis, has **declined** significantly over the past decades. New imaging techniques have replaced bedside assessment skills and many educators exhibit a laboratory-oriented teaching style.

Though most surgeons are quick to point to the importance of clinical judgment and thorough bedside patient evaluation, the role of the surgical educator is too often limited to lecture-type presentations and grilling of individual students or residents when scrubbed in the operating room. In fact, most recent scientific papers on bedside teaching originate from authors with a medical background while the surgical representation is surprising scarce.

The Way We Do It

One useful approach to **surgical service management** is for residents to see all patients together as a group in the morning. Patients are assigned to each medical student who becomes responsible for gathering vital signs and lab results and performing a brief history and physical examination. Each medical student is expected to be aware of the patient's condition and to be more than a simple information gatherer. The surgical residents supervise and complete this process and are ultimately responsible for the information obtained. The chief resident subsequently examines each patient, comparing data obtained from the students and junior residents with his own examination. Each patient is discussed and a work plan is formulated.

The chief surgical resident then discusses all patient related issues with the attending surgeon and formal diagnostic and therapeutic plans are generated.

After the operating room procedures have been completed for the day, the attending surgeon or chief surgical resident selects one or two patients and devotes time to teaching at the bedside. Since group time is valuable, patients must be selected carefully. The patients selected need not be diagnostic dilemmas as almost every bedside encounter can be a rewarding teaching experience. Our teaching foci include patient management algorithms, principles of post-operative management, clinical specifics such as DVT prophylaxis, and basic science/clinical integration issues such as wound healing.

The feedback from students regarding these hands-on encounters has been consistently positive. In-patient bedside teaching is supplemented with student/resident attendance at office hours where much of the preoperative workup and diagnosis takes place. Professionalism is best taught at the bedside, as students are discouraged from using medical jargon and learn how to communicate successfully with patients.

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What is Known About Teaching in the OR?

Teaching in the OR is a dynamic process that should be based on the concept of progressive exposure. The trainee should be exposed to the different aspects of surgery in the OR from the earliest stages of his/her training career. As the trainee progresses through training his/her degree of sophistication will improve but the essentials principles will remain constant.

Objectives for teaching in the OR

RESPECT AND COMMUNICATION SKILLS

Respect involves the senior physicians who have been through and are dedicating time teaching. Respect must also be modeled for the OR personnel, including nurses, techs, anesthesia personnel, orderlies, and the innumerable people that allow the work to happen. Is important for the learner to understand that each operation is a team effort, where all participants are important and good inter-professional communication is key to success. The days of the "surgeon king" are long gone, and modeling humility and team spirit are very important for the aspiring surgeon.

Lastly, and most importantly, respect must be modeled for the patient who lies on the table. There's no other human activity in which a human being deposits so much trust in another one. The OR is a place where the patient's dignity is to be protected at all times.

PRE-OP PREPARATION

Do you know the patient? Adequate mental preparation: did you read about the case? Let the patient know that you are there, a simple gesture that helps the patient feel safer in a hostile environment. Adequate surgical preparation for the case: teach how to place catheters, positioning the patient, prepping and draping. The trainee must understand that an adequate setup is key for a successful operation.

SURGICAL TECHNIQUE

Teach how to position the lights, how to position your body. Demonstrate the appropriate way to hold instruments. Teach the fundamental moves of sewing, cutting, dissecting that must be mastered. This is particularly important in the early stages of development. Old habits die hard!

THE SURGICAL FIELD

Demonstrate surgical anatomy, and ask pertinent questions. Anatomy is familiar to students and residents alike, and draws both into the educational process. Demonstrate the capacity to see how the different layers of a surgical field relate to each other. This is perhaps the single most important difference between an anatomist and a surgeon: the ability to see the field as a 3-D concept, anticipating what's coming even before you expose it.

CONFIDENCE

In part, confidence is endogenous, in part it is taught. A great deal of confidence will come from the feedback that one gets from one's mentors. There is no room for abusing, threatening or insulting the resident in the OR. This could be costly for the fragile sense of confidence of some trainees, especially early in their training. Constructive criticism and words of encouragement can go a great distance toward building a successful, confident surgeon.

HANDLING STRESS

There is no escaping stress in our profession. Model how you deal with it successfully. The trainee must understand that his/her acts will have repercussions that may be irreparable. A progressive exposure to responsibility must be coupled with open discussion about dealing with the stresses of the responsibilities.

LEADING BY EXAMPLE

To a great extent, teaching a resident is no different from raising a child. They will look to you for guidance, even at times you don't feel like guiding. Remember your own travails as a trainee. Conduct yourself with dignity and respect, and show that regardless of how advanced you may be in your career, your search for excellence never ends. This will be your most effective tool in helping transform an inexperienced trainee into a full-fledged surgeon.

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How Can I Use Technology in Surgical Instruction?

Today there is a vast array of instructional technology available, which spreads across the spectrum from text storage and data retrieval to virtual multimedia learning environments. The application of these tools has been slow and haphazard. Graphics and animation are often included, not so much to supplement the material presented as to demonstrate the ability of the designers to manipulate the technology.

Approaches to the problem

Multiple approaches have been used to incorporate instructional technology into the curriculum. One approach merely involves **moving all of the standard course material onto a web site**. While relatively easy to accomplish, this approach can be counterproductive. This kind of presentation usually involves little or no interactivity, stimulates little or no critical reasoning and provides no assessment or feedback whatsoever. Also, since all of the information and materials are available elsewhere within the curriculum, there is a good chance that a site structured in this manner will be of little or no benefit to students or instructors.

Another approach involves the use of **Internet-based material as a supplement** to the curriculum. The material is presented on the site and the student is encouraged, but not required, to review the material subsequent to a formal lecture. While possibly introducing some new material, this approach still falls short of assisting the student or the instructor in the advancement of overall knowledge and thinking processes.

A final approach involves development of an **integrated web presentation**, which can stand-alone or compliment a subsequent lecture or faculty interaction. The presentation needs to incorporate pre- and post-assessment, as well as a number of formative assessments with both feedback and remedial activities. A directed pretest can eliminate the need for the student to work through instructional modules in areas in which (s)he is already competent and to focus on areas that need additional instruction. The learners should also have the opportunity to submit online questions, so that the instructor may directly respond to the questions or use the questions as the basis for lecture / interaction.

Communication is one factor critical to the success of any learning environment. Technology and scheduling problems in our modern world have made effective communication between learner and instructor increasingly difficult. If computer-aided instruction (CAI) is to meet the needs of learners and instructors, interaction between the two groups must be restored. Learning environments need to offer learners more than just access to the material being presented; the environment should also provide a means for taking notes, communicating with instructors or interacting with other learners in asynchronous discussion groups.

Internet-based presentations must provide **added benefit** compared to available text-based material. CAI can provide a means of unifying the coverage of material between different groups of instructors, while increasing the diversity of information. No matter what subject is being taught, there should be multiple approaches available to the learner. A meaningful contribution to the user's education is required, rather then a digital presentation of material that is already available in printed form. In general, learners have been found to read more effectively from written text than from the computer screen, so computer instructional programs must provide new information or the capabilities for rapid search and retrieval.

CAI should incorporate the ability to store key facts, to take notes and to save references. CAI has the ability to form "hyperlinks" (computer connections to other references, web pages or other parts of the program) thereby permitting the user to rapidly jump to additional information that can be used to clarify a topic. In order to maximize efficiency the learner should also be able to leave a "bookmark" so that (s)he can return the same place at a future time.

More sophisticated interactive multimedia programs are also becoming available. These programs have the distinct advantage of allowing multimedia and video input to illustrate key points and of using an effective search engine to allow for rapid information retrieval. Such media can be directed course based

modules (i.e. fluid and electrolytes) or open-ended interactive programs that allow the learner to react to case changes that are dependent on their input. These modules can also be used in preparation for standardized testing or for end-of-course evaluation. As faculty and course time becomes more and more constrained, this format can allow the learners to work through key topics or areas of deficiency at their own speed and convenience. Faculty-learner time can then be more productively concentrated on the areas of specific deficiencies. Ultimately programming templates will permit learners to create their own cases and structure presentations for fellow learners.

Developing Skills: Clinical Reasoning

Medical students on their initial clinical rotations are learning to socialize, that is behave like physicians, as well as learning to make sense of an overwhelming amount of clinical information. They learn by imitation and look for succinct certainty in an ambiguous uncertain environment. Eventually, they will learn to deal with uncertainty and ambiguity, to navigate a sea of information that is expanding faster than it can be surfed, and to be cynical about absolutes. Learning how to reason expertly takes longer than most other elements of training, in part because sound clinical reasoning, or manipulation of information, assumes a sound clinical information base. However, the surgical educator can insist on good reasoning habits during this maturation process.

Students want to know the axioms of clinical medicine, what should be done in particular clinical situations. It is important that they also understand why, so that they will later be able to appreciate and identify the subtle differences in the inevitable exceptions. Ideally, these justifications should be evidence-based, rather than just reasonable; certainly, they should not just be authority-based. Students should be encouraged to ask why this test is necessary or why that treatment was chosen. Students should also be encouraged to find the answers themselves in the medical literature when the topic is rich enough to reward self-learning, but no so rich as to confuse a novice. A useful exercise is to assign a student to report back on the answer to a questions that could not be definitely answered by more senior members of the patient care team, even the educator, to reinforce the concept that evidence-based medicine can turn anyone who knows the vocabulary and can access information into an expert in a limited domain.

Case presentations are excellent opportunities to identify salient information and to evaluate students' understanding of coherent clinical reasoning. For surgical training, a presentation of a patient with acute abdominal pain covers an important part of the surgical discipline and one for which the diagnosis is traditionally not known prior to the surgical consultation. A good case presentation will start with identification of the most important clinical problem (the "chief complaint"). It may be useful to begin the differential diagnostic process at this point in order to emphasize the need to focus the narrative to the information that is salient.

Students without much clinical experience may not be able to reason probabilistically, to give "statistics," but they should be able and encouraged to think logically. For example, if a student suggests what would be an unnecessary test, he or she could be asked to think ahead and project what they would do if the test result was positive and then if the test result was negative. If their next action were the same, no matter what the test result, the redundancy of the test would be obvious by logical deduction alone.

Once students become aware that clinical information is imperfect, they should be introduced to the principles of weighting information appropriately. The likelihood ratio, the ratio of the true positive rate for a finding to the false positive rate for a finding, is both the most accurate and one of the most convenient ways to describe imperfect information. The true positive rate for a finding associated with an outcome, such as diagnosis or prognosis, is easily available in the medical literature. The false positive rate is more difficult to find, as it depends on the context. For instance, the true positive rate for amylasemia with acute pancreatitis can be easily found, but he false positive rate may not. It will not be found in articles restricted to acute pancreatitis, because it refers to patients who do not have acute pancreatitis. It will vary in articles on the differential diagnosis of acute pancreatitis, depending on whether the focus of the article is on patients with acute abdominal pain, patients with biliary tract disease, alcoholic patients, or patients with pancreatic diseases. However the weighting of clinical information with the ratio of the true positive rate to the false positive rate can be a useful exercise even when the rates are subjective estimates.

More sophisticated students can be taught how to use the weights attributable to new information to revise the original probabilities. Classically, this is done using Bayes' Theorem. It can be done impressively as a mental exercise at the bedside using the odds ratio form of Bayes' Theorem [the original odds ratio of the prediction being true vs. false (probability of true/probability of false) times the likelihood ratio (true positive rate of the new information, i.e. how often it is found when the outcomes

does not occur)]. Although important for good predictions and theoretically simple, the mathematical nature of revising probabilities correctly is confusing for students who are not mathematically oriented and should probably be skipped unless the student shows both interest and an understanding of odds ratios.

It is important that all students understand not only the ambiguity of information, but also the uncertainty of outcomes. The final step in clinical decision-making is deciding on an action; that decision is most obvious with the surgical decision, whether to operate and/or what operation to perform. Many surgical decision situations have been pre-analyzed and are presented as algorithms. Thus, the student learns that a patient with an inguinal hernia needs a herniorrhaphy. However, as mentioned previously, the student should also understand why.

Even a straightforward surgical decision provides the opportunity to discuss clinical decisions as an analysis of tradeoffs. A classic decision tree is a useful schema for representing the analysis of the tradeoffs: the most plausible actions, the good and bad outcomes that are associated with each of those actions, the probability that each good or bad outcome may occur if that action were taken, and the relative value of each outcome, compared to the other outcomes, for that patient. Although a formal decision analysis then proceeds to find the best expected yield mathematically, the four-step outline of the process (what are the options, what are the good and bad consequences of each of those options, what are the probabilities or the outcomes occurring given each option, and what would be the impact of each of the outcomes on the patient) is a useful exercise in rigorous clinical decision making. The emphasis should be on recognizing more than one option, even if it's death from the natural history of the disease, and systematically addressing both the good and the bad consequences about all the options so as to minimize thoughtless parochial bias.

An excellent exercise for discussing tradeoffs is the informed consent and ideally students should have the opportunity to observe that process. When a surgeon gets informed consent from a patient, he or she makes a recommendation and gives reasonable alternatives for comparison, then discusses the pro's and con's of each, with estimates about how likely each might occur if that option were taken. The patient then decides whether or not the likely consequences of the recommended action represent a better value for him or her than the alternative. If so, they agree. The informed consent exercise also emphasizes that the final judge about the value of the medical care proposed is the patient, not the physician.

Clinical judgment or reasoning should be taught as a systematic process of manipulating information, rather than as a topical medical domain. The emphasis should be on tools for the acquisition and manipulation of information, starting with the clinical encounter and simple logical deduction and then expanding, in concert with increased clinical experience, to include the medical literature and simple mathematical manipulation of probabilities. Every day, clinical situations provide examples for discussion of the value of additional information and the consequences of actions. The most important question a teacher can ask a student – or a student can ask himself or herself – is "Why?"

How Do I Teach Verbal Communication Skills?

Differentiating the art of oral presentation from written presentation

While both oral and written forms of communication are essential, the daily "business" of hospital medicine depends on effective verbal communication skills. Written presentations may be lengthy and all-inclusive, and fit a predefined pattern and sequence. Oral presentations, in contrast, need not be so constrained. Instead, the presenter may craft the presentation so as to establish only a certain point (or more) while leaving out unnecessary information that would otherwise have been included in the written document. The acquisition of skill in organization and delivery of oral presentations remains a challenge for both students and residents.

Understanding the different modes of oral presentation

There are a variety of presentation styles and formats that the learner must master. By way of example, presentations delivered on Professor's Rounds may be very different than those on work rounds. Several model presentations are listed below; the teacher must clarify the different goals, settings, and formats for each.

- Emergency Department presentations for trauma or general surgery emergency
- Emergency Department presentations for General Surgery consultation
- Morning work rounds (bedside with residents or table-side with attending staff)
- Intensive Care Unit presentation

Communication skills required

The attending staff should work with the residents and students on the following skills that enhance effective verbal presentations: diction, enunciation, logical thought sequencing, and elimination of non-words (i.e. *ah*, *um*, etc.). Of course, the attending must provide a good role model for this endeavor. Multiple training courses are available through a variety of organizations. However, a more cost-effective method is to simply record (tape or video) a presentation that the attending gives and then critique it for problems in each of these areas – improvement is certain to follow.

Suggested Exercises

WRITTEN EXERCISE – IDEAL FOR STUDENTS (AND INTERNS)

Take a current H&P and have students rewrite the text as if they were presenting it to the following individuals: chief resident on AM rounds; the attending who is on call for admissions at 2AM; and the attending who is running Professor's Rounds and has one hour to listen and critique the presentation.

WRITTEN EXERCISE – IDEAL FOR STUDENTS (AND INTERNS)

Using a small group format, have students ask questions of the attending to obtain history and physical data. Then have the student perform a "mock sign-out" asking the student to pare down the data so that the next student "coming on" can care for the patient. Follow this with a critique by the group.

VERBAL EXERCISES – IDEAL FOR RESIDENTS

Have mid-level (PGY-3) and above residents present interesting cases at Grand Rounds. This exercise works best if the resident is paired with a sponsoring attending who can help guide and critique while the presentation is developed. This fosters good communication, an excellent working relationship, and the resident learns how to construct appropriate slides, visual aids, and pair them with a verbal presentation.

Resident presentation at Morbidity & Mortality conference using slides, visual aids, and literature data provide a stepping-stone to Grand Rounds presentations. While not always possible, faculty involvement in this activity is also ideal. To better enable the resident to focus the presentation it may be helpful to have all presentations begin with a similar format. One that works well is for the resident to state the complications to be discussed, followed by " This patient is a ___ year-old m/f who is __ days status-post _____". The remainder of the focused presentation then follows on either an overhead or slides.

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How do I mentor students and residents?

Why is this an issue for a surgical educator?

The issue of mentoring insinuates itself throughout all phases of education and is pervasive at all levels. As one educates, one is mentoring at the same time. Additional focus on the mentoring process occurs when one is approached to guide individuals along a career path, or to help that individual define a career path. Mentoring also occurs when one guides an individual's personal growth within the medical field. Thus, mentoring is not reserved for administrative personnel, or those who are specifically designated as mentors. **All educators are mentors** to varying degrees. It is more common than not for students and residents to turn to those who shoulder the bulk of the educational burden, or those who educate well for focused mentoring to help shape their future.

Approach to the problem

Clearly, not all approaches will work equally well for all mentors. Moreover, each mentee may have a different learning style from another mentee. Thus, the mentor needs to have a **variety of techniques** available.

First, I define which problem the mentee wishes help with. In the course of so doing, it is relatively easy to understand what side issues also need to be addressed. For instance, a student wanting more information about surgery may really need to understand more about related fields and how the challenges of that field mesh with their personal goals and abilities. Next, I try to uncover how they learn best. With students or residents with whom I have worked, this information is already available. If not, the mentee may know how they learn. Then I construct a framework for them to follow that is designed as a joint effort that will help them get where they need to go. The goal may be as simple as how to speak better in public, to how to construct a 7-year plan of research and publications targeted at a specific kind of fellowship.

It is essential to understand your own **limitations** and to bring in outside expertise if you are unable to aid the mentee in a successful and efficient manner. Frequently, much of your time will be spent in acquiring information so that you are knowledgeable about the topic of importance to your mentee. The most difficult time occurs when a mentee has set an unrealistic goal but is unwilling or unable to realize that the goal is likely unreachable. In this circumstance, an outside consultant is invaluable, and may need to come from outside of your department or institution. Most importantly, continued contact is essential for a successful partnership in mentoring. This may mean inconvenient meeting times, or altered schedules, or phone contact (e-mail too), but the ongoing dialogue is of utmost importance to the relationship.

An alternative approach

One alternative is to have **focus group mentoring events** with a variety of mentors on a rotating basis. This does not preclude the development of individual mentor-mentee relationships, but provides a broader base for mentoring than does individual linkage. It also provides for a reduced time requirement per faculty member as not all students will desire a one-on-one mentoring relationship. This approach does not work as well with residents who have a different set of priorities and will be in the system for a longer period of time.

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How Should I Guide Students Interested in a Career in Surgery?

The surgical educator has a role beyond teaching students knowledge, skills and attitudes. The educator can have an impact on career development that can complement the official career planning responsibilities of the Dean's office.

Students may come to you seeking advice on a surgical career or one may identify a student who one thinks will enjoy a future in surgery. What is the surgeon's role as a mentor or advisor for students contemplating a surgical career?

The advisor's role

The student may come to you for advice or for a letter of reference for surgical residency.

DO'S

- Meet the student face to face at an appointed time and place and not on the run.
- Ask for a CV in advance.
- Determine the student's motivation, understanding of the specialty or subspecialty, interest in an academic career.
- Deal with the student's concerns about a surgical career, i.e., lifestyle, gender issues. You may wish to have a student meet with a gender-matched colleague to discuss these issues.
- Discuss elective choices that will both benefit the student's education as well as residency opportunities.
- Suggest names of colleagues who may have more familiarity with a specialty or a program.
- Determine if the student is realistic in choosing a surgical residency. How well do you know the student? Does the student have honor standing? Does the student have a reasonable chance of acceptance by a highly competitive program? Has the student chosen reasonable alternatives? Will a preliminary program allow eventual entry into a preferred categorical program or may it be a "dead-end'?
- Do a cautious re-directing of the student's interest if you believe that the student's goals are not realistic.
- Do encourage a student who is apparently enjoying a surgical rotation and who seems to have potential for a successful career in surgery.
- Determine if the student knows about literature and web sites that can advise on program selection.
- Remember that your own fascination for surgery will be transmitted to the student in both formal and informal encounters and that you will be an important role model.
- Leave the door open for a return visit.

DON'TS

- Do not address a student's approach to you in a rushed off-hand manner - e.g. in the corridor in front of others.
- Do not advise on areas where you lack up-to-date information. Research the area or refer the student to another source.
- Do not make a student feel less worthy of your esteem if the student is not interested in your subspecialty or in any surgical specialty.

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APPENDICES

APPENDIX I: DESIGN OF AN EDUCATIONAL RESEARCH PROJECT

In reality, most educational research projects are not designed by way of a specific series of steps. Usually, an investigator starts out with some vague idea of a research question derived from practical experience or someone else's work. Often, there is a practical problem that needs a solution, and there exists a wide variety of opinions as to how to solve the problem, e.g., how should we evaluate residents?

The design of an educational research project involves numerous decisions - some very theoretical, some very practical. Virtually all educational research requires some degree of control by the investigator of individuals and/or environments. Constraints on the degree of control that an investigator may exert in a research situation impose an upper limit on the degree to which a valid study can be conducted.

In general, the most valid studies require exertion of a high degree of control by the investigator, allowing, for example, research designs that use: **random sampling**, **random assignment**, large samples, **control groups**, **replication**, long-term follow-ups, **blinding** of subjects and/or investigators, collection of **pilot data** and preliminary studies of the **reliability** and **validity of measurement instruments**.

There are numerous "standard" **research designs** that can be applied to educational research studies. Some of these may be very familiar to clinicians (e.g., the randomized, double-blind crossover design); others tend to be more specific to educational research (e.g. the nonequivalent dependent variables design). Each of these designs has known strengths and weaknesses, and generally coincides with a specific approach to data analysis. Often, researchers choose to employ hybrid methods, borrowing elements from several standard designs. In general, **prospective** and **randomized studies** are the more likely to produce valid results, while **retrospective** and **observational** studies are most likely to lack validity.

Among the first steps in designing a study is the definition of independent and dependent variables. In general, an **independent variable** is what the investigator manipulates and/or controls. For example, if a researcher designs a study to test the hypothesis that a case-based lecture format is superior to a didactic lecture format, the independent variable would be the type of lecture format. The independent variable in this case has two **levels**: case-based and didactic. The researcher is hypothesizing that the type of lecture format in which the student participates will cause some change in a **dependent variable -** in this example, most likely some test of knowledge administered after the lecture, to measure knowledge acquired during the lecture. In general, the dependent variable is an **outcome variable**, which the researcher believes is affected by the independent variable.

Most variables of interest in educational research are actually what methodologists call, "**constructs**". These are abstract variables that exist in the minds of investigators and which can (and often must) be measured in multiple ways, even within the context of a single study. In order to study variables like these, one must decide upon one or more **operational definitions** of the variable. So, for example, if the dependent variable in our study is "surgical technical skill" we may want to incorporate expert ratings of each subject's skills as well as objective measures of performance (e.g. speed, accuracy) on specific technical tasks.

Because educational research is generally concerned with constructs, it is essential that the instruments used to operationalize the variables of interest undergo a process of **validation.** This involves estimating various aspects of **reliability** and **validity.**

Generally speaking, a reliable test or measurement instrument should yield similar results across variations in specific:

- test items (internal consistency, alternate forms reliability),

- raters (interrater reliability) and/or
- occasions (test-retest reliability).

In general, a valid test or measurement instrument should:

- use methods that are perceived as appropriate by experts in a field (**face validity**),
- include appropriate content (**content validity**),
- correlate with other measures of the same construct measured contemporaneously (**concurrent validity**),
- correlate with contemporaneous measures of other constructs which are theoretically related (**criterion-related validity**) and/or
- correlate with future measures of other constructs that are theoretically related (**predictive validity**).

It is important to point out that other types of validity have been described and that there is wide variability among authors in the nomenclature and categorization of types of validity. For example, some authors may consider concurrent and criterion-related validity as subsets of a broader category called **construct validity**, while others have defined other types of validity, such as **convergent** and **divergent** validity. The essential point to understand, however, is that the validity of educational research depends in large part on the reliability and validity that can be achieved in the use of measurement techniques.

It is also important to point out that many of the variables of greatest interest to educational researchers are subjective by nature (e.g. interpersonal skills, student perceptions). Measurement of these variables must often rely on ratings or other forms of subjective assessments by experts, supervisors, peers or others, which may be assessing subjects in a study. In these instances, there are many other factors that must be considered with regard to their effects on the **accuracy** of measurement. Most commonly, it is important to consider biases by individual raters, which may result in **halo errors, leniency, severity, range restriction and/or central tendency**.

It is recommended that all educational researchers have some familiarity with **generalizability theory.** This theory provides a framework for conceptualizing and studying reliability and validity.

The internal validity of a study determines the extent to which one can have confidence in inferring a **causative** relationship between independent and dependent variables. Causal statements are only valid if derived from the results of studies designed to control for, or eliminate, the role of **confounding variables**. These are variables that can affect the dependent variable in a systematic way. A common situation occurs when researchers fail to use random assignment of subjects to groups. Returning to the previous example, if the researcher used the lecture format with students at one medical school campus and the case-based format at another campus, it may be quite possible that students in one group, on average, have a higher level of pre-lecture knowledge than those in the other group. When scores on the post-lecture test are compared across groups, there be no way to determine whether the observed differences are due to the superiority of one lecture format over the other, or to pre-existing differences among groups. In most cases, this type of problem can only be overcome through the use of true experimental designs, which utilize randomization, control groups and strict selection and exclusion criteria in subject selection.

Some types of research design can only be used to establish whether or not there is a **correlation** among variables (e.g. **observational studies, surveys**). In these types of studies, the researcher is not directly manipulating any independent variables, nor controlling for any confounding variables. Rather, he/she is simply measuring numerous variables, and using statistics to assess the likelihood that changes in one variable are related in some way to changes in another variable, or to develop a statistical model of the relationship among several variables. If statistical analyses suggest a significant **association** among variables, one can only conclude that the variables **co-vary** or correlate with each

other. The study design does not permit **causal statements**. In these situations, there is often a distinction between **predictor** and **criterion variables**. These are analogous to independent and dependent variables, respectively. The difference in nomenclature reflects the lack of experimental manipulation and control, and therefore the inability to attribute causality in these contexts.

Regardless of the type of research design used in a study, the goal of the research design is to establish a set of procedures for acquiring subjects and collecting and analyzing data, such that specific hypotheses can be tested and valid conclusions can be drawn relative to the original research question.

APPENDIX II: BASIC STATISTICAL CONCEPTS NEEDED FOR EDUCATIONAL RESEARCH

It must be stated at the outset that Statistics is a scientific discipline in and of itself. Without considerable expertise in statistical data analysis, it is foolish for a researcher to design a study without expert statistical consultation. The decision to employ a specific statistical test in a given situation involves numerous considerations and **assumptions,** which, unfortunately are often neglected even by experienced researchers.

Having said that, it is essential for a researcher to understand some basic concepts in statistics and probability and to appreciate the role of statistical data analysis in research. Within the context of research, statistics may be viewed primarily as a set of tools to aid researchers in exploring data, testing hypotheses, making decisions and drawing conclusions relative to their research questions. As one gains expertise in the application of statistics to research problems, a greater appreciation is gained for the utility of statistical theory and statistical thinking in providing a framework for the formulation, design and interpretation of research.

A central concept in statistics is the notion that **chance** influences every observation. This concept can be easily appreciated by simply flipping a coin a number of times. Because we know that a coin has two flat surfaces and that physical forces dictate that it has an equal chance of landing face up (heads) or face down (tails) when flipped, it is intuitive to assume that on half of the occasions that the coin is flipped, it will come up "heads"; on the remaining occasions, tails. However, no matter how many times you flip a coin, it is unlikely that you will get exactly the same number of heads as tails. While we "know" that there is a 50/50 chance of heads and tails in the long run (i.e., after an infinite number of coin flips), we also know that in any finite number of coin flips, we will probably not get exactly half heads and half tails. The more times we flip the coin (i.e., the larger the sample size), the more likely it is that we will get closer to a 50/50 split (i.e., the more likely to make an accurate observation and draw an accurate conclusion).

This little example illustrates what is meant by the role of chance. Mathematical statisticians have figured out the exact probability of getting any number of heads after any number of coin flips. This is possible by referring to what statisticians call a theoretical **probability distribution** (in this case, the **binomial distribution**). A common example of a probability distribution is the **Gaussian distribution** (a.k.a. the **normal or bell-shaped curve)**, which has applicability to a wide range of statistical inferences.

Obviously, researchers are not concerned with coin flips. But every time we make a comparison (e.g. comparing the mean score of the didactic lecture group to the mean score of the case-based lecture group), we must have some way of estimating how large a difference may be observed, just by chance alone. This estimate depends, in large part, on the sample size studied, but it also depends to some extent on decisions that the researcher makes and on the specific statistical analytic tool used (common examples include the **Student t-test, chi-square, Pearson product-moment correlation**). From a purely mathematical point of view, there is not much difference conceptually between research questions and those related to the flipping of coins. Fortunately, statisticians have derived probability distributions that can help researchers to quantify the role of chance in virtually any kind of observation, comparison or association we may choose to measure.

In research, statistical data analysis is generally used for one or more of the following purposes:

- to describe subjects, variables and observations in quantitative terms (**descriptive statistics**),
- to draw conclusions about the validity of the hypotheses tested in a study (**inferential statistics**),
- to estimate the likely range of observations that can be expected in a larger defined **population** based on data collected from a **representative sample** (**parameter estimation**) and/or
- to develop **mathematical models** to describe and predict relationships among multiple variables (**statistical modeling**).

Statistical computations are also used to estimate the **sample size** needed to achieve a given level of statistical **power** in a study. In other words, there are ways to estimate, before conducting a study, how many subjects to include in order to give yourself a reasonable chance of obtaining a significant result. In general, sample size estimation requires a prior estimate by the investigator of: the size of the difference or the magnitude of the association of interest in a study (i.e., the **effect size**), the variability expected in the variable(s) under study, and the desired probability of obtaining a significant result (i.e., power) assuming that an **effect** of some magnitude is present and not due to chance.

Descriptive statistics are employed in virtually every educational research study. A study that fails to describe its sample and its results in quantitative terms is open to interpretation by the reader and therefore less likely to be understood correctly and replicated. The specific descriptive statistics used in a study are determined in large part, by the **scale of measurement** used to quantify a variable. The scale of measurement of variables in a study also influences the choice of statistics used to test hypotheses, estimate population parameters and/or model the relationships among variables. Scales of measurement can be categorized as follows:

Nominal. This level of measurement refers to the process of labeling categories and/or the arbitrary assignment of numbers to categories. For example, researchers often report the number of males and females in a study. The variable in this instance is gender. For the purpose of most studies, gender is treated as a nominal variable with two levels, or categories (i.e., dichotomous). In describing the gender (or any other categorical variable) of a study sample, the number and percentage of subjects in each category will usually be presented. Nominal variables with more than two categories are referred to as polychotomous.

Ordinal. This level of measurement involves assignment of numbers to categories. The numbers are not assigned arbitrarily as is the case with nominal variables. Rather, the number assigned to observations reflects increasing or decreasing magnitudes on a variable of interest. However, there is no way to tell whether the size of the interval between consecutive values is equal among all intervals. For example, clinical performance of residents is often evaluated by ratings. The rating scale may have any number of points, such as a 1-5 scale as follows: 1 = poor, 2 = fair, 3 = average, 4 = above average, 5 = excellent. There is no way to determine if the difference in performance between a rating of 2 and a rating of 3 is comparable to that between 4 and 5, for example. In describing the ratings observed in a study, the number and percentage of subjects in each category of the ordinal variable is often reported. Other relevant statistics for description of ordinal variables include the **median** and **mode**. While not providing the level of **precision** and **statistical power** that can be achieved with interval scales, ordinal scales do allow quantification of variables for which precise measurement is not possible, and may permit application of powerful statistical analyses, even **parametric statistics** under certain conditions.

Interval. Interval scales of measurement are possible when a variable can be measured with such precision that the size of the interval between consecutive values is equal among all intervals. Height, weight and the number of seconds required to complete a technical task are examples of variables that can be measured on an interval scale. Description of observations on interval scale measurements is often accomplished with statistics such as the **mean, standard deviation and range**.

Ratio. This scale of measurement is essentially a special case of interval scale, which occurs when a value of zero is meaningful (e.g., number of days since graduation from medical school).

It should be noted that it is often unclear as to whether or not a particular measurement scale should be considered ordinal, interval or ratio. Such judgments may have important implications for the choice of statistics used to describe and analyze the data.

Obviously, research involves much more than description. Rather, it is usually aimed at understanding observations in such a way as to permit some degree of control and/or prediction of their occurrence. In order to do so, researchers need a standard set of tools and criteria for testing hypotheses and drawing conclusions.

Inferential statistics may be conceived as a set of tools for testing hypotheses. In order to apply inferential statistics, researchers must state hypotheses using the nomenclature of statistical **hypothesis testing**. Within this framework, the **null hypothesis** is the hypothesis which states that a statistical difference or association is essentially zero (i.e., most likely due to chance alone and therefore not significant). Hypotheses formulated by researchers are regarded as **alternative hypotheses** (i.e., alternatives to the null hypothesis). The goal, in most studies, is to collect data in accordance with a research design that will enable the researcher to **reject the null hypothesis**. In order to reject the null hypothesis, the statistical analysis must identify a **significant result** (i.e., a difference among groups or an association among variables that is likely to occur by chance in only a small minority of instances - usually 5% or less, thus the familiar $p<.05$ used in many studies to determine significance).

Having rejected a null hypothesis, a researcher may then conclude that the alternative hypothesis is plausible. If the study has sufficient internal validity, the researcher can then use the alternate hypotheses as a basis for explaining relationships between independent and dependent variables and for drawing conclusions relative to the original research question.

For example, in the study comparing lecture formats, the null hypothesis would state that the difference between the mean scores obtained by the two groups on the post-lecture knowledge test is essentially zero - no greater than would be expected by chance alone. The alternative hypothesis would state that either: a) the difference is greater than zero, but we are not sure which group will have the higher mean score (a.k.a., a non-directional or **two-tailed hypothesis**); b) one group (e.g. the case-based lecture group) will score higher on average than the other (a.k.a., a **one-sided or one-tailed hypothesis**), or; c) the average score for one group (e.g. case-based lecture group) will be some number of points higher than that of the other group (a.k.a., a one-sided hypothesis with a specified effect size). In general, it is desirable to test alternative hypotheses of the latter variety because the specification of an effect size permits a more accurate estimate of the required sample size. In this instance, if: a significant result were obtained indicating that the case-based lecture format resulted in higher test scores; a sufficient sample size had been used; and the design had sufficient internal validity, then the researcher may feel comfortable concluding that case-based lectures are superior to didactics and may use the existing literature and theories related to case-based instruction to explain why this is so.

Inferential statistics are generally used to determine the probability of observing differences between, and/or relationships among variables due to chance alone. For example, the Student t-test is often used to determine the probability that differences observed among group means in a study can be expected to arise simply due to chance. The Pearson product-moment correlation coefficient is used to describe the magnitude of the linear association among two variables; an associated t-statistic can then be used to estimate the probability that an association of that magnitude can occur simply by chance. Researchers usually consider such differences and associations to be statistically significant if the probability of observing such effects by chance alone is thought to be less than 5% (i.e., $p<.05$).

Determinations of the probability that observations are due to chance are based upon mathematical formulations of the **probability distribution** of **population parameters**. This is the technical way of saying that mathematicians can tell you how likely it is that you are making an error when you conclude that you have created some important difference among subjects after treating them differently in your study, or that you have discovered an important relationship among two or more variables that you have measured in your sample of subjects.

A **Type I Error** occurs when an investigator falsely concludes that a difference among groups, or a relationship among variables, is not due to chance. A **Type II Error** occurs when an investigator falsely concludes that a difference among groups, or a relationship among variables, is due to chance. Researchers are usually comfortable with a 5% chance of making a Type I error - thus the common use of $p<.05$ as the cutoff for statistical significance. With respect to Type II error, researchers tend to be less concerned because the only consequence is that one will falsely conclude that there was no difference among groups or no relationship among variables. We are therefore usually willing to live with a 10-20% chance of making a Type II error. The acceptable level of these types of errors should, ideally,

be decided upon when designing the study. This permits a more accurate estimate of the necessary sample size. The acceptable probability of Type I error is often referred to as **alpha**, i.e., many studies are conducted with alpha set at .05. The acceptable probability of Type II error is referred to as **beta**. The **power** of a statistical test represents the probability of uncovering a statistically significant effect, when in fact an observation is not due to chance. Power = 1 - beta. Therefore, in most studies, the desired power is between 80 - 90% (since beta is usually set between 10-20%). It should be noted that the power of a statistical test can be computed after the fact, and may in fact be different than what may have been estimated prior to the collection and/or analysis of the data.

Parameter estimation represents another function for statistical data analysis in research. It is often of interest to researchers to estimate the magnitude of a statistic in a defined population (i.e., a parameter). However, unless one is engaged in **population-based research** it is usually impossible, undesirable and/or unnecessary to actually take measurements from all members of a population. For example, one may have an interest in estimating the average IQ of surgeons in the United States. Obviously, it would be impossible to administer an IQ test to every single surgeon, nor would it be necessary. It would, however, be necessary to identify a representative sample of surgeons. This would require use of some sophisticated **sampling** techniques. Sampling is a field of statistics in and of itself, and a thorough discussion of the topic is way beyond the scope of this chapter. Researchers should be aware that there are specific techniques for addressing questions such as these.

Having computed a descriptive statistic of interest, based on data collected from a representative sample, parameter estimation requires computation of **confidence intervals**, which are estimates of the likely range of the population parameter. It should be pointed out that many research methodologists are currently calling for greater use of parameter estimation, rather than hypothesis testing, in fields such as education. Discussion of this issue is also beyond the scope of this chapter, however the ongoing debate can be expected to have an influence on the design of research and analysis of data in the future.

Lastly, some mention should also be made of statistical modeling since it is being used more and more in educational and other branches of research, largely as a result of the increasing availability of high speed computing. Statistical modeling generally employs a range of **multivariate statistics - multiple regression** and **factor analysis** probably being the most common, to describe and draw inferences about complex relationships among multiple variables. Once developed and validated, statistical models are often used to make predictions about future observations. For example, one may decide to use data from ten previous academic years to develop a model that predicts the scores of chief residents on the in-training examination (i.e., the criterion variable) based on in-training exam scores obtained during previous years, faculty evaluations of clinical knowledge during the chief year, and scores on mock oral exams (i.e., the predictor variables). The model is essentially an equation that will weight each predictor variable in such a way that the chief resident in-training exam score can be estimated with a margin of error of say, 10 percentile points. Once the model is developed and validated, it can be used with future residents to attempt to project who will do well and who will not.

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