AAMC

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GREAT Group Annual Meeting Breakout Sessions
Optimizing Biomedical Research Education and Training II
October 6-9, 2006

The theme of this year's GREAT meeting was "Redefining Research Training". In this portion of the program the attendees assembled into groups of ten to fifteen people to discuss one of five general issues related the session's title "Optimizing Biomedical Research Education and Training". Each of the ten groups had one discussion leader and one recorder. To guide the discussion each group leader was provided with a list of potential topics for the group to discuss. After the breakout session these four people met to compose a composite report on the topic. Listed below are the group charges followed by a summary of the discussions provided by the group discussion leaders and recorders.

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Topic 1. Biomedical PhD Curriculum – Core Content

Group A	Discussion Leader:	Jan Chlebowski
	Recorder:	Jane Harrison
Group F	Discussion Leader:	Victoria Freedman
	Recorder:	William Wessinger

Charge
The biomedical core curriculum provides graduate students with the essential background necessary for a successful training experience. This group will discuss the definition of a common knowledge set that all biomedical researchers should obtain during the core curricular coursework training period. In addition, the group will discuss the pros and cons of the various core curricular content models, each of which utilizes different training elements (course light vs. course heavy core curricula; breadth vs. depth of training; and traditional departmental curricula vs. integrated curricula), and how these models should best be applied to achieve this common knowledge set. Topics to discuss can include the following:

- Core curriculum light vs. heavy
- Breadth vs. depth in training
- Traditional departmental based vs. integrated programs
- What prerequisites should there be to take courses in these different types of programs?
- Is there a difference in curricular requirements between those wanting to investigate disease and those who do not?

- Which medical school courses are appropriate for graduate students?
- What curricular components can be developed to enhance diversity of the student body?

Summary

Questions addressed:

1. Does your curriculum have heavy or light core content? Is core content departmentally based or shared across departments?

2. Breadth vs. Depth: Is mastery of a subject matter less a factor? Is broader exposure more important?

3. Should disease investigations be part of the curriculum? Are parts of the MD curriculum beneficial to graduate training?

4. How could/should core content enhance diversity?

Answers:

1. Regardless of program structure, most programs have shared core content.
    a. *First year:* Heavier didactic content
        i. Biochemistry, cell and molecular biology, ethics
        ii. Core content split differently but in individual, stand alone courses (may be departmental or core curriculum)
        iii. 50/50 split between heavy and light didactic requirements
        iv. Innovative ways to address deficiencies
            1. Marshall: 2 semester communication skills
            2. Baylor: small groups for students identified as weak in critical thinking – expensive but successful (students obtained extramural funding)
    b. *Second year:* Programs have moved away from intensive didactic courses to less formal structures with clever mechanisms for developing skills and exposure simultaneously
        i. Literature-based courses
        ii. Presentations
        iii. Seminars in various formats
    c. *Qualifiers:* as related to core content
        i. Format more focused on some version of grant proposal for both written and oral exams
        ii. Shift to testing for problem solving skills, application development, and synthesis of information
        iii. Minority of programs retain written comprehensive on core and program content as synthetic exercise (e.g., Uniformed Services *Emerging Infectious Diseases*: microbiology/ preventive medicine/ pathology/ therapeutic interventions).

2. Breadth vs. Depth: Importance of broad exposure provided:
    a. Did not lengthen period of training
    b. Did not require additional resources
    c. Relevance of UK model
        i. Given differences in undergraduate training (heavier specific didactic content in UK model), graduate training not all that different: 4 years in UK vs. 5 years as average in U.S.
        ii. Focus on professional and personal competencies resonated with group and should be reviewed at program/institution level

3. Role of disease-based investigation
    a. Unless specifically designed component of MD curriculum to meet PhD needs (Mayo: immunology), MD curriculum not appropriate
    b. Importance of some knowledge of relevance/significance of research is developed in variety of ways, including self-discovery
        i. If missing from curriculum, may require Advisory Committee member with expertise (e.g. histology to interpret data)
        ii. Increasingly important in continuum of research, i.e., CTSA initiative
    c. Courses that provide relevant disease-based information in accessible model (team taught by basic scientist and clinician) are widely popular among graduate students

4. Diversity issues
    a. Fostering knowledge of diversity issues may be of value
        i. To heighten student awareness
        ii. As recruiting tool
        iii. For students engaged in clinically relevant research to develop experimental design
    b. Content on health disparities or genetic differences could be
        i. Part of course, included as examples
        ii. Separate course, as sign of particular interest/ welcome to minority students
    c. Health disparities content as opportunity to mix MD and PhD students

Regardless of program structure (departmentally based vs. integrated), most programs utilize some degree of common coursework (core curricula) in their training. The core curricula tend to be intensive in nature. In most programs it is restricted to the first year, although in some cases there is a course or two in the second year. In many programs, the core courses are restricted to the first semester of the first year. Because this common core material is taken in the first year, there is still time for required courses in year 2 and beyond without overly lengthening the duration of training.

The general trend among programs utilizing the core curricula approach is to emphasize breadth of training. A common view was that the first year of training provided intellectual tools to be applied in future training years toward acquiring additional depth of training. The depth in training comes from the laboratory experience and advanced course work.

Prerequisites to courses were viewed as outdated and unreliable due to the wide disparities among undergraduate courses. At lease one program (MUSC) offers a refresher course during the summer before the first semester called “Initiative for Maximizing Student Development (IMSD)”. Incoming students electing this option arrive at MUSC early, are placed on stipend, start laboratory rotations and participate in this intensive 4-week course that meets 5 days/week for 2.5 hr/day.

Among our group, utilizing medical school coursework for graduate students seemed uncommon, although departmentally based programs sometimes still use this approach.

Some knowledge content, such as disease-based knowledge, may need to be acquired through self-discovery. If needed for research experience, a member of the Advisory Committee may be able to provide special training. Disease-based knowledge is likely to become increasingly important in the continuum of research as exemplified by the CTSA initiative. Courses that provide disease-based information in an accessible model (i.e., team taught basic scientist and clinician topics or courses) are widely popular among graduate students.

The IMSD refresher course described above was originally targeted for minority students, but is now offered to all students. It is felt it still serves to encourage diversity among the student body.

Fostering knowledge about diversity issues may heighten student awareness, serve as a recruitment tool and benefit students engaged in clinically relevant research. Health disparities content could be offered as part of existing courses, or as a separate course. Such content may provide an opportunity for teaching MD and PhD students together.

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Topic 2. Biomedical PhD Curriculum – Structure, Style, and Sequence

Group B	Discussion Leader:	Gretchen Caughman
	Recorder:	Richard Bookman
Group G	Discussion Leader:	Rick McGee
	Recorder:	John Russell

Charge

Curricular elements can be organized and presented in a variety of different ways. This group will discuss how the core curricular content can best be taught, including: the values of rigidly structured vs. flexible curricula and didactic classes vs. small group sessions vs. independent learning; the program stages in which the different elements should be incorporated; the structure and integrity of examinations; the inclusion of curricular components to assist educationally disadvantaged students with the core curriculum; and the utilization of class diversity to enhance the graduate education experience. Topics to discuss can include the following:

- Structured vs. flexible curricula
- Formal vs. informal

- Amount of didactic vs. small group discussions in the curriculum e.g. journal club, seminars, and problem solving sessions
- Seminars
- Who should present in seminars?
- Should basic science, translational and clinical seminars be separate or integrated?
- When during training should courses and seminars be taken?
- How much course work should there be after the candidacy/qualifying examination?
- Examinations
- What should the structure of examinations be for courses and candidacy/general/qualifying examinations?
- What can be done to ensure the integrity of examinations?
- What can be done to assist educationally disadvantaged students?

Summary: Group G

The breadth and variety of programs and curricula in the group was so great that no consensus on a lot of details regarding curriculum was reached or seen as necessary. Broad principles were common, such as:

- minimizing lecture-based delivery of facts
- helping students learn how to find and evaluate information on their own
- incorporation of problem-solving and analytical reasoning exercises frequently
- completion of formal courses within a year or slightly more
- continuation of seminars and journal clubs throughout

The group chose to spend most of its time talking about "higher level" issues, such as how broad a base and how much raw knowledge students should learn vs. focusing on acquiring information as they need it during their research. Despite some preferences for doing away with any formal taught curriculum, it was agreed that for most U.S. students entering PhD programs there is a need for it. There was agreement on a definition of 'curriculum' as being "The language and organizing principles of a discipline" and clear recognition of the importance of students learning the languages of different disciplines to independent learning.

The other major agreement was on the importance of a curriculum teaching and modeling thinking/analytical reasoning within the context of science and research. There are many ways to do this and all programs do, some with more conscious design strategies than others.

There was enthusiasm in the group for coming up with better ways of sharing novel approaches to curriculum among GREAT members, without any attempt to define them as "best" practices since few if any curriculum elements are actually evaluated in any rigorous manner. This is one of the goals of the Poster Session but few people are doing it, probably for a variety of reasons. It was recommended that a simple form be developed with which GREAT members could briefly describe any new approaches to curriculum they were trying, and that these be compiled by the AAMC GREAT Group. The following few questions could be mounted on a Survey Monkey site and periodically compiled for distribution. A good time to do this could be in the months just before the annual GREAT meeting and it could serve to help trigger conversations among members to find out more about what each is doing. The questions could be:

1. Describe a new element or approach to your PhD curriculum that you have recently implemented or are planning to implement in the upcoming academic year. The description need not be exhaustive, just enough to help people decide if they would like to learn more about it from you.
2. Why are you making the change? What problem are you trying to solve or improvement initiate?
3. How much faculty time do you anticipate it will add to or decrease from your current curriculum?
4. Did it work? How did you assess the outcome/impact of the change (this need not be anything formal – just how did you figure out if you should continue doing it in the future)?

Summary: Group B

Structured vs. flexible: most have core components to their curricula and some have core components from which individualized curricula are built for each student.

All programs have their students participating in journal clubs and seminars in years 2+ onward. For some, these are requirements, for others, it more standard practice and is not a credit generating activity. There was a sense that as students individual interests develop, they should be able to attend seminar series that are of greatest interest to them, even if these are not part of the 'required' seminar.

Issues related to the core courses: it's hard to get faculty to teach as the course director typically has no authority. Faculty pleasure with the teaching may depend on what they get paid for it, particularly in those schools that are operating with mission based budgeting. Flexibility in core courses is desirable. Menu of choices can help so that students don't waste their time.

There was relatively little use of *non-traditional teaching methods,* although technology to bridge distance is increasing in use. Some schools that have web-based content for the MD program are now looking into extending that infrastructure over to the PhD programs.

On the requirement for *biostatistics,* the group was spread. Some do, others don't.

Many programs require the mentor (or department chair) to sign an MOU when they take a student indicating their acceptance of *financial responsibility* for the student.

On planning for next year (fall, 2007), many said they were considering shrinking their *incoming class size* due to financial concerns about supporting existing students whose mentors have lost grant support.

A variety of approaches to assist *educationally disadvantaged students* were discussed. These included: provision of peer tutoring services, paid by the Dean as is done for the MD students, pre-admission in January for lab rotations, acculturation, and some background course work. The NIH PREP grant worked well, while it lasted.

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Topic 3. Biomedical PhD Curriculum – Training Experiences

Group C	Discussion Leader:	C. Gita Bosch
	Recorder:	Nancy Street
Group H	Discussion Leader:	Rick Rest
	Recorder:	Susan Ross

Charge

There are a number of training elements outside of the core curriculum that have been identified as providing vital career development skills. This group will discuss learning experiences that may or may not be part of the required core curriculum, whether or not they should be required, and how and when they should be taught. The following are suggested training elements: laboratory rotations; research techniques; statistics; bioinformatics; grant writing; scientific writing and presentation skills; experience and training in teaching; industrial experiences; and activities to encourage minorities to choose scientific careers. In addition, the group will identify and discuss the barriers to implementing these different training experiences within the training program and how these barriers can be overcome. Topics to discuss can include the following:

- Should statistics and bioinformatics be part of the core curriculum or optional?
- Research Techniques
- Higher level courses related to research project
- How important are laboratory research rotations before choosing an advisor?
- How many?
- How long should they be?
- Grant writing and IRB preparation
- Scientific writing and presentation skills
- Industrial vs. academic experiences
- Experience and training in teaching
- How can students participate in activities to encourage minorities to choose biomedical research as a career?
- What activities can be designed that utilize diversity to enrich the educational experience?

Summary: Group C

Proposed Training Elements:

- *Should statistics and bioinformatics be part of the core curriculum or optional?*

Consensus was that this should be required. Some schools have formal courses (4 weeks) where they are exposed to the tools needed in these areas. One problem is many programs rely on a biostatistics department at their school to teach this course and the material used to teach is not relevant to the fields our students are studying. Suggest we call this **"***Data Analysis***"**. For statistics, need a course and it should be required. For bioinformatics, a workshop would be sufficient.

- *Research Techniques*

Do we need to teach them research techniques? Some schools have a 2 week crash course in techniques to provide a foundation of what techniques are available to answer research questions. Others put technology-related lectures in their core course; this is difficult as it is always not in context. Important for graduate students to be thinking of techniques and doing them; some programs integrate this into discussion of articles. Some programs use student journal clubs and then take turns discussing the paper. *Important* to convey to the students that it is their responsibility to learn what the data means when a machine spits it out. One school developed a techniques course that is lecture based that coordinates with a structured first lab rotation. Topics covered include PCR, cell culture, basic genetics, etc. Some schools offer short courses that are specifically focused on techniques that are open to students and staff, as well.
It was agreed that the more opportunities the students have to discuss and present, the better.

- *Higher level courses related to research projects*

Often referred to as "obligatory electives" and "selectives". Do all schools have these? It didn't appear that most require or expect students to take courses beyond their required courses; post-candidacy the expectation is that course work is done.

- *How important are laboratory research rotations before choosing an advisor?*
    - *How many?* 2 or 3, but 3 most common.
    - *How long they should they be?* A range-4 weeks, 4-6 weeks, 10-12 weeks.

Everyone should understand that the goal of these rotations is to understand the lab dynamics, not accomplish significant science.

Several different models were presented:

- At Sloan-Kettering, rotations are not concurrent with class work. They run 4 weeks and the goal is to get a flavor of the lab. Do rotations in August, January and June. At the end of May of first year, all class work is done.
- Other schools encourage students to come the summer before to get one rotation out of the way.
- Most programs run rotations concurrent with first year courses.

- *Grant writing and IRB preparation*

Suggest workshops and courses to explain what these skills are all about. One school pointed out that instead of exams, they have students write grant proposals to show mastery of material. This school ends the course with a peer review process so that they can learn the critique system.
Most programs use NIH grant proposals as the qualifying exam.
Each program must assess their population and determine the level of training needed.

- *Scientific writing and presentation skills (Communication skills)*

Some schools have developed a Communications Course. Teach students how to do PowerPoint, how to give a good presentation, and give feedback. Second half of the course students taught how to do scientific writing and also teach them how to do different types of talks: scientific, lay audience, etc.
It was agreed that everyone needs communication skills so this should be a component of every program.

- *Industrial vs. academic experiences*

This could be internships or, perhaps, have people come in and talk about industrial experiences. Unlikely that a program will allow students time away from the lab to do an industrial internship due to time away from the lab. Beyond the time issues, industry has many proprietary types of intellectual property. It was not felt that this was necessary although it might be useful as a hands-on exposure to a career option.

- *Experience and training in teaching*

Unlikely that you can require teaching in medical schools due to very limited opportunities. Can we provide opportunities for students who want to teach? If there are opportunities on your campus, some schools require at least one semester of TA, which is launched with a 2 day course on the basic didactics of teaching. Expectation is about 10 hours/week. Teaching occurs during 2nd year while funding is still provided by the university. Other schools use graduate students as tutors to new students. Another suggestion is allowing the students to go into the middle or high schools and teach. If a student wants teaching skills, graduate programs should work to provide any opportunities possible.

- *How can students participate in activities to encourage minorities to choose biomedical research as a career?*

Retention is as critical as matriculation. Some schools are instituting tutoring, offered to all students. Several programs offer pre-matriculation programs of one type or another; many commented that often the minorities turned down these offers. Everyone agreed that social structure and interactions were critical for minorities, as well as them seeing minority faculty. It was also suggested that minority student groups would be helpful.

Additional training elements:

- *Interpersonal/social skill development.*

For example, conflict resolution-can you tap into your HR department and have them teach conflict resolution?

- *What is unique about doing research in industry?*

What if your research funding is coming from industry? How would this impact your ability to publish? Is there any uniformity in RCR courses across the country?

- *Career development.*

Graduate students are training under academic mentors and many mentors think that is where their students should go. Many students are afraid to bring this up. Need to find a way to let students know what their options are when they graduate with their PhD degree. Several

mechanisms were discussed how to address this; many programs put the students in charge of this as they are the most invested in making a seminar series like this a success.

- *Business skills-*

You need business skills to run your lab because you have to run your lab. This will make the students better lab managers.

- *Teaching the students leadership skills and how to succeed.*

Teach them skills on how to lead people vs. managing people. Can we make our students better scientists, lab heads and mentors? You could address this by bringing in a business or top-level administrator or executive to speak for an hour on this topic.

How can these barriers be overcome:
Know that each individual mentor will not teach their students every skill-we can offer "courses" or we can train our mentors.

For a very significant percentage of the students, they pick up a lot of these skills along the way. Is there a subset that do not manage to pick up the skills and would formal training help them or is there a larger subset that is really **NOT** picking these skills up? Training in these "soft" areas does not have to be full courses or formal courses with credit associated; they could be yearly conferences or short hourly seminars.

Other ideas for overcoming barriers:
Utilize the Graduate Student Association. Currently they organize community and social events but we could also use this group as an engine to help develop a para-curriculum to deal with the training experiences listed above.

Graduate students are overwhelmed with the idea that they are not being trained in the skill sets they will need when they move on-will need to be trained in mentoring and management.

How do you get students to come to these training sessions? It is difficult because students are in the laboratory and they have many things that pull at them. Suggestion was to run clinics, workshops, seminars on these topics annually. Others suggested attendance be required, for example, this training must be completed prior to defending their dissertation; this also deals with the problem of mentors not wanting them out of labs. We have to continue to educate our mentors. This might also require pressure from the "top" that this is a priority and students should be allowed to attend. **Training grant students must be compelled to attend; for the other students, perhaps leave it to their discretion.** Some people leery of implementing new requirements; would rather see opportunities to learn these skills be available and then let the students decide.

Summary: Group H

General issues:

General barriers to implementing "extra" training programs

- Course load and lengthened time to degree
- Faculty to teach courses
- Cost of running specialized courses
- Making sure training is time-appropriate in the curriculum. i.e. some bioethics training should be later rather than earlier when it's more relevant to the student

General Solutions

- Spread training throughout career as grad student
- Use workshops rather than formal courses
- Have evening courses
- Integrate training into formal courses
- Bootcamps – at UCSF – students come in with very different backgrounds. For example, there's a dichotomy between biophysics and biochemists, biological students and the training they need to begin program. Bootcamps in math labs for biological students – do 2 weeks of training (Matlab, pimol). Chemists learn how to do SDS gels and more biological applications. Really helps to students. To accommodate, cut off two weeks off core courses – students like it
- Mayo – incoming students required to come early to get background stuff – paired biological and engineering students together

Specific training:

Bioethics

- Drexel Med – required, run as once a week evening course
- Other schools – part of core curriculum as separate course/mini-course
- Penn – on-line course for 1st year students, small group workshops with 10 – 12 students, 2 faculty moderators to do year-specific case studies
- UCSF grad programs do special courses – bioethicists come in to do this (clinical bioethicists come in to work with the basic scientists); this introduces both groups to different important issues
- Should it be integrated into science course – i.e. discuss research integrity in the context of regular course

Biostatistics

- Separate course vs. one integrated into curriculum
  - Penn has incorporated biostatistics into 2 core courses with grad program-specific small group sessions

    - Drexel runs it as evening course, once a week
- Is a full course necessary?
    - Introduce students to concepts, language via workshops
- Use of real examples than just "dry" statistical equations

Industry experiences

- Biotech in bay area – UCSF has problem in monitoring quality of experience – depends on the individual providing the experience – they dropped their Biotech NIH funded grad program. Up to faculty to arrange all this
- Universities with coop experiences need fully dedicated person who monitors these students
- Industry connections – how to do this without sending students to the company - have them talk to pharma but is this the same as a coop experience? Consensus was no. Grad student associations like doing this themselves
- Get faculty involved –i.e. Southwestern has many faculty who do start-ups, etc. who can address industry issues
- Company connections only work with universities near biotech – bigger hurdle for places in Midwest, but UCSF when it was working sent students to companies on the east coast
- Great goal but need a lot of infrastructure to make it work
- How to overcome confidentiality issues
- Time away from grad degree – can industry experience be integrated into thesis?

Training students to teach

- How to train people to be teachers from medical schools when not associated with undergraduate institutions
    - Consensus was that merely being a TA was not sufficient
    - Affiliate with small college (for postdocs, they pay for it)
    - Drexel – 10 to 20% of students do teaching. Students can take off for up to 6 months to do teaching experience
    - Southwestern – students/postdocs will be involved in charter high school teaching
- Bring in faculty who teach at small colleges to talk about what it's like
- Temple – grad students give 1 to 2 lectures in undergrad pharm
- Penn – students can teach in our postbac prep program or SUIP or TA undergraduates. University offers a teaching certificate for grad students – have to do workshop training and have someone observe you teaching a couple of classes. Currently paid for by Provost.
- NSF's program for postdocs to do teaching
    - Important for grad students to be trained in research – maybe teaching training should be done as postdoc
    - How to do the funding of this?
    - Emory has postdoc program that incorporates teaching element - IRADAC NSF-funded –mentor knows from very beginning so there isn't opposition

Grant writing, Scientific writing, Presentation skills

- Giving students opportunities to do different things- scientific communication and writing should be formal course

- Temple pharmacology have to write scientific paper in the context of a course – not a writing a course, is part of a regular course
- Drexel requires grant writing as part of all 4 core courses as well as a proposal for prelim
- Integrate communication into the courses/journal clubs – have coaches who help with preparation of journal club and have to keep presenting their own research
- Penn has some grad programs that teach mini-writing courses
- Not every dept. does this at some schools, but most places require this from all their students
- Teaching through osmosis doesn't always work – need formal criticism and feedback

Other courses, experiences

- Should all students take clinically relevant course i.e. pathophysiology or disease-based?
- Mayo offers problem solving courses to accomplish inter-disciplinary research – principals of BME - instead of just doing lectures have made it more problem-based – had to learn everything from clinical to practical applications to engineering even funding of project. Evaluation was mid-term presentation, progress report, assignments and final paper

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Topic 4. Training in Translational and Clinical Research

Group D	Discussion Leader:	Paul Insel
	Recorder:	Naomi Rosenberg
Group I	Discussion Leader:	Barbara Pence
	Recorder:	Wayne McCormack

Charge

There is an increasing need for PhD biomedical researchers with expertise in translational and clinical research. However, it is challenging to design training programs to prepare scientists with special skills in these areas. This group will discuss the goals of such training for both PhD and MD-PhD students, and the specific training elements they should receive to achieve these goals. Translational and clinical investigator employment opportunities and the roles in research teams for PhD researchers should also be addressed. Topics to discuss can include the following:

- Should medical school courses be part of the training?
- Is pathology required?
- Is some clinical experience necessary?
- What sort of clinical experiences?
- How much?
- Role of clinical research centers
- Can clinical research be a valid thesis research project?
- Medical problems specific to minority populations
- How can students be made aware of these areas for research?
- Methods to investigate these at the translational and clinical levels

Summary
A major theme in this session revolved around the need for groups working to develop programs in translational research was the need to share ideas. There was consensus that multiple approaches could be explored and knowing what seemed to work well as soon as possible would benefit everyone. The group also recognized that some approaches might work well because of local circumstances and may not be transportable. A second major theme was the idea that maximizing use of web-based tools and course materials would benefit everyone and help expedite development of course and other materials.

The groups also followed the discussion questions provided by the organizers.

Question 1. Should medical school courses be a part of the training?

General consensus was that there is considerable merit in medical school courses, but almost all participants felt that the medical school curriculum at most schools is not organized in a way that would allow graduate students to sample from the courses. The integrated, systems-based approach used, which may work well for medical students, is unlikely to fit well with a graduate school schedule.

One group did mention that they had surveyed all or most of their medical school curriculum and identified key lectures that would be useful to graduate students interested in translational training. Because these materials were available on the web, they could be provided to graduate students. Since many schools have extensive web-based course material, such an approach, although labor intensive up front, might be helpful at other schools.

A major concern raised by many regarding medical school courses was that they may not be really suitable for graduate students because they are not taught from the perspective of testing hypotheses.

The group generally agreed that one effective way to approach introduction of clinical material into the graduate curriculum is through the development of courses that focus on basic and clinical information on specific major diseases. An approach in which both basic scientists and clinicians teach together and integrate this material has worked well for graduate students at a number of institutions. Some of these courses also introduce trainees to patients or expose the students to some clinical material such a pathology specimens, etc.

Other ways in which such material might be introduced into the graduate curriculum that were discussed included:

- Attendance at Medical or Pediatrics Grand Rounds
- Developing some form of interaction (probably workshops, perhaps based on discussion of major disease problems) that would help clinicians and basic scientists master the vocabulary that is commonly used by each group and foster common understanding of the problems facing individuals working in each domain

Question 2: Should Pathology be required?

In keeping with the responses to question 1, the group agreed that using the standard medical school approach to pathology is probably not straightforward. In most schools, pathology is integrated into a systems-based curriculum. Many did see merit to individuals learning some pathology, especially as students reached a point in their training where the dissertation topic becomes crystallized. No consensus was reached on how this might best be accomplished. Web-based tools and information were considered to be one possibility.

Question 3: Should Clinical Experience be a Part?

The group, particularly the physicians, emphasized that interacting with patients leaves a much more lasting impression than attending lectures, reading the literature or even using state-of-the-art, web-based interactive programs. Thus, there was overall agreement that discovering effective and responsible ways of introducing graduate students to the clinical domain was important and valuable.

Some exposure to the clinical arena was also viewed as building the idea that translational studies need to involve team work, an idea that all felt needed to be infused into this type of training. In addition, clinical exposure was seen as an additional way to build a common vocabulary and enhance the mutual respect that is needed for effective partnerships between clinical and basic scientists.

No consensus was reached on the most effective ways to accomplish this goal, perhaps because there is not a single "correct" approach. Some of the basic scientists felt that doing a ward rotation, similar to those done by third and fourth year medical students would be valuable, but the majority of physicians in the group felt that too much time in ward rotations was spent doing activities that would not really benefit a graduate student and did not support this approach.

One popular idea was to expose graduate students by having them spend several afternoons/mornings doing rounds or attending an outpatient clinic. Some felt that rounding in a hospital setting where patients are more apt to be severely ill was less useful and the outpatient setting would allow more direct interaction. Others felt that the hospital setting, especially if rounding was accompanied by in depth discussion following the patient visit, would be more useful.

A number of other possible ways in which graduate students could be exposed to the clinical arena were discussed and felt to have merit. The group recognized that some of these ideas might work better in particular settings. Among these were:

- Use of medical simulation to obtain hands-on experience with procedures
- Use of standardized patients
- Development of course material to introduce the basics of clinical research

- Exposure to Clinical Research Centers

Question 4: How can material addressing Health Disparities be presented?

General consensus was that making students and faculty more aware of health disparities and health issues facing particular groups was very important. One participant noted that his institution has a course for graduate students focused on this topic. The course features presentations by basic scientists and clinicians on diseases that are particularly prevalent among certain groups or ethnicities. This course is modeled on the pathobiology course discussed in response to Question 1 above, but has a narrower scope. Many thought that this approach was a good idea.

The group recognized that some institutions would be better positioned to have resources and populations nearby that would make it easier to provide direct exposure to health disparity issues. Partnering among institutions and the use of web-based resources for materials relating to health disparities was felt to be a second productive avenue.

Question 5: Is a clinical research project appropriate for a basic science Ph.D.?

The group readily agreed that a clinical research project could be an appropriate topic for a basic science Ph.D. However, the discussion also revealed that there was no consensus on what appropriate topics might be. One example of an imaging-based thesis focused on a neurological degenerative condition was given, but most institutions had not really confronted this issue. The broad spectrum of responses indicated that people have varying definitions of what "clinical research" and "patient-related" research actually are. For some, especially basic scientists, these terms relate to wet lab research on topics that are seen as having translational potential or perhaps involving the use of patient samples. For others, these terms indicate a spectrum of research that involves clinical trials, outcomes assessments, and very limited or perhaps no wet lab experience. Despite these points, most agreed that assessment of suitability would require examining each case and that decisions should be made locally, by the student's program.

Question 6: Should training in Clinical and Translational Research be a new training program? Is it for everyone?

The group discussed this issue at some length even though it was not one of the questions suggested by the organizers. Overall the group felt that mandating this type of training was not a good idea. However, some training should be available to all interested students. This exposure might involve a course modeled after the Pathobiology course discussed above or some other limited activities.

The group also felt that a new program or track that provided more in depth training for a subset of students who were particularly motivated to do translational and clinical research was very important. A major challenge will be to develop such a program that leads to training

researchers who can work as part of teams that attack disease problems. No one was completely sure what should be involved in such a training program and the need to exchange ideas and keep people informed about approaches being tested at different institutions was emphasized.

A second point that is important to consider is how a clinical and translational track or program might differ from programs that are already in place. The classical basic science-focused Ph.D. training approach is not a good fit. Although there are a number of programs that offer Clinical Research degrees, these may not be an ideal approach either. Many/most of these programs focus on research that involves limited exposure to basic science with limited participation by basic scientists. In addition, they are often tailored for individuals who already have an advanced health sciences degree.

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Topic 5. Training the Trainers

Group E	Discussion Leader:	Alan Kaplan
	Recorder:	Clayton Wiley
Group J	Discussion Leader:	Allen Rawitch
	Recorder:	Nancy Schwartz

Charge

Participants in this group will explore the fundamental skills of educators involved in graduate education, and how these teachers and mentors can receive appropriate training and experience. Specific questions to discuss include: What training and experience should be required before becoming the advisor for PhD and MD/PhD students? When and how should these individuals obtain this training? How can trainers be taught to enhance and utilize diversity in a graduate program? How can student mentoring by junior by senior faculty be encouraged and rewarded? This group will also address the implementation of these training experiences within the graduate curriculum and throughout faculty development. Topics to discuss can include the following:

- What skills and training should the trainers have?
- How much training experience should a faculty member have before assuming primary responsibility:
    - as an advisor for:
        - PhD students?
        - MD/PhD students?
    - For developing graduate courses?
    - For lecturing to graduate students?
- Should this training start at the graduate and/or postdoc level?
- Should teaching experience be a requirement for students in a PhD programs?
- Mentoring of junior faculty by senior faculty:
    - How should this be done?
    - What rewards should there be for doing this?
- How can trainers be taught to enhance and utilize diversity in a graduate program?

Summary

- Institutions should have a plan for early support and mentoring of junior faculty that includes assigning a senior mentor to each new faculty member.
- Training to be mentors should begin at the graduate student and post-doctoral levels.
- Institutions should provide opportunities for faculty development in teaching and communication skills.
- Mentors should make students aware of a diversity of career options and support the students' chosen career tracks.