Renal and iliac artery stenting by interventional cardiologists and vascular surgeons: The Foundation for Advanced Medical Education (FAME) initiative.

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The American College of Cardiology, in concert with the Society for Coronary Angiography and Interventions and the Society for Vascular Surgery, planned and implemented an initiative to teach stenting of renal and iliac arteries to their peers in practice. Supported by the Foundation to Advance Medical Education (FAME), the initiative involved 25 preceptees and 6 preceptors and included a didactic portion (a remote learning exercise), an animal practicum, a procedural simulation, and a preceptor/preceptee training segment, all of which was followed by evaluations by the participants.

Assessments of the success of the initiative differed between preceptees, who were positive about the experience, and preceptors, who were more critical of the endeavor (with surgeons more critical than cardiologists). Technical problems, such as obtaining temporary licensure to practice medicine in another state, interfered with the hands-on experiences of several preceptees.

Programs such as the FAME initiative will grow in importance as new technologies continue to be introduced into medical practice and the need to train physicians in practice in their use expands. (Am Heart J 2005;149:883-7.)

Cardiovascular practice continues to evolve rapidly as new approaches and new technology are explored, developed, and incorporated. Cardiologists, particularly interventional cardiologists, are expected to practice in the most effective manner by developing, disseminating, and acquiring new knowledge and new skills. Optimizing the adoption of innovations has been plagued by confounding findings about the effectiveness of traditional continuing medical education (CME) as a means to change. Several studies have addressed the shortcomings of CME programs, have proposed changes to eliminate the failures, and have considered the learning modes of physicians.[1-6] In describing the processes by which professionals adopt innovations in practice, Rogers[7] provided several characteristics of an innovation that can affect its rate of adoption:

- the complexity of the innovation—the more complex the innovation, the slower its adoption;
- an opportunity to observe the innovation—in some cases, seeing an innovation is an important prelude to its adoption in professional practice;
- compatibility of the innovation with existing practices—the extent to which it uses existing ways of performing one's profession;
- the initial application—the extent to which one must try a new procedure or other innovation in a safe setting before applying it in routine practice;
- the relative advantage—the extent to which the innovation is better than current practices.

As the most effective programs are those that combine educational activities and interventions with measurements,[8] educational programs to introduce practicing cardiologists to innovations should incorporate sophisticated opportunities for learners to simulate the new procedure and gather useful feedback as to their performance. Without attention to these issues, CME aimed at fostering the adoption of innovative practices will likely fail.

We undertook an initiative to provide practicing physicians with the expertise to expand their knowledge and their practice into new areas. Adhering to the criteria of Rogers,[7] we designed an educational program, carried it out, and assessed its effectiveness.

Background of the FAME initiative

Together with the Society for Coronary Angiography and Interventions and the Society for Vascular Surgery, the American College of Cardiology secured funding

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from a private foundation (FAME) to test the feasibility and overall acceptance of educational methods and procedures among cardiologists and vascular surgeons. A pilot project was designed to train interventional cardiologists and vascular surgeons in renal and iliac artery stenting.

A steering committee of cardiologists and vascular surgeons representing the American College of Cardiology, the Society for Coronary Angiography and Interventions, and the Society for Vascular Surgery was formed and given the tasks of designing the FAME initiative, establishing criteria for participation, selecting participants, carrying out the program, and assessing the results of the project. The components of the project included a didactic program, an animal practicum, a simulator experience, and a preceptor/preceptee training program. The hypothesis was that such a program would equip 2 different experienced groups of physicians—both invasive cardiologists and vascular surgeons—with the skills they would need to expand their practice into a new arena of interventional procedures.

Selection of participants

Eligibility criteria for surgical and cardiology preceptees were defined by the steering committee and included the following: (1) they should not regularly perform peripheral vascular procedures as part of their practice; (2) surgeons should be certified in the American Board of Surgery Added Qualifications Examination for Vascular Surgery whereas cardiologists should be certified in the American Board of Internal Medicine Added Qualifications Examination for Interventional Cardiology; (3) preceptees should have 4 or more years in practice and be willing and able to participate in both the training and the tracking of clinical outcome; and (4) they should have a commitment to training others after completing the program.

The institutions from which the preceptees came were also required to meet certain criteria. Cardiology preceptees' institutions had to (1) have an interventional cardiology training program and/or be committed to a continuing training process, (2) be committed to a vascular program and to quality assurance, and (3) be willing to permit preceptees to enter the peripheral arena after successful completion of the renal and iliac training. The surgical preceptees' institutions were required to be characterized by (1) a commitment to continuing training processes, (2) a commitment to a vascular program and quality assurance, and (3) a willingness to grant the preceptees entrance into the peripheral arena after successfully completing the training program.

Qualifications for the cardiology preceptors emphasized their expertise in iliac and renal disease; they included (1) primary professional activities in patient care and/or training, (2) affiliation with a major cardiovascular/surgical center and being considered leaders in the field with outstanding expertise in renal and/or iliac artery stenting, and (3) a willingness to commit time to the program and actively participate in it. Guidelines for the selection of vascular surgical preceptors were very similar: (1) primary professional activities in patient care and/or training, (2) being leaders in their field with outstanding expertise in renal and/or iliac artery stenting, and (3) being willing to commit time to actively participate in the program.

After establishing the criteria, the FAME steering committee solicited nominations from the sponsoring organizations and then screened all potential preceptees and preceptors. The participants were ultimately chosen by consensus of the steering committee.

Components of the FAME initiative

Didactic program. The didactic program comprised a series of cases and written educational materials, which were developed and distributed in CD-ROM format. This part of the curriculum had several parts: (1) pathophysiology and natural history of the vascular beds to be treated, (2) introduction of alternative approaches (eg, medical therapy or surgical revascularization), (3) anatomic details of the vascular beds, (4) description of the technical equipment used to perform the procedure, (5) instruction about adjunctive therapy, (6) strategies to prevent or treat complications, and (7) knowledge about longer-term outcome and follow-up of patients. This information was to be mastered before the next step in training.

Animal practicum. The animal practicum was designed and overseen by the steering committee to ensure that participants had hands-on experience with the equipment used for vascular access and procedural performance. The equipment was obtained from multiple vendors so physicians could observe different design features. Surgeons and interventional cardiologists were mixed together in 2 groups for this segment of the project. All participants were exposed to a large animal model (porcine) so that they could practice procedural details, such as vascular access and placement of devices in the vascular beds, as well as experience complications of the procedure. Each animal laboratory practicum was performed according to the guidelines of Institutional Animal Care and Use Committees and with expert preceptors in attendance, with a preceptor/preceptee ratio of 1 to 3. Both renal and iliac procedures were performed in this model.

Simulator. Based on studies that have shown that simulation-based education is an effective method of teaching physicians,[9,10] the simulation portion of the project aimed to introduce the preceptees to each procedure and allow them to encounter and "troubleshoot" major complications. The steering committee selected Medical Simulation of Colorado as the vendor, and the company provided a SimSuite training

unit, which closely resembled a catheterization laboratory. Two renal and iliac artery stenting cases were developed and each included preprocedural information, a real-time simulated procedure, and a postprocedural assessment. The preprocedure section provided a simulated patient profile with presenting illness, laboratory results, and graphics specific for the case. This information was incorporated into the procedure and was used to affect the outcome of the case. The simulator provided a hands-on, catheter-based procedure with a simulated patient connected in real time to a hemodynamic monitor. A concentric catheter set was available for diagnostic and interventional procedures using simulated live fluoroscopy and cine recording. Gantry positioning was simulated for optimal view selection. Medications could be administered as needed for case-related events and complications. The environment simulated as much as possible the real-life case environment.

Preceptor/preceptee training. After completion of the didactic portion, the animal practicum, and the simulator experience, preceptees arranged a time to work with their preceptor for 2 to 3 days, observing and helping with renal and iliac procedures and discussing case management, adjunctive therapy, and alternative therapies. Finally, the preceptor came to the preceptee's medical institution to observe and, in selected cases, participate in renal and iliac procedures performed by the preceptee.

Assessment posttraining. The final module of the pilot project included assessments of the components of the training program by both the preceptors and the preceptees. One evaluation addressed the overall program, the didactic portion, the animal practicum, and the simulation and was filled out immediately upon completion of the simulation. A separate evaluation of the preceptor/preceptee training program was completed after this part of the FAME initiative ended.

Results of the FAME initiative

The questionnaire completed by the 6 preceptors (3 cardiologists and 3 surgeons) was essentially the same as that used by the 25 preceptees. Each group had 1 or 2 questions not asked of the other, however, and the wording of several questions was changed to make them more appropriate to the respondent group. All 6 preceptors and 22 of the 25 preceptees returned the first questionnaire evaluating the overall program and its components except the preceptor/preceptee training.

Preceptors' evaluations

Satisfaction with the program overall was split among the 6 preceptors. Four of them rated their overall satisfaction at ≥ 6 on a 9-point scale, whereas 2 (both surgeons) rated it at ≤ 3. The same 2 surgeons felt that the program failed to meet its objective, failed to meet their expectations, and did not provide a balanced and objective view of the topic. One of these two respondents said that the program contained commercial bias.

The preceptors were generally satisfied with the time allowed for the various components of the program, although half of them wanted more time for lectures. Half thought the CD-ROM was useful and half did not; there was no discernible pattern to the responses to this question by medical subspecialty.

Opinions on the value of the animal practicum and the simulation were also strongly split. Three of the preceptors felt that the animal laboratory was more valuable, 1 that the simulation was more valuable, 1 that they were equally valuable, and 1 that neither was valuable. Two (both surgeons) wanted less time for simulations and 2 wanted less time devoted to viewing industry exhibits. The majority (4 of 6) preferred to have the simulation experience before the animal laboratory. No preceptor wanted the animal practicum to come first.

Opinions about the performance level and skills of preceptees during the animal practicum and simulation were quite varied. The skills of cardiologists were uniformly rated higher than those of surgeons. This theme ran through a number of comments made in response to open-ended questions, including suggestions for programmatic changes in the future. Several suggestions were made to improve the animal laboratory experience, the simulation, and the program overall. These included separating the cardiologists and the surgeons and adding a section on basic catheter skills for surgeons. Preceptors felt that the simulations needed to be more realistic.

Preceptees' evaluations

Overall satisfaction with the FAME initiative was widespread among the preceptees, with the 13 cardiologist respondents rating it slightly higher than the 9 surgeons. With the exception of one cardiologist, all preceptees felt that the animal laboratory was more valuable than or equally valuable to the simulation. No preceptees would change the program by having the animal laboratory before the simulation, although many had no preference. When asked which elements of the program they would prefer to have devoted more or less time to, differences by specialty became more evident: cardiologists rated lectures highest (2.6 on a scale of 3) and the animal laboratory lower (2.3), whereas surgeons rated lectures lowest (1.9) and the animal laboratory highest (2.6). Of the 20 preceptees who responded to the question, 19 intended to make changes to their practice because of attending the FAME program.

Comparison of preceptors' and preceptees' evaluations of the overall program

The preceptees did not differ significantly from the preceptors on any responses to closed-ended (ie,

Table I. Preceptee/preceptor training evaluations (scale of 1 [poor] to 9 [good])

Ratings	Responses	
	Preceptors (n = 9)	**Preceptees (n = 14)**
Visit to other's institution	7.7	8.3
Other's visit to your institution	8.5	8.5
Preceptorship approach to learning	7.3	8.6
Preceptee's ability to perform renal and iliac stenting after training	7.3	8.0

numerical) rating items. Approximately equal percentages of each group (25% of preceptees and 33% of preceptors) said that the animal laboratory did not need to be changed. Suggestions for improvements from the remaining preceptees and preceptors differed only slightly. One third of preceptees who suggested changes wanted to devote more time to the program; this response was not given by any of the preceptors. In general, preceptors favored "process" changes (eg, define formal objectives for each laboratory), whereas preceptees favored content changes (eg, management of complications).

Both preceptors (50%) and preceptees (71%) noted that the simulation needed further technical development to be more realistic. Some preceptees (15%) said that they would like more time spent on the simulation, a comment not made by any preceptor.

Preceptees rated the CD-ROM as more valuable than did the preceptors. Fully 86% of the former group said the CD-ROM was useful, or made positive comments about it, whereas this was true of only 50% of the preceptors. Caution should be used in interpreting this latter finding as the numbers of preceptors was small and the percentages could change significantly with a shift in the response of one of them. All preceptors would be willing to participate in such a program again in the future.

Evaluations of preceptor/preceptee training

The preceptor/preceptee training took place between July 2001 and May 2003. Preceptees observed an average of 5 (range, 2-20) procedures over an average of 9 hours at their preceptors' institutions. At their own institutions, preceptees performed an average of 4 (range, 1-11) stenting procedures over an average of 8 hours with their preceptors observing and/or assisting. In addition to renal and iliac stenting procedures, preceptees observed and performed carotid, subclavian, femoral, and infrainguinal procedures.

Table I summarizes the evaluations of both preceptors and preceptees for this aspect of the FAME program; 9 preceptors (3 additional preceptors were engaged to work on the one-on-one training) and 14 preceptees filled out evaluations. The lowest evaluations from both groups involved individuals who encountered problems in obtaining temporary medical licenses to assist with procedures in another state.

Asked their plans regarding peripheral stenting, 11 of the 13 responding preceptees said that they would continue to do renal and iliac angiography and stenting, 1 would do only renal procedures, and 1 would seek further formal training at his institution. All 12 respondents to the question about whether the FAME program should continue answered affirmatively.

Strategies for the future

Several important lessons have been learned from this project, and they have substantial implications for subsequent training endeavors. (1) It is difficult to simultaneously train physicians with markedly different skill sets and different cognitive processes.[11] Grouping surgeons who are not experienced in percutaneous vascular access but have a great knowledge about regional anatomy with cardiologists who are characterized by extensive experience in percutaneous access but limited knowledge about regional anatomy may be inefficient. Although the cross-fertilization of simultaneous exposure of these groups to each other has advantages, it may be cumbersome and inefficient in a learning environment. (2) It is important to allow the preceptees access to equipment from a variety of vendors and to minimize the potential for commercial bias. Preceptees felt that the FAME initiative was balanced and free of commercial bias although not all preceptors agreed. (3) Satisfaction with specific components of the training program was variable. The majority thought that the amount of time allocated was satisfactory, but many were desirous of a longer period of training. The hands-on animal laboratory practicum was rated more highly than the simulation, although most preceptees found both valuable and indicated the need for expanded simulator platforms. The didactic CD portion was felt by 86% to be an essential component and very valuable. (4) The preceptor/preceptee program was more difficult to evaluate because its success depended in part on the personalities involved and their specific interactions.

Logistics remain a problem: how many procedures are needed, how can procedures be "batched" to be efficient, how can temporary license issues be addressed if the individuals are from different institutions or different states, and how can the preceptors be compensated adequately?

A final issue relates to assessment and outcome of training. Each preceptee's institution, by contract, committed to allowing the preceptee to participate in procedures involved in the training process, provided that local experience and training were satisfactory. No mention was made of certification, which is a local

process. Whether these training programs will ever be the basis for certification is uncertain.

Training physicians already in practice in the performance of new procedures is complex and involves multiple issues such as design of curriculum, need for simulator technology or an animal practicum, as well as the nature and structure of the preceptee/preceptor interaction. In addition, the transition from the training environment to primary practice responsibility as well as certification require continued development and evaluation.

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