The Society of Thoracic Surgeons/American Association for Thoracic Surgery Off-Pump Training Program

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Background. **Opportunities to acquire knowledge and skills in new technology are limited for cardiothoracic surgeons after completion of residency. In 2000 The Society of Thoracic Surgeons/American Association for Thoracic Surgery Joint Committee for New Technology Assessment accepted an educational grant from the Foundation for Advanced Medical Education to implement and test an instructional program for practicing cardiothoracic surgeons in off-pump coronary bypass surgery.**

Methods. **Twenty-four surgeons were selected for participation. Instruction was provided in three phases: (1) a preliminary video illustrating the techniques; (2) 2-day training sessions at two separate locations linked by videoconference; and (3) visits by trainees to observe preceptor surgeons at their institutions, followed by visits of preceptor surgeons to the institutions of the trainees. Evaluation of the program was made by review of trainee case lists in the year after completion of the program and by written surveys completed by trainees and preceptors.**

Results. **Seventeen surgeons completed all phases of the program. Most of them reported frequently utilizing off-pump bypass surgery in practice with good results. Two surgeons dropped out of the program before the first phase, and 5 surgeons did not complete all preceptor visits. Most survey respondents commented that the program met or exceeded their expectations.**

Conclusions. **Some trainees were unable to complete proctor visits because of professional responsibilities at home or because of difficulty in advanced scheduling of procedures. More rigorous selection and stronger administrative controls might have reduced program dropouts. The instructional model worked extremely well for properly selected and motivated surgeons.**

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New operations in thoracic surgery and the technology to support them are diverse, rapidly changing, and often complex. This creates educational problems both for residents in training and for surgeons already in practice. Unfortunately, the surgeons in particular are disadvantaged, because opportunities for learning new procedures are limited in number, vary widely in quality, and usually provide little hands-on experience. Instruction in the use of new devices by their manufacturers tends to be focused on a single line of products that can limit the applicability of the technology. Despite these deficiencies, many community hospitals grant operative privileges to surgeons on the basis of limited instructional experience. In some instances this has resulted in quality of care concerns for both hospitals and surgeons.

The American Medical Foundation for Peer Review and Education, which investigates quality of care issues, recognized the need for education of practicing surgeons in new technology, and proposed, through its subsidiary the Foundation for Advanced Medical Education (FAME), an instructional template based on known effective teaching methods. The FAME group developed a template for advanced surgical training that consisted of a three-step process: (1) a didactic portion including interactive compact disks and videos; (2) a laboratory hands-on experience with simulations or animals, or both, and also with cadavers; and (3) a proctoring process. This proctoring process was divided into two portions: (1) a visit by the trainee to the proctor's hospital to observe procedures there, and (2) a visit by the proctor to the trainee's hospital to observe the trainee's technique in their own hospital environment.

The FAME group was awarded a grant of $2 million by the Philadelphia Health Care Trust to develop and test this template, and in turn they selected five prominent specialty societies to carry out the project. These included the American College of Surgeons, the American College of Cardiology including the Society for Cardiovascular Angiography and Intervention, the Society for Vascular Surgery, The Society of Thoracic Surgeons, and the American Association for Thoracic Surgery. Each spe-

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cialty group was to select a procedure or new technology for testing of the educational template.

In 2000 The Society of Thoracic Surgeons (STS)/American Association for Thoracic Surgery (AATS) Joint Committee for New Technology Assessment (now named the STS/AATS Joint Workforce on New Technology) accepted funding from the FAME group and proceeded to develop an instructional program for practicing surgeons in off-pump coronary bypass operations using the template. The specific goals of the committee were to better understand the feasibility and costs and assess the applicability and value of a preceptor-based educational model. The STS/AATS off-pump bypass training program began in June 2001 and ended in June 2004. Its rationale, methods, results, and evaluation are the subject of this report.

Material and Methods

The Committee selected off-pump coronary artery bypass surgery for instruction in the application of new technology for several reasons. When the project was planned it seemed likely that the procedure would be widely and increasingly applied despite controversy about its ultimate indications. There was good evidence that the technique was of benefit in certain subsets of patients. The procedure required expertise but not major resource investment, indicating that it could be applied in many institutions including community hospitals. New devices to be used in off-pump operations were available from many manufacturers, and the flexibility to choose the most appropriate would be retained by the surgeons and not dictated by a single manufacturer.

Surgeons who were experienced in the performance of off-pump bypass operations were selected as faculty by the committee. Administrative activities for the FAME grant were initially conducted by The STS business office and were transferred to The STS Office of Research when that unit was established. Dr Bruce Lytle, as Chairman of the STS/AATS Joint Committee on New Technology Assessment, was the principal investigator for the FAME grant. Trainee applications were solicited by advertisements in *The Journal of Thoracic and Cardiovascular Surgery* and *The Annals of Thoracic Surgery* together with a simultaneously published editorial in both journals [1, 2], along with announcements in The STS News and on the Cardiothoracic Surgery Network website (www.ctsnet.org), and letters to the Thoracic Surgery Directors Association. The committee selected the participants after a review of submitted applications. Trainees were required to have finished a thoracic surgical residency and possess current hospital privileges for coronary bypass surgery, but were also required to have had little or no experience or training in off-pump bypass surgery. Those selected for the program represented a geographically diverse group of surgeons from a variety of hospitals including academic medical centers, Veterans Affairs or government hospitals, and community hospitals. Most of these surgeons were between 3 and 8 years out of residency and all were engaged in either solo or small group practice. Twenty-four surgeons were selected for participation in the program, but two withdrew shortly before the training began. The twenty-two participating surgeons received a scholarship stipend of $2,250 each and subsequent reimbursement for travel and maintenance expenses

The program was designed to provide trainees with a combination of didactic and hands-on learning followed by the observation of and by a preceptor who has had much experience with the procedure. Liability concerns precluded hand-on activity by preceptors and trainees on reciprocal visits to their respective institutions. The didactic session faculty received a $5,000 honorarium, and preceptors received a $1,000 honorarium for each student visit (with a limit of two), and $5,000 for each visit made in addition to travel and maintenance expenses. An assessment of post-training outcomes was made through maintenance of case logs by the trainees for the year after completion of the training program and review of these documents by the committee.

The educational experience was presented in three phases. Phase 1 consisted of the review of a specially prepared instructional video. Phase 2 consisted of simultaneous classroom and laboratory sessions at two sites (ie, the Cleveland Clinic in Cleveland, Ohio, under the direction of Dr Lytle and the Cardiopulmonary Research Science and Technology Institute in Dallas, Texas, under the direction of Dr Michael Mack). Experienced off-pump surgeons lectured and demonstrated techniques, and videoconferencing linked both sites so that presentations and discussions were shared by both groups. The 2-day training sessions also included a cadaver lab, and all trainees performed off-pump operations on pigs. Animals utilized in training were treated in accordance with the 1996 "Guide for the Care and Use of Laboratory Animals" as recommended by the United States National Institutes of Health. Phase 3 of the program was planned as a 2-day to 3-day visit by each trainee to the institution of the previously selected preceptor surgeon, who was experienced in off-pump operations. During a 2-day to 3-day period in the preceptor surgeon's institution, the trainee was able to observe multiple off-pump procedures in the operating room and discuss the technical details demonstrated with the preceptor. Subsequent to this visit, a proctoring session was planned in which the preceptor visited the trainee at the trainee's institution and observed and commented on the off-pump operations performed by the trainee.

Program evaluation was conducted by several methods. Trainees were requested to submit case lists, suitably blinded to patient identity, and vital outcomes for all off-pump procedures performed during the first year after completion of the program. In addition, written evaluation surveys were distributed to all trainees and preceptors.

Results

All phases of the program were completed by 17 of the 22 trainees (77%). Among these surgeons, one retired from

practice shortly after completing the program and two reported that they subsequently chose not to perform off-pump coronary bypass operations. The remaining 14 surgeons reported that in the year after completion of training, off-pump operations comprised an average of 26% of their coronary bypass caseloads (range, 1% to 80%; median, 19%). The reported mortality rate for off-pump operations was 0% for 10 surgeons and 3% and 2%, respectively, for 2 of the surgeons. Two surgeons failed to submit mortality data. Five surgeons did not complete all phases of the program. Two surgeons who completed phases 1 and 2 of the program made but did not receive preceptor visits, citing scheduling problems at their sites for the reason. One of these surgeons reported an 11% off-pump caseload with a 5% mortality rate and the other failed to submit a case log. Three surgeons completed phases 1and 2, but did not continue to participate in the preceptor sessions. When subsequently queried, 2 surgeons indicated that they did not believe there was a need for further visits, and none submitted case logs of their subsequent experiences.

Trainees were asked to complete a written evaluation of the program. All 10 respondents indicated that the didactic sessions of phases 1 and 2 met or exceeded their expectations, and the 7 who experienced preceptor visits indicated that these met or exceeded expectations. Program evaluations were also distributed to the 13 faculty and preceptors who participated in the program. Among 5 respondents, 4 reported noting improvement in the skills of their trainees as the result of the program, and 1 acknowledged that he could not schedule a visit because of conflicts.

Comment

The success of this program in meeting its goal of effectively introducing new technology into clinical practice is best determined by examining strengths and weaknesses. Among the strengths were the initial didactic sessions, judged an outstanding success by participants. The combination of a preliminary instructional video followed by a didactic session with hands-on practice using a variety of devices under the supervision of knowledgeable instructors seems ideal. Preceptor visits were acknowledged highly beneficial by both trainees and faculty. Trainees who completed all phases of the program generally reported frequent employment of their newly acquired skills in off-pump operations and excellent outcomes. The fact that some surgeons completed training but did not use the procedure in their practices thereafter may reflect a decision on their parts of either hands-on or environmental factors in which off-pump coronary bypass could not be performed with optimal safety and predictable outcomes.

There are some weaknesses in the instructional plan when applied to off-pump coronary bypass. Although most program participants were able to complete all phases of the program, some were unable to proceed beyond the didactic session or complete preceptor visits. Others were unable to travel because of practice responsibilities at home or scheduling conflicts with uncommon and often urgent procedures that could not be made far enough in advance to schedule a preceptor visit. Those who completed only the didactic phases of the program may have been confident of their off-pump skills without the preceptor visits; however, because they did not submit case logs, such assessments could not be verified. In the future, the ability to complete all phases of the program should be addressed with candidate trainees during the selection process.

Some of the weaknesses of this program were administrative. The program was initiated in 2001 at a time when The STS had little prior experience in monitoring and administering grant-supported activities. Much has been learned through the FAME grant, and many of the lessons were incorporated into the Workforce of Office of Research that was created during the restructuring of The STS midway through the project. For example, the loss of 2 potential trainees prior to the didactic phase of training suggests that a backup list of candidates should have been available to fill last-minute vacancies. In addition, the failure to complete all phases of the program, including the return of the case logs and responses to evaluation surveys by some participants, despite repeated efforts on the part of administrative staff, suggests that formal agreements should have been made between trainees and administrators to clarify the purpose and responsibilities of the learning process.

This program of blending didactic and proctoring modules was achieved at a reasonable cost considering the volunteer surgeons' time spent in developing and monitoring the project at no charge and the modest stipends and honoraria provided to participants. The subsequent performance of trainees, insofar as it could be measured, indicates that the combination of didactic and proctoring experience is highly effective in introducing new technology into clinical practice. In retrospect, off-pump coronary bypass, a procedure that usually cannot be scheduled sufficiently far in advance to permit proctor visits, impeded the full deployment of the instructional model. However, for properly selected and motivated surgeons who are applying complex new technology in situations that permit advance scheduling, this educational model seems ideal.

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