# A National Curriculum of Fundamental Skills for Plastic Surgery Residency

## *Report of the Inaugural ACAPS Boot Camp*

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**Background:** The Inaugural American Council of Academic Plastic Surgeons Plastic Surgery Boot Camp program was developed in response to ongoing changes in graduate medical education. The Boot Camp is a hands-on, practicum-based, 3-day course to introduce core concepts in plastic surgery for new plastic surgery residents (in both integrated and independent tracks).

**Methods:** The course was held in Pittsburgh in July to August 2015. There were 43 attendees (35 integrated/8 independent) representing 22 residency programs across 15 states. Faculty was composed of 8 local personnel and 5 visiting. Lecture topics and practical sessions covered the full spectrum of plastic surgery. All trainees completed an online survey evaluation both during the course and at 6 months.

**Results:** Participant responses were overwhelmingly positive. A total of 72% of respondents rated the Boot Camp ≥ 8 on a 1 to 10 scale (10 is excellent) for the overall course rating; 79% of respondents agreed or strongly agreed with the statement that the simulation scenarios were realistic; and 75% of participants agreed or strongly agreed with the statement that they found simulation-based training to be a valuable way to teach this material. Respondents reported an increase in comfort and confidence across topics after attending the Boot Camp at both 0- and 6-month time points. Instructors received positive evaluations across all topics.

**Conclusions:** This successful inaugural course serves as a benchmark for development of a logistical blueprint, business plan, and curriculum for a proposed expansion to regional centers, to potentially encompass all incoming residents in plastic surgery.

**Key Words:** plastic surgery resident education, ACAPS, boot camp, American Council of Academic Plastic Surgery, intern, plastic surgery bootcamp

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The Accreditation Council for Graduate medical Education Outcomes project, continuous accreditation Milestones initiative, and duty hour restrictions have placed a greater emphasis on measurable outcomes of competency and patient safety.[1–4] The impact of duty hour restrictions on resident education has been suggested to be a sacrifice of teaching conferences, case exposure, and surgical skill acquisition in exchange for more well-rested residents with more time for independent reading and research pursuits.[5] It has been further suggested that debating the virtues and vices of these changes is moot, given that duty hour restrictions, in some capacity, are a reality of the foreseeable future. Rather, to prevent the grim prognosis of technically inferior and poorly trained graduates, an evolution in plastic surgery education is needed.[6] To help meet this challenge, The American Council of Academic Plastic Surgeons (ACAPS) sought to develop a national curriculum of fundamental skills for plastic surgery residency, or so-called boot camp.

Education of plastic surgery trainees in the United States would likely further benefit from a standardized introduction of fundamental skills given the potentially disparate experiences of those entering the 6-year integrated track, typically directly from medical school, versus those entering the 3-year independent track after completion of categorical residency training in general surgery, otolaryngology, neurosurgery, oral maxillofacial surgery, or orthopedic surgery.[7]

This initiative mirrors that of others in allied surgical specialties. The Society of Neurological Surgeons Boot Camp Course was one of the first nationally deployed standardized curriculums that included both didactic and skill-based teaching. It provided a blueprint for enhanced learning, professionalism, and safety at the inception of training.[8,9] Similarly, the cardiothoracic surgery boot camp has evolved under the auspices of the Thoracic Surgery Directors Association and the Joint Council on Thoracic Surgery Education to explore the use of simulation-based learning for training of aortic cannulation, principles and management of cardiopulmonary bypass, and crisis management.[10] General surgery adopted practical simulation of clinical scenarios in boot camp-style training for residents and medical students with high-fidelity simulation credited with allowing the practice of medicine "without risk" to actual patients.[11,12] Given the success of these programs, the development of a plastic surgery boot camp leveraged these experiences to provide a relevant, robust, and structured entrée for the plastic surgery resident in their first year of training.

The ACAPS Boot Camp Task Force produced an annual hands-on, practicum-based, 3-day course for new plastic surgery residents (in both integrated and independent tracks) designed to teach practical core concepts and critical basic content in patient care; to establish a low/no-risk educational environment that fosters learning; and to establish a sense

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of camaraderie amongst participants by building relationships and engendering professional enculturation within our specialty.

## MATERIALS AND METHODS

The inaugural course was held July 31, 2015, to August 2, 2015, on the campus of the Department of Plastic Surgery at the University of Pittsburgh Medical Center. The course was free of charge to all programs and participants, excluding travel costs. All course materials, housing, and meals were provided through grant support from industry sponsorship. Registration was capped to 50 registrants, commensurate to the level of funding. There were 43 attendees (35 Integrated/8 Independent) representing 22 residency programs across 15 states (~ ¼ of all new plastic surgery residents for 2015) (Fig. 1). Faculty consisted of 8 local and 5 visiting surgeons. Registrants were provided with online course curriculum before the Boot Camp in the form of Plastic Surgery Education Network modules that corresponded to the Boot Camp program. Lecture topics covered the full spectrum of plastic surgery (general reconstruction, craniofacial, pediatric, hand, breast, aesthetic), as well as practically orientated subjects including perioperative management and common on-call consults. Practical sessions included standardized patients that covered topics, such as breast examination and surgical markings, hand examination and fracture reduction, interpretation of hand, mandible and midface radiology, splinting techniques, facial nerve blocks, basics of craniomaxillofacial plating and wiring, drawing facial proportions, local flap design, cleft lip markings, a cleft palate simulator, and identification of craniosynostotic skull shapes (Fig. 2). A reception dedicated to the integrated residents was held on the first night of the boot camp, providing an opportunity for integrated residents to discuss residency-related challenges with a panel of junior and senior residents. Another reception was held on the second night as a social event for all boot camp attendees, including faculty. All trainees completed an online survey evaluating the relevance and quality of each didactic and hands-on course components and answered additional questions about the goals and design of the course both during the course and at 6 months. Faculty members were also surveyed.

The boot camp program used a multitude of different surveys and evaluations which were housed in Winter Institute for Simulation, Education, and Research's Simulation Information Management System.[13] These included a precourse survey, individual module and session evaluations, a post-Boot Camp course evaluation, and postcourse survey (at 0 and 6 months). Unless otherwise indicated, the evaluations were written on a 1 to 5 Likert Scale (1 is strongly disagree and 5 is strongly agree). The surveys also used a 5-point Likert scale reflecting participants self-rated comfort levels with each of the fundamental skills. Statistical significance between mean scores across timepoints was determined using Student *t* tests with *p* values less than 0.05 considered to be significant. The 6-month postsurvey responses were requested by automated email at 6 months to all participants, followed by a reminder 1 week later, and then by a personalized email from the course director 2 weeks thereafter.

## RESULTS

Resident response rates were 75% for the post–boot camp evaluation, 70% for the precourse survey, 75% for the postcourse survey at 0 months, and 30% at 6 months. Participant responses were overwhelmingly positive, with 72% of resident respondents rating the overall experience 8 or higher on a 1 to 10 scale (1 is poor and 10 is excellent); 79% of respondents agreed or strongly agreed with the statement that the simulation scenarios were realistic; and 75% of participants agreed or strongly agreed with the statement that they found simulation-based training to be a valuable way to teach this material. Mean Likert scale scores for individual items evaluated are presented in Figure 3.

Key modules and clinical sessions that participants identified as important to include in the course were "face call" consults and management (90%, strongly agreed), craniofacial anatomy and radiology (87%, strongly agreed), hand anatomy and radiology (87%, strongly agreed), "hand call" consults and management (83%, strongly agreed), breast examination and markings (83%, strongly agreed), mechanics of local flaps (80% strongly agreed), hand splinting/fracture fixation/nerve blocks (80%, strongly agreed). Modules and clinical sessions that participants thought were *less* important to include in a boot camp were soft tissue filler and neuromodulator injectables for nonsurgical facial rejuvenation, body contouring and liposuction, professionalism, and facial analysis/photography.

Respondents reported an increase in comfort and confidence in plastic surgery skills after attending the boot camp at both 0- and 6-month time points (Fig. 4). There were statistically significant

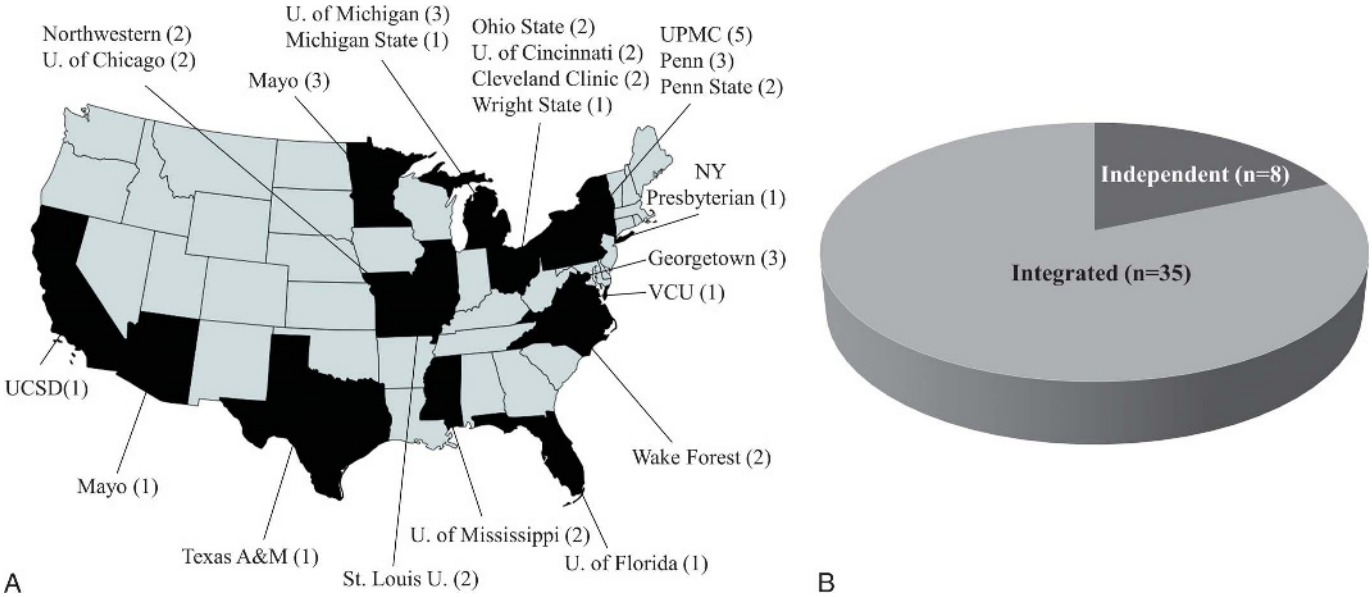


**FIGURE 1.** The Inaugural ACAPS Boot Camp participant demographics. A, Participants by state, program (and number of participants). B, Participants by residency track.

## Friday

| | | |
|---|---|---|
| 15 min | Lecture | Perioperative Management |
| 60 min | Clinical Competency | Case Scenarios – Standardized Patients |
| 75 min | Clinical Competency | Operative Basics: Gloving, Draping, Suturing |

## Saturday

| | | |
|---|---|---|
| 15 min | Lecture | Wound Healing and Nutrition |
| 15 min | Lecture | Pressure Sores, Chronic Wounds |
| 15 min | Lecture | Lower Extremity Trauma and Reconstruction |
| 15 min | Lecture | Professionalism |
| 60 min | Clinical Competency | Case Scenarios – Standardized Patients |
| 15 min | Lecture | Breast Reconstruction |
| 15 min | Lecture | Breast Reduction |
| 15 min | Lecture | Breast Augmentation |
| 30 min | Clinical Competency | Breast Examination, Markings, Implant |
| 30 min | Lecture | Microsurgery Basics |
| 15 min | Lecture | Hand Anatomy and Local Blocks |
| 15 min | Lecture | Hand Radiology |
| 45 min | Lecture | Common "Hand Call" Consults & Management |
| 75 min | Clinical Competency | Hand Exam, Casting/Splinting, Reductions |
| 15 min | Lecture | Craniofacial Anatomy and Local Blocks |
| 15 min | Lecture | Craniofacial Radiology |
| 30 min | Lecture | Common "Face Call" Consults & Management |
| 90 min | Clinical Competency | Clinical Stations |

## Sunday

| | | |
|---|---|---|
| 15 min | Lecture | Facial Analysis |
| 15 min | Lecture | Injectables and Non-operative Facial |
| 15 min | Lecture | Rhinoplasty |
| 15 min | Lecture | Operative Facial Rejuvenation |
| 15 min | Lecture | Body Contouring and Liposuction |
| 15 min | Lecture | Photography |
| 30 min | Clinical Competency | Drawing facial proportions |
| 15 min | Lecture | Pediatric Plastic Surgery, Multidisciplinary |
| 15 min | Lecture | Syndromes and Craniosynostosis |
| 15 min | Lecture | Mechanics of Local Flaps |
| 75 min | Clinical Competency | Drawing: local flaps, z-plasties, cleft repairs |

**FIGURE 2.** The inaugural ACAPS Boot Camp Academic Program.

improvements in comfort/confidence across all parameters except for communication skills and professionalism. Instructors received positive evaluations across all topics. Specific individual comments were also received for input into future program development.

## DISCUSSION

The practice of medicine and the training of the next generation of plastic surgeons continues to evolve. From the days of barber surgeons to formalized training programs, the adage of "see one, do one, teach one" has been challenged by increased scrutiny of proficiency within the context of standardized milestones. The trend has been toward more graduated levels of trainee independence and increased supervision at every step. The importance of providing excellence in patient care while also providing structured education is a challenge, with both being the foundation of our fundamental duties as a profession.[14]

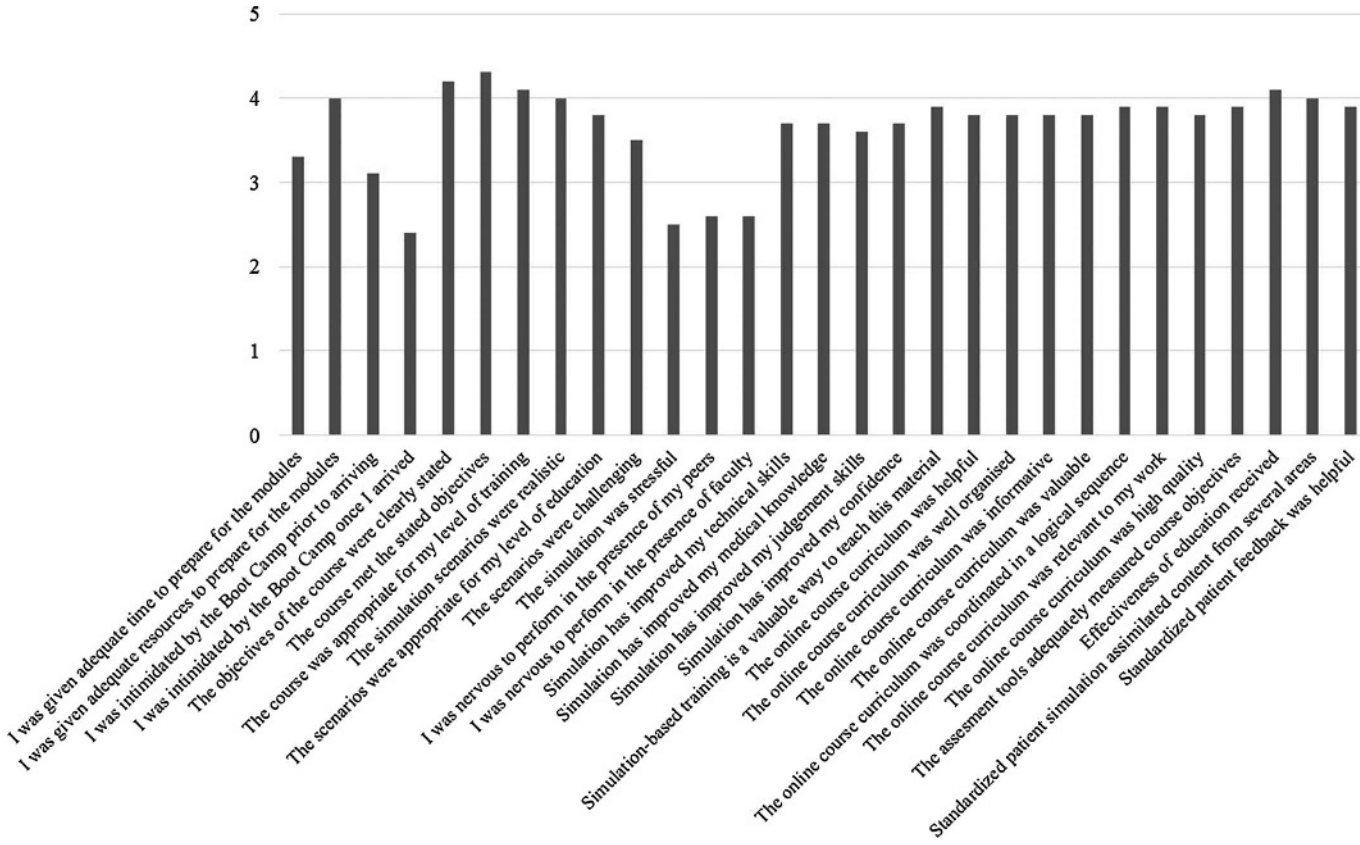


**FIGURE 3.** Post-boot camp course evaluation. Mean scores from a 1 to 5 Likert scale (1 is strongly disagree and 5 is strongly agree) querying the participants level of agreement with the requested statements.

The evolution in resident education in response to these contemporary pressures calls for replacement of the teacher-centered educational style with a learner-centered style. This approach is comprised of several elements, including the adoption of the "flipped classroom" concept of conference didactics, promotion of a standardized curriculum, establishment of formalized faculty training, adoption of "real-time feedback" teaching and coaching strategies for operative procedures, and innovation and utilization of simulation tools for objective assessment of technical proficiency and nontechnical aptitudes.[15–17]

Plastic surgery is at the forefront of this trainee education revolution, benefiting from educational adjuncts, such as the Plastic Surgery Education Network; organizational resources created and sponsored through ACAPS, American Society of Plastic Surgeons, American Society for Aesthetic Plastic Surgery, American Association for Hand Surgery, and American Society for Reconstructive Microsurgery, AO Foundation Surgery Reference materials, Industry-sponsored resources; Journals, apps, newsletters, and more.[18]

Intense boot camp style preparatory training as a concept has been adopted from its military origins and connotations to "kick start" on-the-job or in-field educational experience in a wide spectrum of training from retail, management, industry, and now medicine. The experience of the inaugural ACAPS plastic surgery boot camp reported herein complements the other educational adjuncts listed above. The positive participant feedback is demonstrative of a successful first for such a program (Fig. 5). Importantly, moreover, this experience serves as a benchmark for further adaptation and improvement.

The survey results of topics covered in the boot camp curriculum demonstrated a statistically significant increase in confidence/comfort of fundamental skills after the boot camp program compared with precourse survey scores across all topics except for "professionalism" and "communication skills." This is likely the result of participants' perception that they already have comfort in these areas. For those demonstrating a statistically significant increase in confidence/comfort reporting, this was maintained at 6 months with no significant difference between 0-month and 6-month data. The only exception to this was with the casting/splinting of hand fractures. This may be that despite the increase confidence gained at the boot camp, once the challenge of actual difficult clinical scenarios was presented over the 6 months of residency, the difficulty of this skill was truly realized. Alternatively, it is possible that there was limited exposure to these scenarios in their home programs, and so there was an effective perception of being "deskilled." Ideally, future boot camp evaluations could take into account the clinical experience received in the intervening 6 months between the conclusion of boot camp and the resurvey of the participants. The lowest mean confidence/comfort scores were for the microsurgery skill. This was taught only through lecture format given the logistical challenge of providing practical microscope based teaching. In response, however, a macrosurgical model for microsurgical teaching has now been developed.

In reviewing evaluation and survey responses, several recurring themes could be identified. The majority of participants felt that the course was a positive experience. Several participants indicated that they would prefer less time spent in lecture, more enduring materials and less or no standardized patient sessions. In response, it is our aim that future classes will be provided with access to enduring materials in a timely manner before the start of the boot camp to aid in preparation and to better use the "flipped classroom" model, whereby facilitators will assume core content preparation and focus instead on specific content questions and review difficult topics, which will allow for more dedicated time for hands-on sessions. In addition, these materials will

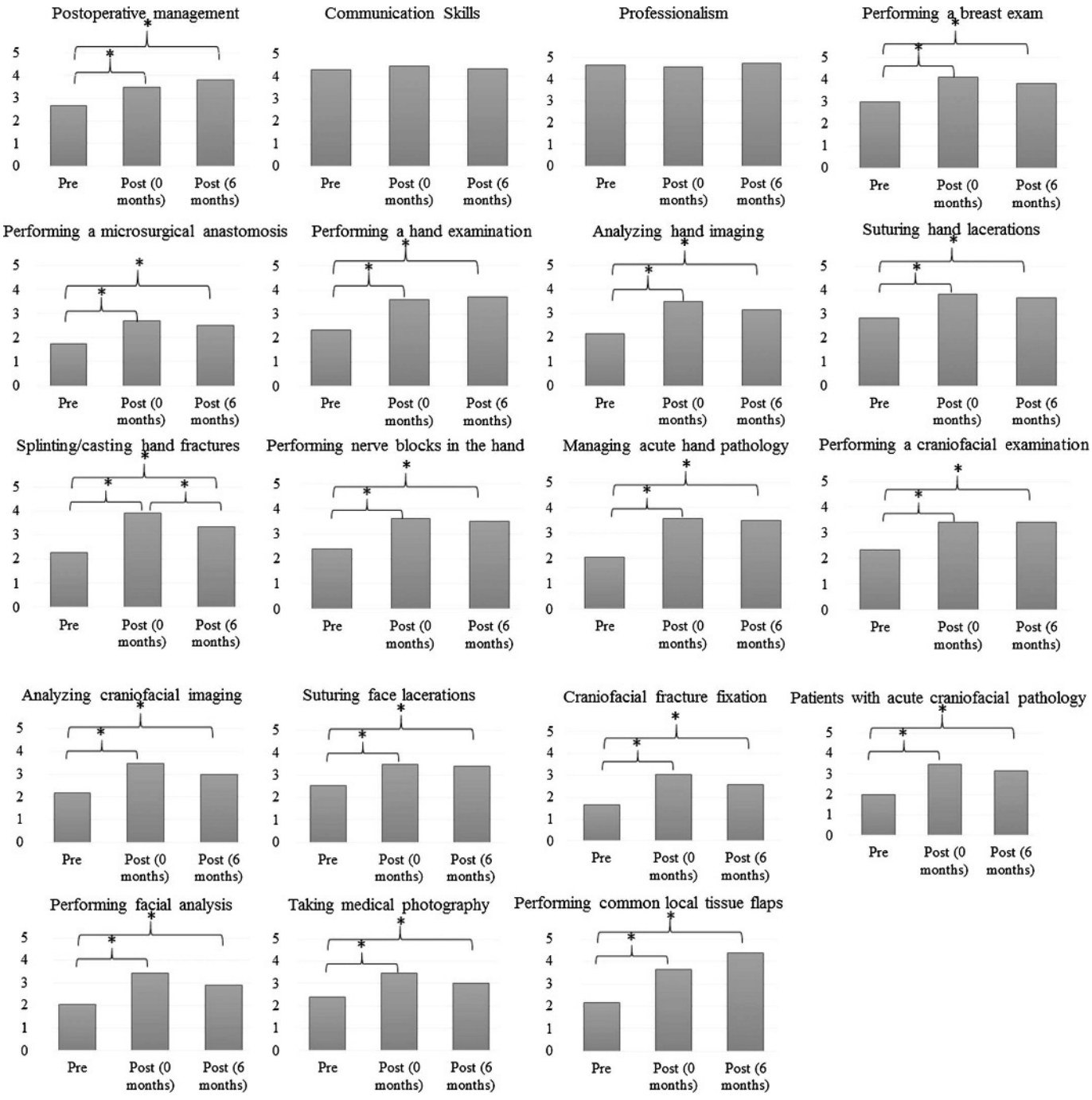


**FIGURE 4.** Precourse survey and post-course survey (at 0 and 6 months) of participant task confidence/comfort.

be available for access after the boot camp. The necessity of the standardized patient scenarios for the independent residents and the scope of the aesthetic plastic surgery topics is undergoing reevaluation, although the resident feedback will need to be tempered with the need to provide comprehensive coverage of basic plastic surgery topics. The number and content of the surveys and evaluations is itself undergoing reevaluation. The number of questions within each evaluation as well as the total number of evaluations may have resulted in responses that were not critically considered. The creation of unique evaluations by instructor or 1 instructor evaluation for the entire course may minimize this effect. In addition, the postcourse evaluation contained some redundant and potentially irrelevant questions, likely contributing to the poor response rate to the 6 month postcourse survey. Creation of shorter, more directed, evaluations may result in higher quality feedback and data. Furthermore, evaluation of performance in the modules, rather than satisfaction of the experience, may be a more valuable outcome measure for testing the utility of the boot camp program, including better determining the relative benefits of the various modules for integrated versus independent residents.

Since this first boot camp course, the task force has continued to drive a proposed expansion to (6) regional centers—providing access to all (~200) new plastic surgery integrated/independent residents


**FIGURE 5.** The inaugural ACAPS Boot Camp in pictures.

within reasonable travel distances to the programs. A logistical "blueprint" of facility requirements, supplies, and faculty needs has been engineered along with a business plan and budgetary proposal for ongoing industry support. There has been curriculum development of standardized preconference materials as well as for all didactic and practical sessions to unify participant experience independent to the center attended. This forum can also serve as a platform for testing and development of further surgical simulation tools.

## CONCLUSIONS

The ACAPS Plastic Surgery Boot Camp helps to ensure accountability for the education of trainees and keep plastic surgery on the forefront of adult surgical education. This successful inaugural course serves as benchmark for development and expansion to provide access to all plastic surgery residents as part of a systematic evolution of graduate medical education in our specialty to meet the changing needs of our patients and society.

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