# Is Subspecialty Fellowship Training Emerging as a Necessary Component of Contemporary Orthopaedic Surgery Education?

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The current minimum training standard for orthopaedic surgeons in the United States consists of a 5-year orthopaedic surgery residency program with the option to pursue subsequent fellowship training.[1] Traditionally, orthopaedic residency training was intended to expose residents to all aspects of orthopaedic surgery and prepare them for general orthopaedic practice.[1,2] The demand for increasing subspecialization, more duty hour restrictions, and greater supervision requirements have rapidly changed the clinical experience of orthopaedic surgery trainees.

As training requirements and expectations for orthopaedic surgical graduates continue to expand and the body of knowledge and technical applications in orthopaedic surgery continue to grow, it has become more apparent that our traditional 5-year residency pathway may be increasingly insufficient for preparing trainees for the future world of independent orthopaedic surgical practice. Subspecialty fellowship training, therefore, may be evolving as an educational necessity to help trainees meet the demands of society's evolving definition of orthopaedic competence rather than an educational option. Compared to several decades ago when a minority of orthopaedic surgery trainees pursued additional fellowship training,[3] approximately 90% of the current class of orthopaedic graduates plans to complete at least 1 fellowship after completing residency.[4–6] There also seems to be a new trend toward pursuing more than 1 fellowship.[6] All of these transitions have coincidentally appeared with the recent changes in residency training regulations and societal expectations. It is possible that this is a matter of simple math: shorter periods of clinical exposure (less input) cannot possibly result in equal experience upon graduation (same output). Since the baseline input (residency training) cannot be overhauled, additional input (fellowship training) is sought to reach the same end point.

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## Orthopaedic Surgery Fellowship Training

Most orthopaedic fellowships are 1-year programs that focus on subspecialty clinical and surgical training. Orthopaedic fellowship curricula broach the entire subspecialty range of the field, including orthopaedic trauma; spine, hand, shoulder/elbow, sports, foot and ankle; musculoskeletal oncology, adult reconstruction, and pediatrics. The various subspecialties currently use 1 of 3 available matching systems: the San Francisco Matching Program, the National Resident Matching Program, and the American Shoulder and Elbow Surgeons Fellowship Matching Program.

A growing number of current orthopaedic trainees are choosing to complete 2 fellowships, often combining related specialties such as hand and shoulder/elbow, sports and shoulder/elbow, sports and foot/ankle, musculoskeletal oncology and adult reconstruction, or orthopaedic trauma in addition to another subspecialty fellowship.[6] The exact reasons for this are not known but may relate to current US market forces and the ability to carve out a niche in practice. This is certainly not the only potential reason. As advances in spinal surgery techniques have blossomed, for example, there has also been an increasing trend for trainees to now complete 2 rather than 1 spinal surgery fellowship, often with 1 fellowship emphasizing spinal deformity, pediatric spinal surgery, minimally invasive spine surgery, spinal oncology, spinal arthroplasty, cervical spine surgery, or spinal trauma. Trends like these should force us to reconsider our design and objectives for initial orthopaedic residency training.

The decision to pursue additional fellowship training is quite costly, particularly when considering the time commitment, possible moving costs, and deferred reimbursement.[7] The average current salaries for orthopaedic surgery fellowships range from $60,000 to $80,000, which is substantially less than the average orthopaedic surgeon earns in clinical practice. In 2009, Gaskill et al[7] analyzed the financial impact of orthopaedic fellowship training and found that spine, shoulder/elbow, sports, hand, and adult

TABLE 1 **Surgical Graduates' Career Plans**[a]

| Specialty | Percentage of Trainees Who Plan to Pursue Fellowship Training Following Residency |
|---|---|
| Orthopaedic surgery | 87.4 |
| General surgery | 71.2 |
| Ophthalmology | 66.8 |
| Internal medicine | 49.2 |
| Otolaryngology | 47.1 |
| Plastic surgery | 45.5 |
| Neurological surgery | 41.5 |
| Urology | 39.2 |
| Obstetrics and gynecology | 22.0 |
| Emergency medicine | 11.2 |
| Radiation oncology | 2.1 |

[a] Data from 2012 FRIEDA survey of program directors: percentage of respondents who plan to pursue fellowship training.[8]

reconstruction yielded positive returns; trauma yielded a neutral return; and pediatrics and foot/ankle specializations had negative net values. Despite the opportunity cost of pursuing an extra year of fellowship training, general consensus and sheer volume of residents seeking such training tend to support the notion that these financial implications continue to be muted by the fact that this additional training is perceived to be invaluable to the surgeon. Such added subspecialty expertise and skill development is felt to add lifetime benefit to the surgeon.

Orthopaedic surgery is not unique in having a high proportion of trainees pursue additional training following the completion of residency. It does have the highest proportion of trainees entering fellowships compared to all other major surgical specialties[8] (TABLE 1). While 87.4% of orthopaedic surgery trainees planned to complete a fellowship in 2012, for example, only 41.5% of neurological surgery trainees planned to complete a fellowship following residency. Although this may be partly related to the additionally mandated 2 years (7 total) of minimum training for neurosurgeons compared to that for orthopaedic surgeons, it is unlikely to be a sole factor as only 39.2% of urological surgery trainees, who also complete 5 years of residency, planned to complete a fellowship. Time spent in residency is therefore clearly not the only factor influencing this trend. General surgery trainees are the second most likely surgical trainees to pursue additional fellowship training, with 71.2% of trainees planning added education after residency. One related factor may be the similarly enormous growth of techniques and subspecialty expansion seen within these fields over the past several decades, which may be a driving force responsible for the large number of trainees seeking additional training prior to entering independent practice, although the reasons for this growing trend are undoubtedly multifactorial.[3,5–7,9]

Regardless of what the actual reasons are for the almost universal pursuit of additional fellowship training in orthopaedics, fellowship opportunities have now become more abundant than ever. In a recent investigation of orthopaedic surgery fellowships,[10] we identified 478 fellowship programs with a total of 897 fellowship positions (TABLE 2). The number of fellowship positions offered in the orthopaedic subspecialty match programs thus exceeds the total number of positions offered in orthopaedic surgery residencies, which totals 692 allopathic and 100 osteopathic residency positions.

### ACGME Accreditation of Orthopaedic Fellowships

The propensity for Accreditation Council for Graduate Medical Education (ACGME) accreditation for orthopaedic fellowships is variable, with the highest rates of ACGME accreditation in the subspecialties of hand surgery and sports medicine, which offer American Board of Orthopaedic Surgery Subspecialty Certificates that require completion of an accredited fellowship (TABLE 2).[10] Currently, approximately 90% of orthopaedic fellowships across the nation are non-ACGME-approved, although this group must still meet the demands of institutional GME requirements. Potential, yet unvalidated, benefits of ACGME accreditation include higher quality applicants, improved reputation, and more standardized training and the ability for fellowship graduates in hand and sports to obtain a subspecialty certificate. Possible disadvantages of ACGME accreditation include forced duty hour and supervisory restrictions which may limit learning opportunities and the transition to independent practice, intensive documentation and paperwork requirements, complicated facility and faculty requirements, and limitations to billing for clinical services. Medicare/Medicaid billing regulations for ACGME-accredited fellows can severely restrict self-funding opportunities and force an increased reliance on industry support in light of the ongoing limited hospital and GME funds for new training positions.

### The Future of Orthopaedic Fellowship Training

Demand for orthopaedic subspecialty fellowship training is likely to continue due to ongoing duty hour and supervisory restrictions and the demands of an ever-expanding

TABLE 2 **Orthopaedic Surgery Fellowship Programs and Positions**[10]

| Orthopaedic Subspecialty | No. of Fellowship Programs (Positions) in Match | No. of ACGME-Certified Programs (Positions) | Percentage of ACGME-Certified Programs (Positions) |
|---|---|---|---|
| Orthopaedic sports medicine | 102 (224) | 95 (218) | 93.1 (97.3) |
| Hand surgery | 80 (168) | 65 (142) | 81.3 (84.5) |
| Musculoskeletal oncology | 14[a] | 11[a] | 78.6[a] |
| Pediatric orthopaedics | 42 (66) | 25 (39) | 59.5 (59.1) |
| Adult reconstructive orthopaedics | 53[a] | 21[a] | 39.6[a] |
| Orthopaedic surgery of the spine | 60 (112) | 18 (35) | 30.0 (31.3) |
| Orthopaedic trauma | 56 (78) | 10 (16) | 17.9 (20.5) |
| Foot and ankle orthopaedics | 43 (70) | 7 (21) | 16.3 (30.3) |
| Shoulder and elbow surgery | 28 (42) | [b] | NA |
| Total | 478 (897) | 252 (523) | 52.7 (58.3) |

Abbreviations: ACGME, Accreditation Council for Graduate Medical Education; NA, not applicable.

[a] Adult reconstructive orthopaedics and musculoskeletal oncology are grouped together by the San Francisco Matching Program.
[b] Shoulder and elbow surgery is ACGME accredited under the classification of orthopaedic sports medicine or adult reconstructive orthopaedics.

field of orthopaedic surgery applications. This trend toward subspecialization also occurs in general surgery, neurological surgery, urological surgery, and other surgical fields.[11–14] With increasing specialization, the general training provided during surgical residency alone may not suit the needs of today's patients or tomorrow's trainees. A potential solution to this expanding training gap might be to reconfigure the traditional residency training design from a general to a more subspecialty-based exposure, extend the length of general residency training, or institute mandatory fellowship training following residency. Mandating additional training for all residency graduates in any form would certainly require a substantial change in the status quo. This model already exists, however, in certain programs across the United States. The Brown University Orthopaedic Training Program, for example, for nearly 20 years, has required a 1-year trauma fellowship for all of its trainees following their traditional orthopaedic residency program.[15] This program has produced orthopaedic surgeons who were more likely to enter academic medicine than their non-Brown University–trained counterparts and who were overwhelmingly satisfied with the training process. Additionally, almost all of the trainees surveyed perceived the fellowship year as valuable to their surgical and decision-making skills.[15] Unfortunately, no control populations from 5-year programs were evaluated as part of this assessment, and it is possible that the people who chose this particular program were already "preselected" for such results.

In light of the rapidly changing health care landscape, careful reassessment of both the merits and pitfalls of our current orthopaedic educational system seems in order. We carry significant responsibility for ensuring that our future caregivers are properly prepared for the world ahead and what it expects of them. Over the past 20 years, there have been new rules and restrictions placed on medical training, and it should come as no surprise that yesterday's educational algorithm might no longer be appropriate for tomorrow's physician. Future investigation of how we should best train our orthopaedic residents is paramount, and we should feel compelled to critically analyze not only the effectiveness of fellowship training and the possibility of mandating fellowship training on a broader scale but also the effects of ACGME accreditation and specific matching programs on fellowship effectiveness and satisfaction. Both modernization of our residency system and further standardization of fellowship training may improve graduate preparedness upon conclusion of training.

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