

# 25 Years of Duke Foot and Ankle Surgery Fellowship Training

## INTRODUCTION

There is a growing demand for orthopedic surgeons trained in the management of foot and ankle conditions, yet recruitment is modest, and there remains wide variation in the process of fellowship education along with a dearth of training outcomes assessment. With a burgeoning population and incommensurate surgeon production, foot and ankle surgery is confronted by a potential relative workforce shortage unless we can improve recruitment and enhance educational efficiency.<sup>1</sup>

Of the 48 programs in the United States offering fellowship positions, 6 incorporate a relative amount of standardization and oversight by the Accreditation Council for Graduate Medical Education (ACGME).<sup>2</sup> We aimed to assess the educational curriculum, research production, and career paths of graduates in the past 25 years from the Duke Orthopaedic Foot and Ankle Surgery Fellowship, the longest running ACGME-accredited foot and ankle fellowship program in the United States.

## ANALYSIS OF PROGRAM GRADUATES

The Duke Orthopaedic Foot and Ankle Surgery Fellowship program has consisted of clinical and research training of American and international fellows since 1990. A prospectively collected database of all graduates was utilized to identify practice types and locations as well as tabulate PubMed indexed articles authored by fellows while in the program. The evolution of the program has led to the educational curriculum for the 2015–2016 fellowship class that is outlined in Table 1. At present, three full-time professors, one associate professor, and one assistant professor provide instruction. Four are employees of the university health system and one is in a private practice group affiliated with the university. Fellows rotate two to three times with each orthopedic foot and ankle staff member as part of an apprenticeship model with mentoring in the clinic and operating room settings. Two weeks in a year are spent alongside a staff podiatrist for exposure to various aspects of diabetic foot and wound care.

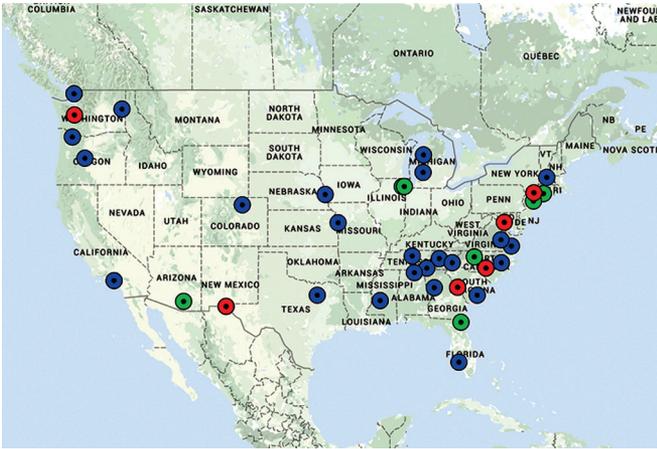
**Table 1:** Program fellowship's 2015–2016 educational curriculum

<i>Weekly Schedule</i>	<p><i>Monday</i></p> <ul style="list-style-type: none"> <li>• Quarterly research meeting</li> </ul> <p><i>Tuesday</i></p> <ul style="list-style-type: none"> <li>• Didactic conference</li> <li>• Monthly patient safety conference</li> </ul> <p><i>Wednesday</i></p> <ul style="list-style-type: none"> <li>• Grand rounds</li> </ul> <p><i>Thursday</i></p> <ul style="list-style-type: none"> <li>• Bi-weekly radiology conference with musculoskeletal radiology staff</li> </ul> <p><i>Friday</i></p> <ul style="list-style-type: none"> <li>• Surgical indications conference</li> </ul>
<i>Courses</i>	<p>Salto-Talaris Cadaver Lab (Tornier) – Durham, NC</p> <p>Musculoskeletal Ultrasound Course (Duke) – Durham, NC</p> <p>Infinity/Inbone Cadaver Lab (Wright Medical) – Durham, NC</p> <p>Foot &amp; Ankle Fellowship Course (Tornier) – Baltimore, MD</p> <p>Duke Foot &amp; Ankle Fellows Lab (Arthrex) – Naples, FL</p> <p>Foot &amp; Ankle Fellowship Forum (Arthrex) – Naples, FL</p>
<i>Meetings</i>	<p>American Academy of Orthopaedic Surgeons Annual Meeting</p> <p>American Orthopaedic Foot &amp; Ankle Society Annual Meeting</p>

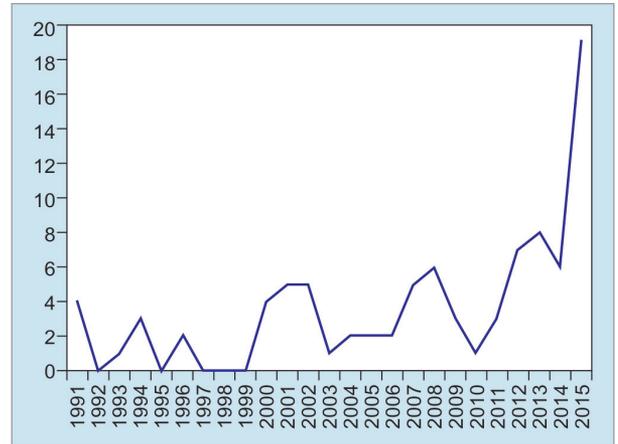
## Post-fellowship Practices

Our fellowship program has graduated 50 fellows in the past 25 years, of whom 38 (76%) practice in the United States and 12 (24%) practice abroad. There was a single matriculated fellow per year over the first 13 years of the fellowship's existence, at which point the program expanded. The current fellow class consists of three U.S. fellows and one international fellow. Since the creation of the AOFAS Resident Scholars program in 2010, we have enrolled 12 eligible U.S. fellows, of whom 5 participated in the program.

Of our program's U.S. graduates, 8 (21%) pursued careers in academic medicine, 6 (16%) returned to military employment, and the remaining 23 (61%) are in private practice or hospital employee models without any regional predilection (Graph 1).



**Graph 1:** Program graduates' U.S. practices by location and type (green = academics, red = military teaching hospital, blue = private practice/hospital employee; www.batchgeo.com)



**Graph 2:** PubMed-indexed fellow authorship totals by year

**Table 2:** Program graduates' international practice locations

	Nova Scotia, Canada		Cigli-Izmir, Turkey
	Santiago, Chile (two graduates)		Koeln, Germany
	Jeddah, Saudi Arabia		Benowa, Australia
	Saskatchewan, Canada		Waterford, Ireland
	Calgary, Canada		Tel Aviv, Israel
			Brisbane, Australia

The 12 international graduates are widely dispersed throughout the globe representing 8 countries on 5 continents (Table 2). When accounting for international, military, and academic practitioners, 54% of our graduates entered practice types with a teaching component.

### Fellow Research Production

PubMed-indexed research articles for each fellow were assessed, and on average 1.9 PubMed indexed articles (0–12) were published by fellows during their tenure in the program. Graduates going into military, international, and U.S. academic practices published 2.5, 2.8, and 3.7 articles during training respectively. These numbers do not account for book chapters, studies published in journals not indexed within PubMed, and manuscripts published after the fellow had graduated and changed publication affiliation to their next institution.

During the fellowship's infancy, the process of publication was tedious, resulting in only a modicum of contributions to the orthopedic literature. As the foot and ankle research vision was realized at our institution, the research process has become sufficiently refined to enable fellows to start projects and see them through completion within the year of training. Fellows begin the year by attending a four-part seminar on navigating the research labyrinth at our medical center as part of their ACGME-mandated research requirements. Staff support consists of dedicated foot and ankle research coordinators who participate in clinical data collection, Institutional Review Board (IRB) management, grant and funding acquisition, and assimilating fellows and residents to the existing research infrastructure. A PhD-level biostatistician is salaried by the foot and ankle division allowing for quick turnaround on analytics, and a full-time engineer is on staff managing multiple biomechanics projects. The current research requirement is a minimum of two publications per fellow per year, which has now increased to three publications owing to the newfound efficiency of the research cycle. As demonstrated in Graph 2, fellows have easily achieved these publication metrics over the past 5 years.

## PERSPECTIVES AND FUTURE DIRECTIONS

The progression of our fellowship parallels that of many other long-standing foot and ankle training programs. Education has advanced with new modalities of teaching, emerging technologies, and evolving evidence-based practices. Reimbursement models have molded clinical practice as they now emphasize value and demand better collection of outcome measures and a mindfulness of cost.<sup>3</sup>

Over the years, we have empirically found that recruitment is most successful when the priority of the program is the education and success of its fellows, not utilizing trainees as clinical labor. Surgeon education is no longer simply a matter of understanding anatomy and pathology; it must be scripted under the broader context of educating surgeon leaders. To flourish in value-based health care, it is imperative that foot and ankle surgeons not be relegated to functioning solely as technicians but must instead be valued for their ability to make decisions regarding clinic and surgical center operations as well as demonstrating the value of our trade to payers, health systems, policymakers, and patients. For these reasons, we have expanded the educational opportunities for our fellows to include symposia with coding and billing specialists, hospital administrators, private practice group managers, and financial advisors to provide for a well-rounded graduate. In addition to the aforementioned research requirements, fellows are required to participate in a quality improvement project as part of their holistic systems-based education.

As was true at the time of the program's inception a quarter of a century ago, impediments to fellowship funding remain very real today. Medicare does not fund PGY-6 fellowship positions, yet fellows in ACGME-accredited programs cannot bill independently in a clinic or as co-surgeons in the operating room to subsidize their own salary. Our program has not received institutional financial backing for fellow stipends and has relied exclusively on philanthropy and industry grants to support our trainees. Procurement of these sponsorships is progressively more difficult, and we have found it necessitates strong working relationships as well as meticulous record keeping of tangible deliverables demonstrating the utility of the fellowship (e.g., conference participation, presentations, research contributions, etc.).

The current iteration of our training program is the result of years of refinement based on fellow input, investment in educational and research resources, and realizations gained from missteps. We hope that other programs may benefit from our lessons learned. Through open dialogue and standardization of core teaching methods, we can provide the highest level of training to all fellows and recruit brilliant, dynamic minds to our profession.

## REFERENCES

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