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Establishing a Standardized Fellowship Curriculum for Advanced Minimally Invasive Spine Interventions: A Multidisciplinary Approach to Training and Competency

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INTRODUCTION

Spinal interventions have evolved significantly over the years, with a growing overlap between procedures traditionally performed by spine surgeons and those undertaken by pain physicians. Recent advancements blur the distinction between symptom management and interventions that alter spinal biomechanics. Pain physicians are increasingly performing minimally invasive spine interventions (MISI), to address pain and improve spinal function¹ as an alternative to traditional spine surgery.

This shift arises partly due to provider shortages, increased demand, and financial considerations, in addition to the influence of industry. However, many interventional pain fellowships lack structured training in spinal biomechanics, pathophysiology, and risk mitigation akin to surgical training.²⁻⁵ Existing guidelines often fail to specify competency benchmarks, leaving a gap in ensuring procedural safety and efficacy.^{2,3,6-8} Specific recommendations for training and credentialing regarding neuromodulation and spinal intervention have not yet seen widespread adoption.^{9,10}

There is a pressing need for formal fellowship curricula that integrate advanced knowledge of MISI with practical, hands-on training. The authors of this editorial (which includes both surgeons and interventional pain physicians) proposes a comprehensive fellowship model designed to enhance patient care and delineate clear practice parameters. By fostering interdisciplinary collaboration, the proposed program aims to build a robust framework for advanced spinal interventions.

CURRICULUM OUTLINE

1. Philosophy and Structure

The 1-year program focuses on equipping physicians with advanced MISI skills through a combination of theoretical knowledge and practical experience. Designed for individuals with prior pain fellowship training, the curriculum emphasizes interdisciplinary learning and hands-on procedural training in MISI (e.g., sacroiliac joint fusion, percutaneous lumbar decompression, kyphoplasty, spinal cord stimulation, pain pump implantation, and endoscopic rhizotomy). A secondary track may address the needs of spine surgeons seeking expertise in minimally invasive or neuromodulatory approaches.

2. Core Objectives

- (1) Deepen understanding of spinal anatomy, biomechanics, and pathology
- (2) Explore the mechanisms of pain and their relevance to spinal interventions
- (3) Master minimally invasive spinal techniques, tools, and technologies
- (4) Develop proficiency in interpreting advanced imaging modalities
- (5) Perform advanced MISI procedures under supervision
- (6) Emphasize safety through risk identification and complication management

3. Implementation Roadmap

1) Rotations

- Spine surgery services
- Interventional pain practices and private clinics
- Specialized radiology services, including musculoskeletal imaging

2) Training modules

- Monthly cadaver labs for advanced techniques
- High-fidelity simulators for complex procedures
- Didactic sessions on imaging interpretation and ultrasound-guided interventions

3) Competency evaluation

- Quarterly assessments, including written exams and Objective Structured Clinical Examinations
- Procedural case logs with defined minimum thresholds
- Comprehensive final exam covering theoretical and practical skills

DISCUSSION

The increasing scope of pain medicine necessitates a reevaluation of fellowship training frameworks. Incorporating MISI into routine practice without standardized training risks compromising patient safety and procedural outcomes. That these procedures, and even lumbar fusions, are already being performed by physicians from nonsurgical specialties does not diminish the need for a MISI fellowship but rather calls out this need. This editorial suggests a structured fellowship curriculum designed to address these gaps while fostering interdisciplinary collaboration.

Implementing such a program will require overcoming significant challenges. Establishing consensus on curriculum content, procedural benchmarks, and certification standards is essential. Additionally, financial and logistical hurdles must be addressed through institutional and societal support.

To advance this initiative, we propose forming a multidisciplinary working group comprising pain physicians, spine surgeons, educators, and professional societies. This group would refine the curriculum, establish certification protocols, and advocate for widespread adoption across training institutions.

CONCLUSION

A standardized MISI fellowship curriculum offers a pathway to equip interventional pain physicians with the skills necessary for advanced spinal procedures. By fostering interdisciplinary collaboration and addressing current training gaps, this program promises to enhance patient care and expand access to MISI. Collaboration among stakeholders will be critical in turning this vision into a reality.

NOTES

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