CORR Curriculum — Orthopaedic Education

Orthopaedic Surgery Education in India

Paul J. Dougherty MD, Anil Sethi MD,
Anil K. Jain MS, MAMS, FAMS, FRCS(Eng)

Introduction

India is the second most populous country in the world, with a population of 1.28 billion people spread across southern Asia. This developing nation is home to the largest democracy, including a central government with state representation, and state governments for each of its 28 states [10].

Note from the Editor-in-Chief: We are pleased to present to the readers of Clinical Orthopaedics and Related Research® the next CORR Curriculum – Resident and Registrar Education column. The goal of this column is to focus on the mechanics of resident education. We welcome reader feedback on all of our columns and articles; please send your comments to eic@clinOrthop.org. Each author certifies that he or she, or any member of his or her immediate family, has no funding or commercial associations (eg, consultancies, stock ownership, equity interest, patent/licensing arrangements, etc) that might pose a conflict of interest in connection with the submitted article. All ICMJE Conflict of Interest Forms for authors and Clinical Orthopaedics and Related Research® editors and board members are on file with the publication and can be viewed on request. The opinions expressed are those of the writers, and do not reflect the opinion or policy of CORR® or the Association of Bone and Joint Surgeons®.

India's official language is Hindi, with English as the second "official language." There are several hundred other languages spoken in India, demonstrating the diversity of the population.

The economy is also diverse, ranging from wealthy to some of the poorest populations on earth. The World Bank [10] reports that 29.8% of the Indian population lived below the national poverty line in 2010. This diversity is also reflected in medicine, where the disease burden ranges from "Western problems" like heart disease and arthritis, to critical health concerns we associate with poverty, including Hansen's disease (leprosy), tuberculosis, neglected trauma, and untreated clubfoot [1, 2, 4, 5]. Some medical

centers in India provide quality care on par with the best in the world, yet others lack basic resources to care for the local population.

Clinical Orthopaedics and Related Research® is an international journal, and one purpose of this column is to survey orthopaedic medical education around the world, exploring the strengths and limitations of each country's programs, and offering better insight to educators for orthopaedic educational improvement. Each country tailors its medical training to address the medical problems specific to their inhabitants. For example, medical students and interns in India must complete a mandatory community medicine program, which provides education in underserved areas. The diverse clinical problems that plague India, coupled with its disparity in infrastructure, tests the ingenuity of the medical community, and requires an emphasis on varying types of treatment.

P. J. Dougherty MD (✉) · A. Sethi MD
Department of Orthopaedic Surgery,
Detroit Medical Center,
4201 St. Antoine, Suite 4G, Detroit,
MI 48201, USA
e-mail: pdougher@dmc.org;
pauldoug@med.umich.edu

A. K. Jain MS, MAMS, FAMS,
FRCS(Eng)
Department of Orthopaedic Surgery,
University College of Medical Sciences,
University of Delhi, Delhi, India

Medical College

Unlike the United States, students in India enter medical school after graduating high school. The decisive factor

CORR Curriculum — Orthopaedic Education

for admission into medical school is based upon a national written examination [1, 9]. India has a large number of schools and applications. Because of this, the single written examination is generally the criteria for admission.

The first 4 and a half years of medical school are dedicated to basic medical training. Once completed, students earn a Bachelor of Medicine and Bachelor of Surgery (MBBS) degree. The MBBS curriculum includes gross anatomy, physiology, pathology, pharmacology, and other common topics followed by beginning clinical rotations in medicine (and subspecialties), surgery (and subspecialties), Obstetrics, and Pediatrics [1–7, 9].

Following completion of basic medical training, students enter a 1-year Compulsory Rotating Residential Internship (CRRI). This program is similar to a rotating or transitional internship. Upon successful completion of the CRRI, medical students receive medical college diplomas.

In order to apply for residency specialty training, MBBS graduates must pass a national level and/or state level “postgraduate entrance exam” — a written exam that is the deciding factor for placement in postgraduate training [1–7, 9].

Residency

Residents in India can obtain orthopaedic surgery education using a variety of

pathways (Fig. 1). Residents can earn a Master of Surgery (MS) degree in orthopaedic surgery MS(Orthopaedics[Orth]) upon successful completion of a 3-year orthopaedic specialty training program. In order to gain eligibility for an exit examination, residents must pass the standard national curriculum for resident exposure and education, and successfully complete a required thesis (Table 1). The curriculum covers all aspects of general orthopaedic surgery, including pathology (focusing on conditions commonly found in India, such as infections and tuberculosis) [1–7].

According to the Medical Council of India, there are 225 MS(Orth) training programs available to residents. Last year (2012–2013), 919 slots were available for the first-year postgraduate orthopaedic class [1, 9]. That number is quite small when considering the population of the country [2, 8]. Just what the “right number” might be is hard to discern when considering the size and scope of the entire Indian health system.

Like other countries, orthopaedic surgery is a popular specialty for postmedical school education. Recognizing the overwhelming interest in obtaining a MS(Orth) degree, the Medical Council of India supervises a second pathway for entrance into orthopaedics called the Diploma in Orthopaedic Surgery (D[Orth]) program [1, 3, 7]. Last year, the 2-year

D(Orth) program offered 110 courses with 309 first-year seats available [9].

Candidates who fail to earn admission into the MS programs can also apply for the 3-year Diplomate of National Board (DNB) program with a focus on orthopaedic surgery DNB(Orth) in non-university affiliated hospitals. In order to gain enrollment in DNB(Orth) courses, MBBS students must take a national level common entrance examination conducted by National Board of Examination. D(Orth) candidates who wrote a thesis and have 2 additional years of education may also be eligible to take the DNB(Orth) exams. Qualified MS(Orth) candidates may take the exit examination for DNB(Orth) without any further training. The course structure is on par with the Medical Council of India’s recognized courses [1, 3–7].

Further training as a senior resident in orthopaedic surgery is available in few select states/universities/hospitals. Senior resident training runs for 3 years, and is less structured than the MS education. The senior resident will care for patients along with faculty members at their hospital. The senior resident is also given more autonomy to run their own operating room and clinic, with indirect supervision of a faculty member. Admission for a senior residency is based on recommendations and interviews. Each institution is slightly different, but generally, it takes 3 calendar years to

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Fig. 1 The flowchart shows the variety of pathways Indian students can take to earn their orthopaedic surgery medical education.

complete a senior residency. There are even fewer senior resident positions available than those at the MS level

program. Therefore, not all Masters graduates will receive further training [1–7].

A person is considered a qualified orthopaedic surgeon once they complete the DNB(Orth) or MS(Orth)

CORR Curriculum — Orthopaedic Education

Table 1 Sample India medical school curriculum [1, 2]

Phase	Semester	Subjects
Preclinical	1–2	Anatomy, biochemistry, physiology
	3–5	Community medicine, forensic medicine, pathology, pharmacology, microbiology (first clinical experience)
Clinical	6–9	Community medicine, medicine (and subspecialties), psychiatry, dermatology, obstetrics and gynecology, pediatrics Surgery, anesthesia, otolaryngology, ophthalmology, orthopaedic surgery

programs, and are authorized to practice orthopaedic surgery. However, those without senior resident training may have less job opportunities, and will take positions as a junior staff to gain more experience or work in underrepresented areas.

Fellowship training, beyond senior residency, is offered by the National Board of Examinations in hand and microvascular surgery, spine, and trauma. These 2-year fellowships are available postgraduation, but usually have no more than ten spots available.

Strengths

There are a number of strengths to Indian orthopaedic medical education. Medical school candidates are exposed to a wide variety of specialty areas that serve the needs of the country prior to making their selection of career. This differs from the American experience, in which a medical student generally applies for specialty training at the end of their third year in medical school.

The Indian medical education is provided in English, and both junior and senior residents are exposed to the world's leading medical journals for orthopaedic surgery. Additionally, textbooks are printed in English, allowing for a broad exposure to world orthopaedic surgery. Since MS(Orth) training is provided in highly dense patient-population institutions, the trainee learns how to utilize his or her basic skills in decision making and handling large patient loads.

Although tuberculosis and polio are not commonly found in the United States, Indian orthopaedic education emphasizes these diseases, as well as neglected fractures and clubfoot. Caring for these diagnoses serve the needs of the country's patient population.

Senior orthopaedic residents work in a more traditional model. They will run their own operating room while in the supervision of a consultant. This allows for autonomy and developing surgical skills in a safe environment. As a senior resident's skills progress, he or she is given more autonomy. Under this system, the senior resident

must demonstrate the ability to care independently for patients.

Limitations

Leading Indian orthopaedic surgeons [1–6] have noted that the Masters level training in India is not comprehensive enough, and some graduates may have insufficient training to practice independently. We suggest developing longer residency programs, (possibly adding 1 to 2 years of mandatory education), and creating mechanisms (such as board certification processes) that ensure physician competence.

Senior level resident education varies from hospital to hospital due to varying faculty and clinical resources. Because of this, some physicians will graduate with inconsistent clinical education. One possible solution is to develop a national curriculum that serves the needs of India for general orthopaedic surgeons, as well as a board certification process after senior resident training. Training opportunities for

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MS/DNB graduates must be readily available.

Conclusion

Indian medical care has considerably improved since the country gained independence in 1947. Given the limited resources at the present time, the orthopaedic education system attempts to provide the most good for the most people. In the future, one could expect improvements in care, particularly in rural areas.

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