Surgery in New Zealand is performed by more than 500 surgeons who serve a population of 3.8 million people. Most of the surgeons are trained in New Zealand under the auspices of the Royal Australasian College of Surgeons. Surgical services are consistent with the highest standards of Western countries.

New Zealand is a South Pacific country of great natural beauty with a population of 3½ million people. Its 2 main islands stretch from the tip of the North Island to the bottom of the South Island, some 2500 km to the south. In the north, the climate is subtropical, with beautiful beaches and blue sea, whereas in the south, there is great variety, including Norwegian-type fjords, inland deserts, lakes, and snow-capped mountains. There are 4 major cities (Figure), the largest of which is Auckland, which has a population of around 1 million. One third of the population live in the upper half of the North Island.

New Zealand today is a multiethnic society, as exemplified by Auckland, which is the largest Polynesian city in the world. The original people, the Maori, began settling the land in the early ninth century and now constitute about 12% of the population. They had come to the North Island from other Pacific islands, the last wave from Tahiti in about 1350, in a fleet of large canoes. The Maori spread out along the coast and the rivers on both of the main islands. In the late 18th and early 19th centuries, despite fierce opposition from the Maori, British missionaries and whalers established settlements and trading posts in New Zealand, chiefly in the north of the North Island. Systematic immigration, mainly from Great Britain, began in 1839. By the terms of the Treaty of Waitangi, signed in 1840 by a British representative and 50 Maori chieftains, Great Britain formally proclaimed sovereignty over the islands and agreed to respect the land ownership rights of the Maori, who placed themselves under the protection of the British government.

The discovery of alluvial gold in about 1860 caused a new influx of immigrants, many of whom settled down to farming when the deposits of gold were exhausted. Sheep raising and gold mining were the main sources of the country's wealth in the latter part of the 19th century. After World War II, New Zealand encouraged European migration, and recent years have seen an increasing trend toward multinationalism, with a liberal immigration policy, particularly for people from the Pacific Islands and parts of Southeast Asia.

MEDICAL SCHOOLS

Scottish settlers established the Otago University Medical School in the southern city of Dunedin in 1875. This school produced all of the country's physicians until 1966, when a second medical school was established in Auckland. In 1973, Otago University opened clinical schools of medicine in Christchurch and Wellington. The New Zealand Medical Council registers graduates of medical schools that have been approved on the basis of accreditation, without requiring them to pass a separate registration examination. Auckland Medical School and Otago University Medical School and all medical schools in Australia are accredited.

MEDICAL WORKFORCE

In 1998, 8491 physicians were in active employment in New Zealand, 31.3% of
whom were women; only 2.3% were Maori and 1% were Pacific Island natives. Physicians whose primary medical education was gained in another country represented 33.7% of the workforce.

ROYAL AUSTRALASIAN COLLEGE OF SURGEONS

The first physicians in New Zealand were British military men who came to the country in the early part of the 19th century. The first New Zealand–trained physicians were considered capable of practicing surgery on graduation. Their teachers had come from Great Britain and, as a consequence, toward the end of the century, New Zealand graduates sought further training there. It was not until the early part of this century that a New Zealander, Louis E. Barnett, MD, held a Fellowship of the Royal College of Surgeons of England. Barnett, after several visits to the United States, was the first New Zealander to fully appreciate the reforms in both hospitals and surgery in general that occurred after the formation of the American College of Surgeons in 1913. As a direct result, in 1920, he proposed to create a New Zealand association of surgeons after the American model; however, in 1926, New Zealand instead joined an Australasian body that was being promoted by Melbourne surgeons. The result was the formation of the Royal Australasian College of Surgeons (RACS) in 1927. Today, the RACS is an internationally recognized organization of 4700 surgeons who are based mainly in Australia and New Zealand. About 90% of all surgeons practicing in Australia and 80% practicing in New Zealand are Fellows of the RACS (FRACS). These surgeons were trained by the RACS in 9 surgical specialties through its department of examinations and training. The RACS is also responsible for maintaining surgical standards in Australia and New Zealand through its department of continuing medical education and recertification.

The RACS is a nongovernmental organization run by a council made up of elected members from throughout Australia and New Zealand who work in an honorary capacity. There are also co-opted members who represent surgical specialties. Also working in an honorary capacity are the surgeons who are on the national, state, and Australian Capital Territory committees as well as the 32 committees of council that have been formed to address issues affecting surgeons in a wide variety of areas.

SURGICAL TRAINING

Surgical training in New Zealand is carried out under the auspices of the RACS. The RACS trains and examines in 9 surgical specialties and training for all of these disciplines may be conducted in whole or in part in New Zealand. Of more than 5000 vocationally registered (fully trained specialists or general practitioners) physicians in New Zealand, there are 649 surgeons. The specialty breakdown is shown in the Table. There are a total of 2100 physicians-in-training for the various branches of medicine, of whom about 100 are training in the various surgical disciplines (Table). Specialty training takes between 4 and 6 years (depending on the specialty) after entry into an advanced training program.

BASIC TRAINING

After leaving medical school, graduates are required to undertake a 1-year rotating internship before fulfilling the requirements of the Medical Council for full registration as a medical practitioner. After this year, graduates may concentrate on surgical specialties, although a broad experience is encouraged in those presenting for selection into the advanced training programs. To be eligible for selection into advanced training, candidates (called basic trainees) must have completed 2 clinical years after their internship. They must also have successfully completed 2 formal examinations. The first of these is a series of three 2-hour multiple-choice question examinations. The curriculum involves the basic sciences of

<table>
<thead>
<tr>
<th>Specialty</th>
<th>No. of Registered Surgeons</th>
<th>No. of Trainees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardiothoracic surgery</td>
<td>31</td>
<td>6</td>
</tr>
<tr>
<td>General surgery</td>
<td>243</td>
<td>40</td>
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<tr>
<td>Neurosurgery</td>
<td>18</td>
<td>3</td>
</tr>
<tr>
<td>Orthopedic surgery</td>
<td>180</td>
<td>26</td>
</tr>
<tr>
<td>Otolaryngology</td>
<td>85</td>
<td>10</td>
</tr>
<tr>
<td>Pediatric surgery</td>
<td>12</td>
<td>1</td>
</tr>
<tr>
<td>Plastic surgery</td>
<td>33</td>
<td>9</td>
</tr>
<tr>
<td>Urology</td>
<td>47</td>
<td>9</td>
</tr>
<tr>
<td>Total</td>
<td>649</td>
<td>104</td>
</tr>
</tbody>
</table>

Specialty Breakdown

New Zealand and surrounding countries.
anatomy, physiology, and pathology, as well as some aspects of relevant clinical knowledge. The examination is known to be difficult and the average pass rate is approximately 30%. The second formal examination is a 2-hour, 20-station, objective structured clinical assessment. This can only be taken after the candidate has taken the multiple-choice question examination. The objective structured clinical assessment tests relevant clinical knowledge that should have been acquired during the years after internship. Pass rates for this examination are around 80%. In addition to passing these 2 formal examinations, candidates must also successfully complete the advanced trauma life support course (known in Australia as the Early Management of Severe Trauma, or EMST, course) and obtain satisfactory mentor assessments from at least two 6-month clinical attachments.

ADVANCED TRAINING

Selection into advanced training is highly competitive in all specialties, with about 50% of the candidates presenting being selected at any one time. Overall numbers of trainees are governed by manpower requirements as well as the number of available training posts. Training is carried out in a series of 6-month attachments, usually to a pair of surgeons functioning as a team. Trainees are expected to gain operative surgical experience as well as experience in assessing acute and elective patients in the emergency and outpatient departments. Trainees must keep a logbook of surgical experience and document their involvement in cases. They must determine whether they acted as the surgeon in 1 of 3 categories (mentor available, mentor present but not scrubbed, or mentor scrubbed and assisting) or as the assistant. Cases are designated as major, intermediate, or minor depending on a college definition and trainees are expected to be involved in at least 100 major cases in each 6-month attachment. The number of intermediate and minor cases is generally twice the number of major cases. The trainees' involvement in major cases is expected to increase with seniority. In a trainee's first year, he or she should be involved as surgeon in major cases about 20% of the time, whereas in the last year of training, this involvement should be at least 50%. Some research output and attendance at relevant conferences and training days is also expected. After completing the proscribed training, there is an exit examination. This is usually taken halfway through the final year of training. It involves a written component as well as oral examinations in anatomy, pathology, operative surgery, and clinical case management. It is expected that the training will have prepared the trainees adequately for the examination and the overall pass rate is about 90%.

Although training has in the past been conducted within 4 regional areas, many training programs are now nationally or, in the case of neurosurgery, cardiothoracic surgery, and vascular surgery, internationally based (in partnership with Australia). Vascular surgery has only recently been granted divisional status within the RACS and is tested by a separate examination process. Only in the last 12 months has it been defined as a category of vocational registration in New Zealand. Selection occurs at a single national meeting of the relevant specialty training committee and allocation of training posts is also organized on a national basis. Surgeons in training in many specialties can expect to spend their 4-year to 6-year training period in several hospitals in up to 3 different geographic regions of New Zealand (and/or Australia). Approximately 100 young surgeons are in training at any one time in New Zealand, with general surgery (40 training posts) and orthopedic surgery (26 training posts) being the largest groups. Although more than 50% of medical school classes are now made up of women, less than 10% of surgical trainees are women. This bias reflects the smaller numbers who present themselves for selection compared with their male counterparts.

CONTINUING
MEDICAL EDUCATION

Continuing medical education is verified by the RACS on an annual basis. There is no points system per se, but surgeons must accru e a certain number of hours in a variety of areas such as audit, conferences, and courses to qualify for recertification. A major highlight of the surgical year is the Annual Scientific Congress of the RACS, which is attended by more than 1000 delegates.

SURGICAL SOCIETIES
AND RESEARCH

Surgical research in New Zealand is conducted mainly, but not exclusively, within the universities. Over the years, there have been signal contributions in the fields of transplan t immunology, vascular surgery, cardiac surgery, and nutrition and metabolism. Surgical trainees may elect to spend periods of 1 to 3 years in the research laboratory and, very recently, a combined PhD/FRACS training program has been introduced for those who choose a career in academic surgery. The Surgical Research Society of Australia, founded in 1962, meets in centers throughout Australia and New Zealand once a year with a program and format very similar to its British counterpart.

HEALTH CARE PROVISION

Every resident in New Zealand is entitled to health care provided by the state. However, the completeness of the health care coverage and the promptness of the service have decreased in recent years. In addition to universal health care provisions, New Zealanders have the option of purchasing private health care insurance. About 25% of the population has private coverage. This provides options with regard to a range of general practice, medical, and surgical services. About 7% of gross domestic product is spent on health care services. As in many other countries, most patient consultations are with general practitioners. Although patients may elect to go to the emergency departments in public hospitals or private urgent care centers, the former are only available for emergencies and the latter provide episodic rather than continuing care. General practitioners' services are largely provided at a cost to patients, with a small subsidy (<25%) provided by the state. More gen-
In the late 1980s, a philosophy known as the “funder-provider split” was introduced into New Zealand health care. Previously, hospitals and primary health care facilities were administered by health boards that were allocated budgets by the central government; these health boards were responsible for administering health care facilities and providing patient care. In the financial climate of the last decade, this dual responsibility was thought to be fiscally unhealthy. Thus, a system in which one organization (currently the Health Funding Authority, Wellington) allocates the funds (called the funder) and others (currently, general practitioner groups and hospital health services) provide the care was developed. The latter groups must be financially prudent and compete between themselves for the funds from the Health Funding Authority. For clinicians, the last decade has seen a burgeoning in the amount and cost of health care administration. Whether this has placed providers or patients in a better position than if there had not been regulations of more specialists who immigrate to New Zealand will be accepted as valid. This will place increasing pressure on the ability of the RACS and other continuing medical education organizations to provide ongoing education and recertification.

In the future, this has been resisted, and in large part, overseas specialists who immigrate to New Zealand are required to complete some part of the FRACS and to engage in the continuing medical education process. In the future, it is possible that the qualifications of more specialists who immigrate to New Zealand will be accepted as valid. This will place increasing pressure on the ability of the RACS and other continuing medical education organizations to provide ongoing education and recertification.

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ARCHIVES OF INTERNAL MEDICINE

The Role of Spiral Volumetric Computed Tomography in the Diagnosis of Pulmonary Embolism

M. Douglas Mullins, MD; Daniel M. Becker, MD, MPH; Klaus D. Haghsipiel, MD; John T. Philbrick, MD

To evaluate the evidence for the use of spiral volumetric computed tomography (SVCT) in the diagnosis of acute pulmonary embolism (PE), the 11 English-language studies published through July 1998 that compared SVCT with a reference standard for PE were systematically reviewed. Among the reviewed studies, methodological problems were common. Only 5 of these studies fulfilled 5 of 11 basic standards addressing important issues in diagnostic test research. The reported sensitivities of SVCT compared with pulmonary angiography varied widely (64%-93%), which was likely the result of differences in study populations. Spiral volumetric computed tomography may be relatively sensitive and specific for diagnosing central pulmonary artery PEs, but it is insensitive for diagnosing subsegmental clots. Spiral volumetric computed tomography may have a role as a "rule-in" test for large central emboli, but additional research is required to establish its place in clinical practice. (2000;160:293-298)

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