Academic / Government Partnership: The Development of Academic Medicine in Singapore

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“A New Era of Patient Care”
Outline

• About Singapore

• Medicine in Singapore

• Singapore’s transformation from Third World to First World

• Development of Academic Medicine in Singapore
Profile of Singapore

Size: 700 sq km

Population: 4.6 M (3.6M)
Chinese: 76%
Malay: 14%
Indian: 9%

Language of business and education: English
Other official languages: Mandarin, Malay, Tamil
Profile of Singapore

- General literacy rate (over 15 years of age): 95%
- GDP: US$161 billion
- Per Capita GDP: US$ 37,489 (17th in the world)
- Official foreign exchange reserves: US$ 171 billion

Source: Monetary Authority of Singapore, 2007
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Medicine in Singapore

• 5 public hospitals; 1 women’s and children hospital; 1 mental health hospital
• 80% of public obtain their chronic health care in public hospitals
• Co-payment with Govt subsidy / co-payment with employer / self payment; private insurance being encouraged as “top-up”
• Ranked 6th in world by WHO for quality of health care
• Currently, health care is 3% of GDP; planned to slowly rise to 7% with aging population
Medicine in Singapore:
Top 10 Causes of Death

1. Cancer 28%
2. Ischemic Heart Disease 21%
3. Pneumonia 16%
4. Cerebrovascular Disease 12%
5. Trauma 5%
6. Other Heart Disease 4%
7. COPD 4%
8. Diabetes Mellitus 4%
9. Urosepsis 3%
10. Chronic Renal Failure 3%
Medicine in Singapore

- National University of Singapore Medical School founded in 1905

- The first institution of higher learning in Singapore

- An undergraduate medical school, modeled on the British system, with entry after high school. The degree is an MBBS, or Bachelor of Medicine, Bachelor of Surgery.
Medicine in Singapore

- Medicine remains the most competitive School for University admission in Singapore and the region

- Each year, over 2,000 top students apply for only 250 places
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Singapore’s Development: From Third World to First World

1965: Geography: Port

1970s: Petrochemicals, Singapore Airlines

1980s: Electronics and Computers

1990s: Financial Services

1997: ?
The Case for Developing Biomedical Sciences in Singapore

- Tilting of world’s economic center towards Asia
- Rapidly growing educated middle class want treatment for chronic disease
- By 2020, burden of world’s chronic disease will be in Asia
- Major repository of scientific talent – especially young talent in IT, engineering, mathematics
The Case for Developing Biomedical Sciences in Singapore

- Asians and Caucasians have differences in biology and drug handling that are not well characterized

- Pharmaceutical industry understands this

- Need for centers of excellence to complement those in the West
Singapore: Unique Features for Biomedical Research

- Compact; easy to get around and meet collaborators
- 80% of population get medical care from 7 public hospitals
- All citizens have unique identifier number when born
- Chinese, Malay, Indian populations
- High degree of IT use
- English is language of education, science, and business
- Supportive government for research, education, and healthcare
Ethnic diversity

76% Chinese
14% Malay
9% Indian
1% Others
The Case for Developing Biomedical Sciences in Singapore

**With the 3 different populations: Chinese, Indian, and Malay, we can:**
- help develop therapies relevant to our community and nearly half of humankind

**With a supportive government, compact size, and competitive infrastructure, we can:**
- help accelerate drug and technology development and attract industry to invest and create high value jobs
Why May Ethnicity and Population Matter?

**PHENOTYPE**
- Toxicity
- Response

**GENOTYPE**
- Drug metabolising enzymes
- Drug transporters
- Receptors
- Serum proteins

**Patient characteristics**
- Organ function
- Nutritional and inflammatory status
Lung Cancer In Asians May Be Different From North America
EGFR Selective Small Molecule Tyrosine Kinase Inhibitors

**EGFR tyrosine kinase activity requires ATP**

Gefitinib and Erlotinib compete for ATP binding

**Reversible inhibitors**

**Orally bioavailable small molecules**

*Gefitinib = ZD1839, Iressa®
**Erlotinib = OSI-774, Tarceva™*
Factors Predicting Response to Gefitinib & Erlotinib

Data of 5 studies (n=1256)

Gazdar; Hong Kong 2004
Somatic mutations of the EGFR genes was identified in 8/9 pts with gefitinib-responsive NSCLC.
No mutations were detected in 7 pts with no response to gefitinib.
Consistent findings were also reported in Science (2004;vol 304) and PNAS (2004;vol ...
Help From Friends

Ed Holmes
Judy Swain
Dan Tenen
Edison Liu
Axel Ullrich
Yoshiaki Ito
Neal Copeland
Nancy Jenkins
Biomedical Sciences Value Chain

- Research
- Development
- Manufacturing
- Healthcare Services

Human Capital Development
Intellectual Capital Development
Industrial Capital Development
Biomedical Sciences (BMS)
Manufacturing Performance 1986-2006

Cumulative Output (1986 – 2006) - S$125 billion

- S$23 billion (2006)
- S$6 billion (2000)

Manufacturing Output | Value-Added
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The University and University Hospital

- Biopolis - BII
- Biopolis - GIS
- Biopolis - IBN
- Biopolis - IMCB
- Biopolis - BTI
- Biopolis - Novartis

- National University Hospital
- Temasek Life Sciences Laboratory
- Center for Life Sciences
- Dentistry
- DMERI
- Science
- Computing
- MRT
- Engineering
- Computing

Legend:
- Accommodation
- CEN
- Campus Dining
- Library
- Carpark
National University Hospital

- 960 beds

- 58,000 inpatient admissions. Average LoS: 5 days.
- 85-90% occupancy

- 600,000 outpatient attendances
- 115,000 ER attendances

- 560 medical and dental staff
- 1900 nurses
- 580 allied health
# Yong Loo Lin School of Medicine

## Full Time Faculty

<table>
<thead>
<tr>
<th>Position</th>
<th>Count</th>
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</thead>
<tbody>
<tr>
<td>Full Professors</td>
<td>39</td>
</tr>
<tr>
<td>Associate Professors</td>
<td>102</td>
</tr>
<tr>
<td>Assistant Professors</td>
<td>86</td>
</tr>
<tr>
<td>Total</td>
<td>227</td>
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</tbody>
</table>

## Student Numbers

<table>
<thead>
<tr>
<th>Category</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Undergraduate Medical Students</td>
<td>1,203</td>
</tr>
<tr>
<td>Graduate Students (MSc, PhD, Grad Diploma, Master of Nursing)</td>
<td>589</td>
</tr>
<tr>
<td>Master of Medicine (MMed)</td>
<td>49</td>
</tr>
<tr>
<td>Life Sciences Undergraduate Students</td>
<td>1,700+</td>
</tr>
<tr>
<td>Nursing Degree Students (2 intakes)</td>
<td>98</td>
</tr>
</tbody>
</table>
Governance NUS and NUH: Pre-2008

Ministry of Education

NUS Board

President

Provost

Dean Yong School of Medicine

Heads, Academic Depts

NUS HOD Meeting

NUH Medical Board Meeting

Joint appointments

Ministry of Health

Natl Healthcare Group Board

CEO, Natl Healthcare Group

CEO NUH

Chairman of Med Board, NUH

Chiefs, Clinical Departments
Thinking about academic medicine in Singapore

February 2006

The School of Medicine’s International Advisory Panel, comprising Ed Holmes (UCSD), Ralph Nachman (Cornell), and Tak Lee (King’s College, London) recommend unification of the Medical School and the University Hospital under a common governance and led by an academic physician.
BMS International Advisory Council

Sir Richard Sykes (Chairman)  
Imperial College (UK)

Dr John Mendelssohn (Co-Chairman)  
MD Anderson (USA)

Dr David Baltimore  
California Institute of Technology (USA)

Dr Sydney Brenner  
The Salk Institute (USA)

Dr Leland Hartwell  
Fred Hutchinson Cancer Research Center (USA)

Dr Peter Gruss  
Max Planck Society (Germany)

Dr John Reed  
Burnham Institute (USA)

Dr John Bell  
University of Oxford (UK)

Dr Colin Blakemore  
Medical Research Council (UK)

Dr Philippe Kourilsky  
College de France (France)

Dr Harriet Wallberg-Henriksson  
Karolinska Institutet (Sweden)

Dr Suzanne Cory  
WEHI (Australia)

Dr William Evans  
St Jude (USA)

Dr Helen Hobbs  
UT Southwestern (USA)

Dr Tadataka Yamada  
Gates Foundation (USA)

Dr Rolf Zinkernagel  
University of Zurich (Switzerland)

Sir Philip Cohen  
University of Dundee (UK)

Dr Alan Bernstein (Emeritus)  
Canadian Institutes of Health Research (Canada)

Dr Richard Lerner (Emeritus)  
Scripps Research Institute (USA)

Sir George Radda (Emeritus)  
University of Oxford (UK)

Dr Samuel Barondes (Emeritus)  
University of California, San Francisco (USA)

Dr Stanley N. Cohen (Emeritus)  
Stanford University (USA)

Dr David I. Hirsh (Emeritus)  
Columbia University (USA)

Dr Susan Lindquist (Emeritus)  
Whitehead Institute of Biomedical Research (USA)

Dr Paul A. Marks (Emeritus)  
Memorial Sloan-Kettering Cancer Center (USA)

Dr Alan Munro (Emeritus)  
University of Cambridge (UK)

Sir Keith Peters (Emeritus)  
GlaxoSmithKline (UK)

Dr Hans Wigzell (Emeritus)  
Karolinska Institutet (Sweden)

Dr Axel Ullrich (Emeritus)  
Max-Planck Institute of Biochemistry (Germany)

Dr John Shine (Emeritus)  
Garvan Institute of Medical Research (Australia)
Thinking about academic medicine in Singapore

December 2006:

Singapore’s International Advisory Council for Biomedical Sciences chaired by John Mendelsohn and Sir Richard Sykes recommends management and governance structures to help advance medical education, research, and healthcare delivery in an integrated fashion. The Council recommends development of Academic Health Centers – hospitals which do not focus solely on clinical service, but whose missions encompass and integrate teaching and research as equally important pillars.
The Second Medical School
Duke-NUS Graduate Medical School
Developing New Models of Governance
Thinking about academic medicine in Singapore

March 2007

A Study Team, led by the Permanent Secretary of the Ministry of Health, meets with the Association of Academic Health Centers in the U.S. and discusses pros and cons of unified governance between University Hospital and Medical School
July 2007

The Govt approves the formation of the National University Health System, unifying the governance of the National University Hospital with the Yong Loo Lin School of Medicine and the Faculty of Dentistry into an integrated healthcare system with a tripartite mission.
The Tripartite Mission

- **Best Clinical Care**: Sets standard of care, esp for complex cases
- **Best Training**: Attracts and anchors future leaders
- **Great Research**: Brings hope, wins research $, and inspires everyone
Four Immediate Platforms

1. INTEGRATED strategic planning
2. ONE common budget & resource allocation system
3. HARMONISED HR framework
4. INTEGRATED space management
Components of Academic Medical Research

- Disease Category
  - Health Service Research
  - Clinical Trials
  - Animal Models
  - Disease Oriented Research
  - Basic Research
Areas of focus:
5 diseases interrogated by 8 platforms in a matrix fashion.

- Health Services Research & Biomedical Ethics
- Molecular Epidemiology
- Genomics, Proteomics, Metabolomics & Molecular Pathology
- Immunology
- Imaging
- Experimental Therapeutics
- Bioengineering and Tissue Engineering
- Bioinformatics and Medical Informatics
Ultimately……

• Can we improve the health of our community?

• Can we shape the practice of medicine?

• Can we attract the best to a career in academic medicine?

• Can we contribute to the nation’s economy?
Welcome to NUHS …

Centre for Translational Medicine
Lecture theatres, seminar rooms, library, patient simulation, Investigational Medicine Unit, molecular pathology, Clinical Imaging Research Center Labs, BSL-3 facility: 40,000m2. Expected Completion: 2010
Welcome to Singapore!
Thank you