Developments in Biomedical Sciences Education in Asia....

....and Current Challenges for Biomedical Sciences Educators, Practitioners and Researchers

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The Hong Kong Polytechnic University
The Hong Kong Polytechnic University (PolyU)

- 1937: Government Trade School
- 1947: Hong Kong Technical College
- 1972: Hong Kong Polytechnic (HKP)
- 1994: The Hong Kong Polytechnic University (PolyU)
- Currently the largest higher education institution in Hong Kong in terms of student numbers

www.polyu.edu.hk
Some key facts on Hong Kong:

Sub-tropical city, 22°N.
One of the most densely populated areas in the world.

Hong Kong : 1,104 km²

km2http://www.ifitweremyhome.com/compare/GB/HK
Key Facts on Hong Kong

- **Population**: 7,324,300; 46% male, 54% female
  - 11.1% aged <15 years
  - 74.2% aged 15-64 years
  - 14.7% aged 65 years and above (up from 3% in 1960)

- **Life expectancy among highest in the world**: 81.2 years for men, 87.3 for women

UK figure for those aged 65+ is 18% (up from 12% in 1960)

http://www.censtatd.gov.hk/hkstat/sub/so20.jsp
http://data.worldbank.org/indicator/SP.POP.65UP.TO.ZS
The Hong Kong Government funded health services sector (Hospital Authority and Department of Health) is the major employer of our PolyU biomedical science graduates.

The public (and private) healthcare sector and the core professions have to meet community demand, anticipate changing needs, and adopt new technologies in an effective and timely manner.

Educational programmes have to prepare graduates to fit the needs of their profession and to adapt to - and drive - developments to meet future needs.
Health Services and Costs in Hong Kong
Health Services in Hong Kong

Department of Health & Hospital Authority, Main Public Healthcare Providers in HK

- 42 hospitals under the Hospital Authority (27,895 beds)
- 11 private hospitals (4,0314 beds)
- 59 nursing homes (5,498 beds)
- 21 hospitals in correctional institutions (880 beds)
- Department of Health clinics
- Private clinics

Health Facts of Hong Kong 2015 edition
www.dh.gov.hk
HA and DH Outpatient Clinic Attendees:
> 24,500,000/year
- Dept. Health: 6,215,237
- Hospital Authority:
  - 16,100,458 (general, family & specialist) patient visits
  - 2,225,486 Accident & Emergency

Plus, many private clinics

Sources: Health Facts of Hong Kong 2015 edition www.dh.gov.hk
Healthcare Professionals in Hong Kong

Mainly PolyU FHSS graduates

**Registered Healthcare Professionals**

- **3,297 Medical Laboratory Technologists** (1:2,222 of population)
- **50,461 Nurses** (1:145)
- **2,121 Radiographers** (1:3,453)
- **2,792 Physiotherapists** (1:2,652)
- **1,783 Occupational Therapists** (1:4,108)
- **2,165 Optometrists** (1:3,353)
- **13,726 Medical Doctors** (1:534)

figures from: Health Facts of Hong Kong 2015 edition (www.dh.gov.hk)
Total Expenditure on Health in Hong Kong in 2012/13 (latest figures available)

HK$ 112,144,000,000 (~10,900,000 pounds)

47.6% Public Expenditure
52.4% Private Expenditure
Healthcare Expenditure in Hong Kong
(2012/13, latest figures available)


- Curative care
- Rehab and extended care
- Long-term care
- Ancillary services
- Medical goods
- Admin & Insurance
- Investment in medical facilities
- Prevention & Public Health

3.6%
Turning to Biomedical Sciences Education

- History
- Current situation and needs
- Future demand
- Challenges
- The education/clinical practice/research interplay
- What are we doing at HKPolyU?
PolyU History in Biomedical Science/Medical Laboratory Science education in Hong Kong: first and until recently the only provider MLS graduates from IBMS accredited courses

- *FINALLY*, UGC approval for 3 year, A level entry FT BSc(Hons) in Medical Laboratory Science (2004) *(changed to 4 year programme in 2012)*
- Numbers on the programmes are mandated by HK Govt; 34 → 44 in 2012 → 55 in 2016 *(to meet employer (HK Hospital Authority) demand)*

Currently UGC-funded BSc(Hons) Medical Laboratory Science (MLS); the only one recognized for automatic registration of graduates with HK Medical Technologist’s Board

PolyU also runs a s/f MSc in Medical Laboratory Science

Also, Research Postgraduate degrees *(UGC funded MPhil and PhD degrees, and a s/f Doctor of Health Science programme)*

*Demand is high, and some s/f and franchised u/g MLS/Biomedical Science programmes are being offered/planned*
What are the needs and demands of the community in terms of biomedical science services in the healthcare sector?

How does this impact on developments and challenges in Biomedical Science clinical practice – and educational programmes?
Community needs and demands

Changing population demographics

Increased community expectations
Globally, the population is ageing

- 88% of all newborns born in developed countries will live past 65 years of age; 44% will live past 85.
- The number of people aged >65 is expected to double between 2010 and 2040 (from 40M to 80M in US)
- The number of people aged >85 years will also double (from ~8M to 16M)

Obesity increases risk of heart disease, cancer and diabetes,

Up to 130 million people in the Asia-Pacific region could suffer from obesity by 2010.

By 2030 Asia is expected to have 190 million diabetes cases (more than half of them in India and China), due primarily to a dramatic rise in obesity.

Scientists say the percentage of overweight/obese people in India is on track to rise from 9% in 1995 to 24% in 2025.

From 1989-97, the proportion of overweight males in China almost tripled; by 2025, more than 38% of Chinese adults are estimated to become overweight or obese.

Obesity can triple the risk of heart disease.
10 Leading Causes of Death Globally (together accounting for 52% * of deaths annually worldwide)

Data from World Health Organization www.who.int/mediacentre/factsheets

Red = non-communicable, age-related disease;  *34% of total
Non-Communicable Disease (NCD): the major threat to global wellbeing

◆ Cause ~ 36 million deaths per year

◆ Disabilities from NCD account for ~79% of all years lived with a disability

◆ The World Economic Forum ranked NCD as one of the greatest risks to global well-being, and project a cumulative loss of US$47 trillion by 2030 due to NCD

◆ UN Political Declaration on NCD states that “...the global burden of NCDs constitutes one of the major challenges for development in the 21st century.”

Source: InterAction Global Health Briefing Report 2013
How does the scenario impact on clinical practice?

What are the developments in Biomedical Science education that are needed within the context of this ‘demand scenario’?
Growing epidemic of age and obesity related diseases driving increases in healthcare costs and development of tools to detect and manage these diseases

Increasing consumer-driven healthcare delivery systems driving higher demand for specialized services

‘Cradle to grave’ individual electronic health records – higher demand for IT literacy and accountability

Rapid developments in genomic and proteomic guided targeted diagnostic and therapeutic testing (personalized medicine) – greater education, planning, resource and management needs

Growing gap between scientific and medical demands for innovation in and access to healthcare and the ability to deploy the workforce necessary to meet these demands
Impact on clinical practice

- Higher workload and costs
- Reduced TATs
- More automation and IT
- More specialized tests
- Development, evaluation and adoption of new technologies, tools, and evidence-based laboratory tests
- Wider test menus
- More stringent standards for accreditation
- Higher educational needs – basic and CPD
- More flexible, well qualified, responsible, adaptive, innovative personnel
- Higher level management skills

How do we prepare our graduates to cope?
The changing laboratory environment - moving towards total automation for routine analysis
The Rise of the Machines

How does this impact on clinical practice and educational needs in Biomedical Science?
Challenges to Universities Providing Biomedical Science Programmes

- Resourcing – staff, equipment, space
- Relevance and currency of curricula, learning facilities and pedagogical approaches
- Logistics – balancing
  - fundamental scientific principles & specialized knowledge
  - theory and practical aspects
  - scientific and life skills
- Teaching/research/clinical balance
In curriculum planning and delivery – we need to pay more attention to:

- Management
- Accreditation
- Quality control
- Specialized scientific, analytical and IT skills (genomic, LC-MS/MS, data management….)
- Development and evaluation of new biomarkers, tools and technologies, – how is this done?
- Increasing use of POC testing
- Life skills - adaptability, communication, responsibility, self-motivation, life-long learning, service, cross-cultural understanding, ethical behaviour
- Research skills – to drive innovation and knowledge acquisition
.... and yet, keep the bread and butter stuff

- The basic scientific pathological and analytical principles
- The routine tests
- Professional standards
- Clinical relevance
How are we doing?

Is the current biomedical science healthcare service meeting community needs?

As educators, are we equipping our Biomedical Science graduates to provide the best service?

As biomedical science researchers, are we driving healthcare innovations in the right direction?
Are our graduates equipped to develop into Researchers, scientists, advisors and industry leaders.
Example: Diagnosis of Acute Myocardial Infarction – ultra sensitive Troponins….. Earlier diagnosis….. Years of intensive research ➔ routine clinical approach

…but, what does confirmation of diagnosis achieve?
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**Health assessment & risk reduction offer far greater potential for benefit**
Developments at PolyU
Developments @ PolyU

- More broad based (4 year curriculum) – all outcome based
- International outlook and more overseas exchange opportunities
- Introduction of compulsory Service Learning subject
- More project work, PBL, critical analysis, peer assessment, assessed team activities
- Compulsory ethics subjects [for RPgS]
- Greater involvement in research – summer research internships/paid student helpers on staff research projects
- Greater variety of pedagogical approaches - e-learning, interactive, flipped classroom, PBL
- Student e-portfolio
- Healthy lifestyle subject
- Research Methods and Biostatistics subjects
- More Molecular Biology subjects
- More modern equipment for hands-on labwork
- More modern, vibrant teaching spaces
Transforming classrooms
Creating AV/IT-assisted and interactive spaces and a colourful, modern, comfortable environment
Promoting small group and interactive, collaborative learning – The ZONE
Challenges

- Fitting it all in, updating curriculum and yet still meeting the requirements of the Hong Kong Medical Technologist’s Board for registration of our graduates and IBMS for accreditation

- Increase in student numbers – challenges re. laboratory and project work and places for clinical attachment

- Overseas exchange – finding good partners

- Recruiting academic staff – PhD, research track record, clinical experience, teaching ability

- Resourcing (equipment) and lab space

- And ........ getting the research/teaching balance right