**Appendix**

**Building an academic workforce from scratch within a quarter of a century: the Malaysian example**

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**Background**

Within any health service, 2.4 billion people worldwide can benefit from rehabilitation.1 This means, for 10 million Malaysians, i.e. 30% of a population of 32.7 million,2 rehabilitation can potentially change their lives. Up till 1962, seven years post-independence, there was one medical school based in Singapore that produced doctors much needed for the country’s health service. When the Faculty of Medicine, University Malaya (UM), moved to its present premise in Kuala Lumpur, the Foundation Dean had included rehabilitation as one of the clinical services to be developed. The Rehabilitation Unit became functional in 1968.3 In 1980, an academic Rehabilitation Medicine incubator was initiated by the Vice Chancellor. The Chief of Orthopedics headhunted Zaliha Omar and appointed her as the first rehabilitation academic staff trainee (AST). Since then, Malaysia has seen a crescendo of academic, clinical and community disability rehabilitation services. Systems thinking in community engagement, educational politics, policies, management, and leadership in the rapidly changing situation had enabled this. The turning point in the rapid development from the preceding sluggish years was the United Nation’s declaration of the International Year of Disabled Persons (IYDP) in 1981.4

**Introduction**

Malaysia was then helmed by a physician Prime Minister, Mahathir Mohamad, whose wife (also a doctor) was passionate about people with disabilities (PWD). They both led Malaysia's active participation in many aspects of rehabilitation, especially in collaboration with the United Nations Economic and Social Commission for Asia and the Pacific.5 In the meantime, Mahathir’s Look East policy6 forced an early return of Zaliha Omar from her training in Medical Rehabilitation at the British Postgraduate Medical Education, University of London.7 Ironically that became a turning point in her career. The Diploma of Medical Rehabilitation, Royal College of Physicians, London (DMR RCPLond.), was then the premier qualification in rehabilitation for doctors(Personal Communication: RCB Wynn Parry, 1984). Three doctors who worked in Malaysia in the 1970s had acquired the DMR RCPLond. earlier but two confined themselves to clinical work within orthopedics and the third within the Department of Welfare services.

It was a little different for Zaliha Omar. The packed training program took her through the gold standards for clinical rehabilitation practice in rheumatology, neurology, spinal cord injury, pediatrics, orthopedics, cardiology, rehabilitation technology, sports, and geriatrics by renowned experts in the field. The regular multi and interdisciplinary teamwork seemed overwhelming at each weekly grand round at various hospitals, namely 1) the Royal National Orthopedic, 2) Stoke Mandeville,3) Neurology Institute, Queen's Square, 4) Children's Hospital, Great Ormond Street, 5) Charing Cross, 6) Queen Mary, 7) University College Hospital, and others that she was posted to. The cramped and totally new lessons learned in two years turned out to be the essential and precious micro-components of rehabilitation practice that she took home. They were eagerly used to the fullest throughout her tenure in developing the academic workforce in rehabilitation medicine from scratch in Malaysia over a quarter of a century.

**The Formative Years**

The foundation of rehabilitation in Malaysia dated back to the 1930s at the Sungai Buloh National Leprosarium.8 Many UM medical students acquired their first taste of basic rehabilitation principles there. Modernization of rehabilitation practice that followed leveraged on leprosy rehabilitation that had been established.

In 1984, medical rehabilitation was formally incorporated into the UM medical school curriculum through teachings in orthopedics. In 1989 when the postgraduate training in orthopedics started, a rehabilitation component was included in the curriculum and the examinations. This gradually evolved into an inclusive component for other postgraduate medical studies at the faculty of medicine9 including primary care medicine, internal medicine (neurology and geriatrics) and pediatrics. A seamless multidisciplinary collaboration was a bonus to be established. These served partly as bases for the rehabilitation medicine residency, managed by the Department of Allied Health Sciences in 1997. A year earlier the residency in sports medicine and rehabilitation10 had started in the same department. Its academic, clinical, community and administrative resources were shared with that of rehabilitation medicine which started off with nominal budget.

In the meantime, from 1980, clinical rehabilitation services developed by leaps and bounds at the rehabilitation unit11 UM Medical Center (UMMC). There was already a dedicated psychiatric rehabilitation unit,12 headed by a psychiatrist from the Department of Psychological Medicine. This was an added advantage as clinical psychology quickly became an essential component of the medical rehabilitation service. Over two decades the number of patients and staff increased more than 10-fold. There was rapid development and increase in the number of multidisciplinary (MDT), interdisciplinary (IDT), and transdisciplinary (TDT) teams; the chronological events are illustrated in Table 1. MDTs were formed with resources from internal medicine (neurology, geriatrics, and rheumatology), pediatrics, social obstetrics (sexuality), orthopedics, neurosurgery, and anesthesiology (pain management). From 1986 to 1991 special interest physiotherapy training in sports, stroke, traumatic brain injury, orthopedics, rheumatology, and pediatrics were conducted in collaboration with Cumberland College, Sydney, Australia. It was funded by Kuok Education Foundation. This had enhanced the preparation for an academic base for the rehabilitation medicine residency. Between 1991 and 1995, 4 teams of nurses, physiotherapists and occupational therapists were sent to internationally renowned centers for training in stroke, spinal cord injury, pediatric, burn and upper limb rehabilitation. They formed the first five special interest IDT that supported the residency training. TDT were developed for services that were scarce. From 1996 to 1998, a team of podiatrists from the United Kingdom was employed to train nurses in diabetic foot care. This was partly sponsored by ConveTec. Through this service and training residents were taught valuable skillsets for diabetic foot care and prevention of diabetic lower limb amputation. Some embarked on related research.

Considerable development also took place in rehabilitation technology, particularly in orthotics, prosthetics, and wheelchair management. The skills of craftsman appliance makers were upgraded through prosthetic and orthotic training in Japan. They were sponsored by the Japanese International Corporation Agency. In addition, for two decades Nakamura Brace company from Japan provided and sponsored inhouse training. MDT for prosthetic and orthotic management and continuing professional development program evolved through this endeavor. 20 Prosthetic and Orthotic update series were organized between 1986 to 2005. In 1994, UMMC collaborated with Motivation Charitable Trust of London in an inhouse training program for wheelchair manufacturing, modification, and maintenance management. Occupational therapy and engineering technicians were trained, and these services were formalized into daily rehabilitation tasks. IDT for wheelchair maintenance management, wheelchair boot camps and wheelchair tennis evolved out of this program. Rehabilitation technology service that evolved became another base for the rehabilitation medicine residency. Other TDT services that grew included counseling, speech, swallowing and complementary integrative rehabilitation.

Working alone as a pioneer Rehabilitation Physician for 13 years in a 900-bedded general hospital setting at UMMC,13 Zaliha relied on daily feedback and critiques from colleagues, patients, staff, and the public for a continual improvement process in the early development of rehabilitation medicine. Regular attendances at international conferences and a network of like-minded people worldwide provided much needed reflections, guidance, and thoughts on the way forward. The political, other environmental situations and the Asian financial crisis in 1997 resulted in the rehabilitation medicine residency training being approved conditionally without dedicated funding for the first five years. Necessity being the mother of invention, Zaliha got creative and innovative. Alternative funding was acquired through endowments and contributions from the hospital, health industry, well-wishers, education foundations, general scholarships, and many others. The focus was academic development, hence international collaboration was a key strategy and finance became an essential element.

Faculty of Medicine UM had established a system of examination boards for all examinations. International members were appointed regularly. For the Master of Rehabilitation Medicine (MREHABMED) these assessors were made academic collaborators. Melbourne University provided an invaluable resource; for five years residents spent between 6 to 12 months at the Melbourne Extended Care and Rehabilitation Service center, Royal Melbourne Hospital, Australia14 and gained much insight and lessons from a polished and experienced academic center. Assessors from Indiana, Philadelphia, the Philippines, Indonesia, and Singapore provided the much-needed academic input when they willingly returned to help in teaching and research mentorship. Others who contributed were individuals from an extensive network of international organizations, e.g., International Rehabilitation Medicine Association,15 International Federation of Physical Medicine and Rehabilitation,16 International Society of Prosthetics and Orthotics,17 Japan Society of Prosthetics and Orthotics18 and Japanese Association of Rehabilitation Medicine.19 The University of Edinburgh and Academic Medical Center Amsterdam contributed towards curriculum development and the much-needed teachings and mentorship by experienced academics. A lasting academic relationship grew out of this strategy.

**The Virgin Curriculum Construct**

MREHABMED was the 22nd postgraduate medical training in the Faculty of Medicine UM.20 It leveraged on a standardized curriculum format, making it inclusive at the outset. Additionally, to ensure that all stakeholders’ needs were taken care of, deliberations were held with many including 1) community members, 2) people with disabilities (PWD), 3) their advocators,21-25 4) Department of Welfare,26 5) Special schools,27 6) Social Security Organization,28 7) Sports organizations,29 8) rehabilitation industry, and others. In addition, pioneers in rehabilitation medicine residency establishments worldwide were consulted. References were made to 1) the European White book,30 2) the Australian College of Rehabilitation Physician’s residency program,31 and 3) some residency programs in Physical Medicine and Rehabilitationin the United States.32 This culminated in a curriculum designed to meet local requirements in keeping with international standards and future needs. The community needs were addressed through one of the core components, i.e., community-based-rehabilitation (CBR). The basic sciences and clinical components were as exemplified by lead programs internationally. The external assessors for the annual board examinations served as resources for the yearly review of the curriculum for the first five years of starting the residency program.

**Leadership Role in Pioneering Rehabilitation Medicine Academia**

Isaac Newton in 1675 admitted to seeing further by standing on the shoulders of giants. In the same tone, the academic development of rehabilitation medicine in Malaysia could not have been done without the foundations that have been laid by many. It had taken many lessons from past leaders; the invaluable lessons through medical school, specific dedicated training, and tireless continuing education. For one in the lead, it is in fact deeply rooted in personal growth, early education, regular school, informal lessons and many more.33 Leaders must be creative in taking on various approaches including transformational, translational, democratic, emotional, and spiritual ones. Visionary leaders of pioneering work need to build on foundation works into pragmatic, propagative and sustainable ones. This is particularly important in general education and medical studies, rehabilitation medicine included. They must transform learners and followers into agents of change for the betterment of their chosen field. Students in turn may emerge as new leaders keeping vigil, rigor, and relevance of the field or subject as their passion and responsibility. Respectful and effective leadership demands spiritual consistency for integrity, honesty, and humility. It comes with showing respect for others, demonstrating fair treatment, expressing caring and concern, listening responsively, recognizing the contributions of others, democracy and regularly engaging in reflective practice.34 Succession plans must be put in place in a timely manner. Tactful withdrawal of leadership calls for sincere and selfless intent for future growth.

**Goal Orientation**

The common idiom ‘we must practice what we preach’ is very powerful; it is a useful principle in rehabilitation practice. At a macro level one needs to carefully thread through calculated risks to reach desired goals. They are often blurred at the outset, only to be felt evolving through seemingly endless time. At the UM, after a quarter of a century of concerted effort with numerous waves of trials and tribulations, blood sweat and tears, challenges and limitations, the light at the end of the tunnel gradually emerged after a quarter of a century. The triumph can only be celebrated many years afterward when sustenance of development and perpetual growth can be felt, seen, and watched by all.

**Outcomes**

MREHABMED is one of 22 postgraduate medicine programs offered by UM. The standardization of academic and administrative processes and governance has made Rehabilitation Medicine an inclusive specialty since 1997. It was preceded by Master of Sports Medicine and Rehabilitation in 1996 by default but had gained much from it. Five home-grown Rehabilitation Physicians graduated in 2001, the first of many batches. 21 years on, 105 have graduated. IDT within essential medical rehabilitation services is well established and continues to improve. MDT between Rehabilitation Medicine and other medical specialties as well as health services is growing rapidly. TDT management is still relevant for some services that are scarce, e.g., podiatry, psychology, and complementary integrative medicine. Four graduates have acquired doctorates in rehabilitation studies, and many more have been inspired to pursue this journey. Collaborative research is active not just in academia but also in institutions and health services throughout the country. This is assuring for ensuring inclusion of real-world data for evidence-based practice. Malaysian rehabilitation physicians, residents and medical students actively collaborate internationally with Cochrane Rehabilitation, ISPRM ICF Task Force, International SCI survey, Asian Spinal Cord Network, World Stroke Organization, American Congress of Rehabilitation Medicine, WHO Collaborative Centers, Fujita Health University, ASEAN universities and many other universities worldwide.

**Impact**

There has been a significant propagation of academic, clinical and community engagement development over the past two decades since the graduation of the first batch of Rehabilitation Physicians. Leaders who have emerged from amongst our resident graduates include the Dean of Medical school in University Technology Mara (UiTM) and Heads of academic rehabilitation medicine departments in six local universities. The director of our premier University Hospital, UMMC is one of MREHABMED first five graduates. So is the Chief Rehabilitation Physician in the Ministry of Health whose services span through 24 hospitals throughout the country. She helms the health and medical services that are accessible for the majority of the 30% of our population as stipulated by WHO.1 In four private hospitals, Rehabilitation Physicians serve at top management positions, further enhancing rehabilitation services for our population. All heads of the 15 rehabilitation medicine services of the Ministry of Health are UM graduates of MREHABMED. Many have reaped national and international accolades for their dedicated services.

In 1980 there were only three practicing rehabilitation physicians in Malaysia. They served at the Department of Welfare Rehabilitation Center Cheras and a rehabilitation unit at the General Hospital Kuala Lumpur. The academic path taken a quarter of century since then has developed a stable base for Malaysia, a middle-income developing country, to meet the healthcare rehabilitation needs of its population throughout the country.

**Conclusion**

A developing country must keep pace with the international development of rehabilitation medicine so that the 2.4 billion people in this world can access rehabilitation services through a robust healthcare system.1 Key to this endeavor is building academic workforce capacity as exemplified in this paper. The Malaysian experience highlights the importance of leadership, situational social and environmental conditions, community engagement, forward thinking policies, networking, as well as politics in determining the fate of the noble pioneering work in rehabilitation medicine.

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**Table 1: Significant milestones in medical rehabilitation capacity building in University Malaya (1980-2005)**

|  |  |
| --- | --- |
| New personnel, program, or service | Year of incorporation into a preexisting medical rehabilitation service at University Malaya Medical Center or academic program at Faculty of Medicine (1980 – 2005) |
| Rehabilitation Medicine ResidentRehabilitation PhysiciansMedical StudentsMultidisciplinary teams (MDT)Special Interest Group (SIG) Physiotherapists SIG Occupational therapistsSIG Rehabilitation NurseSpeech TherapistsPsychologistProsthetic & Orthotic Technical TrainingWheelchair Technical TrainingInternational Research CollaborationInternational Academic CollaborationMDT Rehabilitation Update seriesMDT P&O Update seriesInterdisciplinary Team ApproachTransdisciplinary Team ApproachIndividualized / Person Centered CareCommunity-based Rehabilitation |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 80 | 83 | 84 | 85 | 86 | 90 | 91 | 92 | 94 | 95 | 96 | 97 | 98 | 00 | 01 | 03 | 05 |
| Badge Tick1 with solid fillU1 |  |  |  |  |  |  | Badge Tick1 with solid fillU1 |  |  |  | Badge Tick1 with solid fillUM |  |  |  |  |  |
|  | Badge Tick1 with solid fillU1 |  |  |  |  |  |  |  | Badge Tick1 with solid fillU1 |  |  |  |  | Badge Tick1 with solid fillUM |  |  |
|  |   | Badge Tick1 with solid fillR |  |  |  |  |  |  |   |  |  |  |  |   |  |  |
| Badge Tick1 with solid fillSW |  | Badge Tick1 with solid fillCS |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  | Badge Tick1 with solid fillAU |  | Badge Tick1 with solid fillUK |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  | Badge Tick1 with solid fillUK |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  | Badge Tick1 with solid fillUK |  |  |  |  |  |  |  |  |  |  |
| Badge Tick1 with solid fillENT |  |  |  |  |  |  |  | Badge Tick1 with solid fillRU |  |  |  |  |  |  |  |  |
| Badge Tick1 with solid fillPSY |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|   |  |  |  | Badge Tick1 with solid fillJ |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  | Badge Tick1 with solid fillM |  |  |  |  |  |  |  |
|  |  |  |  |  | Badge Tick1 with solid fill U2 |  |  |  | Badge Tick1 with solid fillN1 |  |  |  |  | Badge Tick1 with solid fillWHO |  |  |
| Badge Tick1 with solid fillOJ |  |  |  |  | Badge Tick1 with solid fillU3 |  |  | Badge Tick1 with solid fillIPT | Badge Tick1 with solid fillN2 |  |  | Badge Tick1 with solid fillM | Badge Tick1 with solid fillUS | Badge Tick1 with solid fillG |  |  |
|  |  |  | Badge Tick1 with solid fillMR | Badge Tick1 with solid fillSG |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  |  |  | Badge Tick1 with solid fillOP |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | Badge Tick1 with solid fillID |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | Badge Tick1 with solid fillTD |  |  |  |  |  | Badge Tick1 with solid fillCIM | Badge Tick1 with solid fillDFC |  |  |  |  |  |  |  |
|  |  | Badge Tick1 with solid fillPCC |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
|  |  | Badge Tick1 with solid fillCBR |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

Key: Start of Master of Sports Medicine & Rehabilitation, UMMmmmmM Start of Master of Rehabilitation Medicine, UM |

* U1: 2 doctors were appointed as academic staff trainees were placed at the British Postgraduate Medical Education, London to be trained in medical rehabilitation. They acquired the Diploma in Medical Rehabilitation Royal College of Physicians London and became the two core academic staff for the launch of the MREHABMED residency.
* UM: First batch of five MREHABMED graduates from University Malaya (UM)
* R: Introduction of Rehabilitation Medicine Curriculum in medical school UM
* SW: Initiation of Multidisciplinary teamwork (MDT) with social workers from Medical Social Work Unit of University Malaya Medical Center (UMMC)
* CS: Start of MDT with clinical and support units of UMMC including psychological medicine (PM), internal medicine, Otorhinolaryngology (ORL), ophthalmology, dentistry, nursing, dietetics and others
* AU: A five-year special interest in physiotherapy training in collaboration with Cumberland College, Sydney Australia sponsored by Kuok Education Foundation, Malaysia.
* UK: First team of 3 were sent for interdisciplinary team (IDT) training in Stroke rehabilitation in Edinburgh and Southampton, United Kingdom. Subsequently 3 teams were sent to 1) Sir George Bed Brooke Spinal Cord Injury Rehabilitation Center, Perth Australia 2) Adelaide Children’s Hospital for pediatric rehabilitation, 3) Adelaide Hospital Burns Rehabilitation Centre 4) A private center for Upper Limb rehabilitation
* ENT: The first rehabilitative speech therapy and audiology service was outsourced from ORL unit
* RU: First speech and language therapist service in rehabilitation unit

 Psy: The start of regular clinical psychology service from PM unit

* J: Regular training of Orthotic and prosthetic technician by Japan International Corporation Agency followed by interdisciplinary training in house in collaboration with Nakamura Brace Company, Japan which sponsored the program for 20 years.
* M: In partnership with Motivation Charitable Trust of London an inhouse wheelchair technical training workshop and service were initiated, further strengthening IDT approach in rehabilitation
* U2: First collaborative research with University of Edinburgh, Scotland, through academic staff sabbatical leave partnership with UM.
* N1: First collaborative research with Academic Medical Center Amsterdam, Netherlands.
* WHO: First collaborative research with WHO ICF Collaboration Center.
* OJ: First academic collaboration with Japan through Orthopedics.
* U3: First academic collaborative initiative with Edinburgh University, Scotland
* IPT: First Academic collaboration with ASEAN countries, Indonesia, Philippines, and Thailand
* N2: First academic Collaborative initiative with Academic Medical Center, Amsterdam, Netherlands.
* M: First academic Collaborative MREHABMED residency initiative with University of Melbourne. All residents get to do part of their residency in Rehabilitation Medicine Department, University of Melbourne over a five-year period. This was a stop-gap measure for lack of core academic staff at UM.
* US: First academic Collaborative initiative with Indiana Medical school, USA.
* G: Academic Collaborative initiative with Maximillian University Germany.
* I: Academic Collaborative initiative with All India Institute of Medicine, India.
* MR: Start of continuing professional development (CPD) MDT medical rehabilitation series. 33 were organized in 20 years
* SG: Initiation of patient support group and community engagement culture into routine rehabilitative service at UMMC. Patient welfare fund and numerous diagnostic support group work grew over time.
* OP: Start of CPD MDT prosthetics and orthotics series. 20 were organized in 20 years
* ID: Beginning of IDT approach in medical rehabilitation culminating in sports, stroke SCI, pediatric, upper limb, burns rehabilitation that served as IDT base for MREHABMED residency.
* TD: Beginning of transdisciplinary teamwork to compensate for lack of essential staff in a wide spectrum of rehabilitative services including speech, swallowing counselling and other rehabilitation services.
* CIM: Start of alternative approach in rehabilitation and complementary integrative medicine with

introduction of acupuncture training and service by an acupuncturist from China. A grateful patient sponsored the program.

* DFC: Transdisciplinary podiatric work. Nurses were trained in diabetic foot care by podiatrists, a program partly sponsored by ConvaTec.
* PCC: Introduction of patient centered care approach.
* CBR: Introduction of community-based rehabilitation training and service in collaboration with non-governmental organizations, Department of Welfare, advocators for empowerment of people with disabilities etc..