



MGM INSTITUTE OF HEALTH SCIENCES

(Deemed University u/s 3 of UGC Act, 1956)

Grade 'A++' Accredited by NAAC

Sector-01, Kamothe, Navi Mumbai - 410 209

Tel 022-27432471, 022-27432994, Fax 022 – 27431094

E-mail : registrar@mgmuhs.com ; Website : www.mgmuhs.com

AQAR- 2021-22

Best Practice: 1:

Title of the Practice: Interdisciplinary training, research & development at MGM Centre in Human Movement Science (CHMS).

Objectives of the Practice:

MGM Centre of Human Movement Science is committed to develop the science of human movement and biomechanics in India. The Centre aims to disseminate fundamental knowledge and study applications of movement science for health promotion and rehabilitation, to address unmet local and global needs of people from across all economic strata of society. The conflux of scientists from health care and engineering is essential to meet this objective. A team of enthusiastic Physiotherapists, human movement scientists and mechanical engineers is working towards creating indigenous simple bold healthcare solutions; designed to engage the mechanical marvel of human body itself to keep people mobile and functionally independent. Faculty and students form physiotherapy, prosthetics and orthotics and mechanical engineering work together to solve health-related questions. The centre also provides training workshops to engineers and health care providers. The aim is to generate a task force within the country to undertake research & conduct integrated training for health care professionals & engineers to develop human movement science for health promotion; reduction of rising burden of non-communicable-diseases (NCDs) for e.g. diabetes, arthritis, Parkinson's, cerebral palsy, etc. and design and validate technology for rehabilitation of people with movement disorders

3. The Context

In India, a need for concerted, cohesive inter-disciplinary effort to develop appropriate movement related healthcare solutions is still perceived. Movement related health solutions can increase the compliance of patients to physical activity and thereby reduce the burden of non-communicable diseases. Engineers and healthcare professionals need to work together to achieve this goal. Medical device innovation has already gained momentum in India with the call of Atmanirbhar Bharat and Make in India slogan released by Hon'ble Prime Minister. Dedicated medical device innovation Centre's such as BETiC, TCS Innovation Labs, etc. seek complementary support from MGM Centre of Human Movement Science. MGM Centre of Human Movement Science is developing exemplary partnerships with various Engineering Institutes and other health professionals to address an urgent need of integrating clinical biomechanics in healthcare through the interdisciplinary work. However, the science of human movement is growing gradually. Health and Engineering Institutes like IITs (mechanical, biomedical and aeronautical engineering departments), IISc, Bangalore; BARC; DRDO, NITIE, SRASSC, Manipal Academy, Physiotherapy Institutes, SAI etc. are pursuing academic and research activities in human movement science. However, each institute is working in isolation within a specific mandate of funded projects; resulting in scattered growth of biomechanics throughout India. High-end fundamental research and elite applied clinical work is going on at a few health and engineering institutes, in addition to focused efforts towards indigenous development of robust and affordable prosthesis.



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4. The Practice

The centre has collaborated with various engineering institutes across country such as IIT-B, BETiC- IITB, IIT Madras, Somaiya Engineering College, Pillai College of Engineering, SVERI's College of Engineering, MGM College of Engineering, OMICS Lab, MGM Institute of Health Sciences to work on various interdisciplinary projects related to Health Science and Technology. Rarely in the Indian Higher Education systems multidisciplinary work is seen in the area of human movement science with students and faculty work together to solve health care problems. (MoU's attached in annexures).

Research & Development:

1. An interdisciplinary collaborative project between IIT Bombay and MGM Institute of Health Sciences, Navi Mumbai aimed towards developing a powered trans-tibial prosthesis for people with below knee amputation; funded by Department of Biotechnology, Government of India. Dr. Abhishek Gupta, Department of Mechanical Engineering, IITB and Dr Rajani Mullerpatan, MGM School of Physiotherapy, MGMIHS are the principal investigators working on the project and Dr. Swagatika Mishra, Department of Orthotics & Prosthetics, MGMIHS served as a co-investigator. A joint patent has been filed on 20.11.2021
2. The Centre has worked with BETiC, IIT Bombay to develop an indigenous device to measure the tissue stiffness of plantar cutaneous surface in patients with Diabetic Neuropathy. Currently there is no tool to measure plantar tissue stiffness as an indicator of tissue breakdown. Hence a tissue stiffness measurement device was developed and is in the process of being patented.
3. An indigenous Mechanical Actuated Stance Control Knee Ankle Foot Orthosis was developed by Aumeesh Tech Pvt. Ltd(Society of Innovation and Entrepreneurship) an SINE -IITB and BETiC incubated healthcare startup in the field of assistive devices and rehabilitation healthcare. The design was validated on 3D motion analysis system and the results were presented for a BIRAC, DST, Government of India grant. The clinical validation is on-going with MGM University Department of Prosthetics and Orthotics.
4. MGM CHMS worked in collaboration with IIT Madras to validate wearable inertial sensor-based (i-Sens) systems as an alternative to standard camera-based motion capture system for estimation of joint angle and gait parameters. Owing to its miniaturized size and wireless data transmission the setup finds its usefulness in indoor and outdoor environments. A paper was published in May 2022.
5. MGM CHMS team is working with MGM Paediatric Department and MGM College of Engineering on a project for Early Detection, Monitoring and Rehabilitation (DREaM) in children with Cerebral Palsy. One Junior Research fellow (Computer Science Department) has been appointment in this project.

Training:

1. Nine 1st year Orthopaedic residents from MGM Hospital were given a tour of Centre and explained the Basic Biomechanics of Gait.



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5. Evidence of Success:

Each of the above interdisciplinary work has translated to further develop the technology or transfer the knowledge to clinical practice.

1. Joint patent granted for: A device for measuring mechanical properties of tissues was applied and granted in September 2019.
2. The work on tissue stiffness has led to one provisional patent publication “Patent No: a device for screening of Diabetic foot: 201821005692”
3. The work on Mechanical Actuated Stance Control orthosis is ongoing (which has won BIRAC award) and 4 patients have been tested. The results are promising to continue work further.
4. The I sens project with IIT Madras has led to one research publication in PubMed journal” Patel G, Mullerpatan R, Agarwal B, Shetty T, Ojha R, Shaikh-Mohammed J, Sujatha S. Validation of wearable inertial sensor-based gait analysis system for measurement of spatiotemporal parameters and lower extremity joint kinematics in sagittal plane. Proceedings of the Institution of Mechanical Engineers, Part H: Journal of Engineering in Medicine. 2022 May;236(5):686-96.

5. Problems Encountered and Resources Required

The major problem is lack of dedicated engineering support at MGM CHMS to address the technical issues encountered during clinical validation. Secondly, consistently available transport vehicle will help in transportation of patients during clinical validation.

Challenges	Resources required
The major challenge the centre is to retain the engineering support to address the technical issues encountered during clinical validation.	A dedicated engineering support with funds for remuneration.
Travel of participants and patients for clinical validation is challenge.	A dedicated transport vehicle will help in smooth coordination of research and development work.
Lack of equipped IT – studio for designing, problem shooting and executing.	Dedicated funds to develop IT studio and Industry linkages.

7. Notes (Optional)

Please add any other information that may be relevant for adopting/implementing the Best Practice in other Institutions (in about **100 - 200** words). Any other information regarding Institutional Values and Best Practices which the university would like to include.