# *Tokyo Metropolitan University,*

# *Graduate School of Human Health Sciences*

## *Department of Frontier Health Sciences*

*Science of Muscle Physiology*

*Science of Functional Morphology*

*Evaluation and Management for Social Health, Medical Welfare, and Various Disasters*

*Medical Image Analysis and Management*

**We tackle various issues concerning human health sciences and medicine at the molecular, cellular, organ, individual, and social levels through strategies of interdisciplinary, leading-edge basic science research.**

The Department of Frontier Health Sciences consists of four fields and one endowed program: Science of Muscle Physiology, Science of Functional Morphology, Evaluation and Management for Social Health, Medical Welfare, and Various Disasters, and Medical Image Analysis and Management. In this department, we build flexible and organic collaborations with other departments to further promote education and research. We also make use of the most advanced and comprehensive research bases of our partner graduate schools in Tokyo medical partner organizations and so on to develop sophisticated researchers and educators in interdisciplinary and basic science research or academic fields, as well as training practicing expert professionals with broad-based knowledge and high-level research abilities.

**Science of Muscle Physiology "Let's measure the macro movement of organs at the nano level!"**

In the Science of Muscle Physiology field, we aim to unravel the mechanisms of muscle contraction and relaxation, which are the source of the movement of organs, and the motility of cells that constitute organs. We conduct studies using the latest physiological techniques, such as X-ray diffraction, trying to capture the living movements of various organs and tissues at the molecular (nano) level. In addition, we hope to shed light on the true nature of the functions and movements of molecules related to contraction and relaxation in intact organs and tissues, and clarify the mechanisms of the physiology and pathophysiology of organ movement.

**Science of Functional Morphology "Analysis of autonomic innervation concerning with cancer, and obesity!"**

In the Science of Functional Morphology field, we are contributing to research areas relating to the patterns of perineural infiltration of cancer and the development of new operative procedures for the preservation of organ functions, while elucidating the basic principles of autonomic innervation of internal organs with our original whole-mount immunohistochemical method. In addition, we are carrying out studies on research to analyze the mechanism of visceral fat accumulation, particularly mesenteric fat, and to analyze the relationship of obesity-resistant and gut flora in an experimental animal, *Suncus murinus*.

**Evaluation and Management for Social Health, Medical Welfare, and Various Disasters**

In this field, we study how to allocate and utilize limited medical resources as public goods for humankind, with a view to not only in normal times but also in disasters. We accept various medical professionals related to social welfare and health care, and moreover administrative staff and business people who are enthusiastic about solving problems in this field.

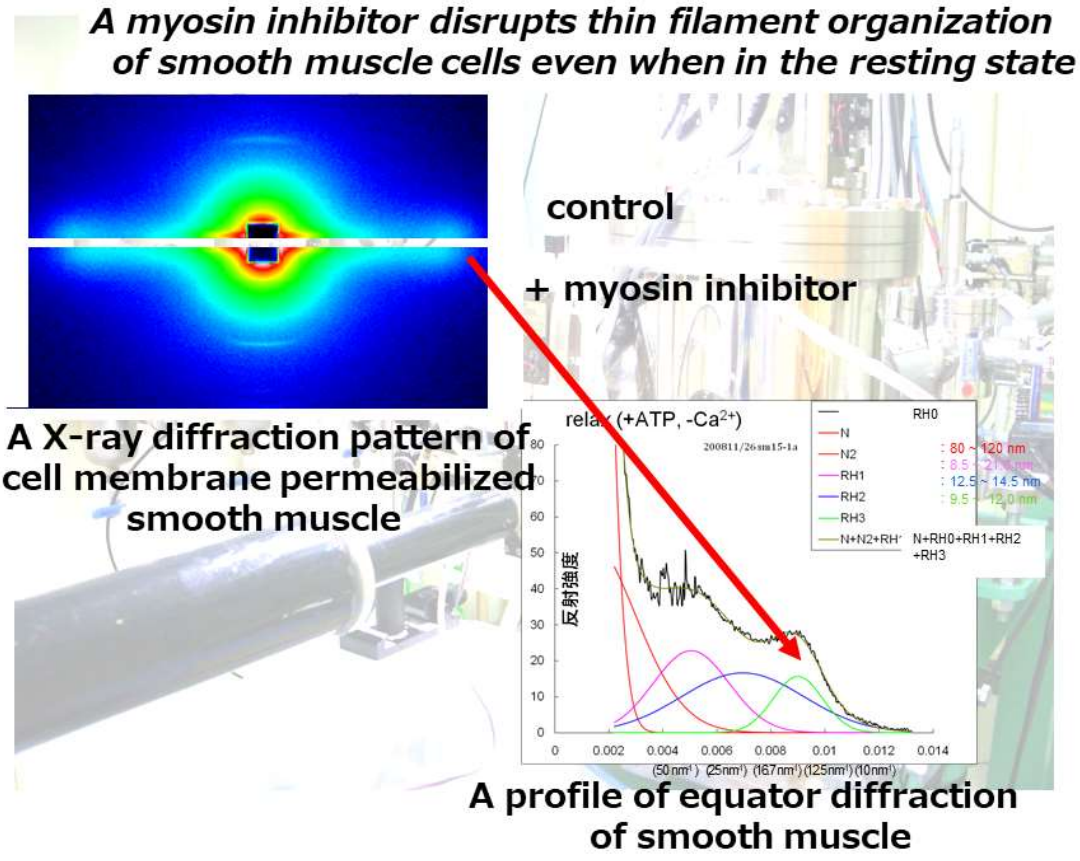
**Medical Image Analysis and Management**
**"Exploring the structure and function of the human body through non-invasive imaging!"**

In this field, we conduct research by closely collaborating with fields of the Department of Radiological Sciences. Utilizing medical imaging techniques like MRI and CT, we explore the structure and function of the human body in a non-invasive manner. Furthermore, we conduct academic investigations into clinical challenges in diagnostic imaging, including errors in diagnostic reporting and strategies for improving efficiency in radiological practice. By integrating cutting-edge technologies, including artificial intelligence, we aim to address these issues and advance our field.

# Science of *Muscle Physiology*

*Let's measure the macro movements of organs and tissues at the nano metre level!*

In the Science of Muscle Physiology field, we aim to unravel the mechanisms of muscle contraction and relaxation, which are the source of the movement of organs, and the motility of cells that constitute organs. We conduct physiological studies making use of techniques such as X-ray diffraction, trying to capture the living movements of various organs and tissues at the molecular (nano metre) level. In particular, in our X-ray diffraction research on smooth muscles distributed in internal organs, we demonstrated the disruption of the myosin filament structure in smooth muscles by a myosin blocker for the first time in the world, and next we will conduct quantitative analysis of equatorial reflection profiles. We want to shed light on the true nature of the functions and movements of molecules related to contraction and relaxation in intact organs and tissues, clarify the mechanisms of the physiology and pathophysiology of organ movements, and contribute to the advancement of health sciences. Youthful, flexible thinking is needed to promote research. We sincerely hope that you will join us.




**If you are interested, please contact us at the following e-mail address:masaru [at] tmu.ac.jp**

Faculty in charge (person to contact): Masaru Watanabe (M.D, Ph.D.)
The researcher's website: http://www.tmu.ac.jp/stafflist/data/wa/908.html

**We are actively recruiting students of the master's and doctor's courses!!**

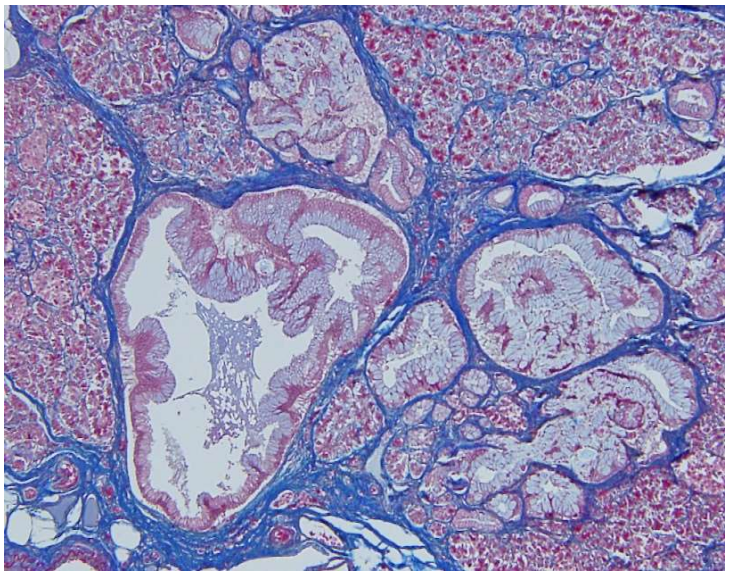
# Science of Functional Morphology

We are conducting **analysis on the autonomic innervation with clinical applications in mind**. We aim to illuminate various clinical issues, such as the pattern of perineural infiltration of cancer, through three-dimensional visualization of the visceral autonomic nervous system using whole-mount immunohistochemistry with the house musk shew (*Suncus murinus*), basic research using neuroscience techniques by utilizing antibodies specific to sympathetic, parasympathetic, and sensory nerves, and gross anatomical analyses.

Furthermore, we conduct research on the receptor and transmission mechanisms of visceral pain. Specifically, we are carrying out studies to clarify the underlying **mechanisms** for visceral pain associated with chronic pancreatitis and fibrosis of the pancreas.

house musk shew (*Suncus murinus*)

Innervation of the stomach in *Suncus murinus*



Elucidation of pathological pathology of pancreatitis, pancreatic fibrosis and precursor lesions of pancreatic cancer, and development research for early detection of pancreatic cancer. Focusing on the molecular level, especially exosome / microRNA, for chronic pancreatitis / pancreatic fibrosis, type 3c diabetes, etc., which are risk factors for the development of pancreatic cancer, we are developing research to develop biomarkers related to early detection of pancreatic cancer.

We are also studying on **Clinical Anatomy** of the musculoskeletal system.

**If you are interested, please feel free to contact us.**

**Faculty in charge (person to contact): Shuang-Qin Yi, M.D., PhD.**

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**Phone: 03-3819-1211 (Ext.: 445)**

# Evaluation and Management for Social Health, Medical Welfare, and Various Disasters

In this course, we will study how to allocate and utilize limited medical and social resources as public goods for humankind, with a view to not only normal times but also disasters. Based on this goal, we aim to develop human resources who can lead the future of this nation through research along the following three pillars, with optimized methodologies, management theories, and educational theories.

1. Re-analysis of various problems related to social welfare resources in Japan (including emergency medicine and end-of-life care) and proposal of practical solutions…We rebuild the safety and security of this country and improve the happiness of all the people in Japan.

2. Establishment of a methodology to provide a stable medical supply to all people without collapsing the medical system even in the event of disasters when the demand for medical care increases…We promote following activities for public: formulation of practical disaster response manuals/business continuity plans, formulation of valuable disaster drills and consideration of their evaluation methods, development of educational programs and contents related to disaster response, strengthening of multi-professional collaboration and awareness-raising activities for the nation.

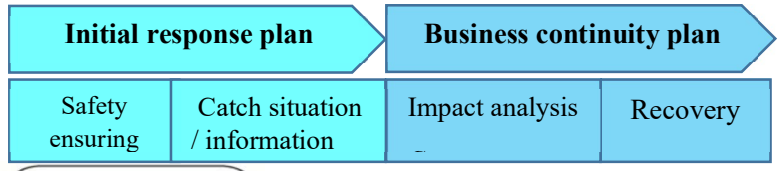
3. Scientifically-based systematization of medical care preparation standards for large-scale events and public facilities (mass gathering medicine) ... Contribute to society from the perspective of seamlessly considering normal times and disasters.

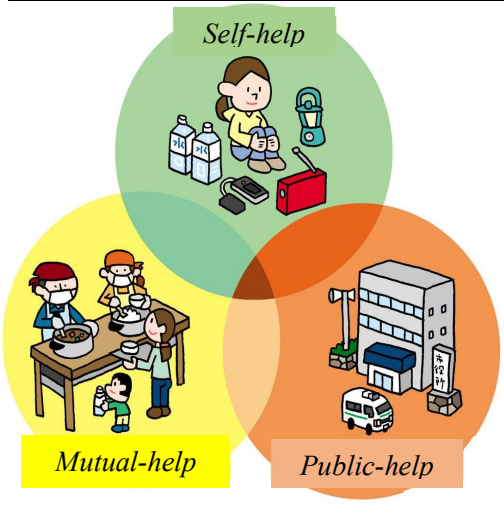
**《 Eliminate disaster-related deaths ! 》**

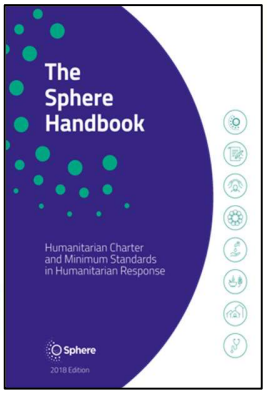
•Disaster-related death is a man-made disaster & a social problem including medical care.

= "Disability" is created by society.

•Providing generous “public-help” while encouraging “self-help”.




*The Sphere*


*Guidebook of mass-gathering medicine. Co-authored. Herusu Pub. (Tokyo) 2019*

**If you are interested, please contact us at the following e-mail address**

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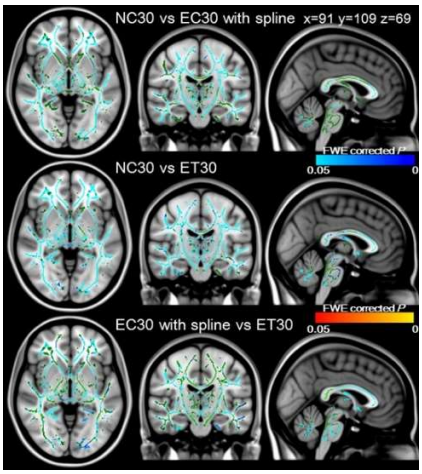
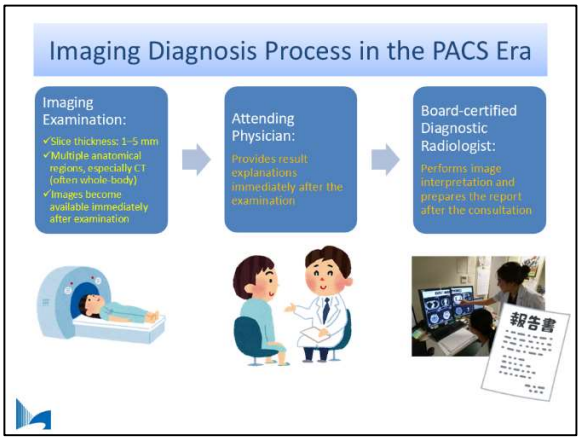
# Medical Image Analysis and Management

In this field, we collaborate across fields in the Department of Radiological Sciences to conduct non-invasive research utilizing medical imaging techniques such as MRI and CT. Specifically, through statistical analysis of MRI techniques, we focus on morphological and functional brain imaging to deepen our understanding of the pathophysiology of neurological disorders.

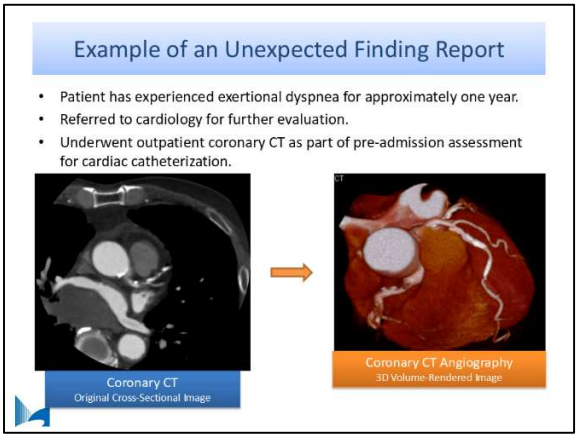
Additionally, we explore the application of artificial intelligence in image reconstruction, detection, and diagnosis. Through collaborative research with medical institutions and other facilities, we plan to analyze patient images across various diseases.

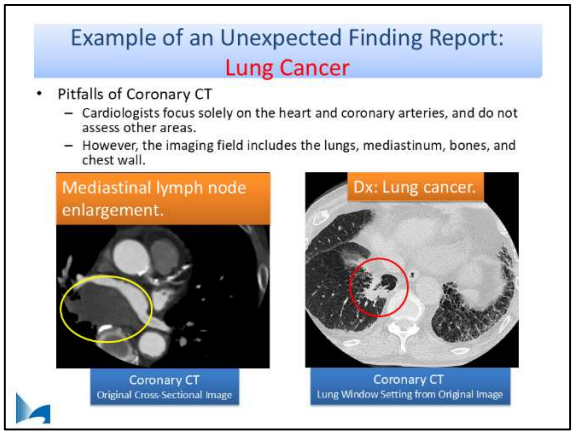



We conduct academic research on the optimization of radiological practice through the integration of digital transformation (DX), including artificial intelligence, and the promotion of time and economic efficiency through task shifting and sharing (task delegation and redistribution). Additionally, we explore risk management strategies, such as the management of incidental findings in radiological imaging, by applying the latest technologies and methodologies.

Through the societal contribution of our research, we aim to improve the quality of radiological diagnostics and treatment within medical institutions.

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