

Program Schedule

14:45~15:00 Opening Remarks

Masahiro Kohzuki (International Society of Renal Rehabilitation)

Kunihiro Yamagata (Japanese Society of Renal Rehabilitation)

Paul Bennett (Global Renal Exercise Network)

15:00~16:00 Sponsored Symposium

Peritoneal Dialysis and Renal Rehabilitation

Chair : Itoko Tobita (Osaka Medical and Pharmaceutical University, Japan)

Yoshitaka Ishibashi (Japanese Red Cross Medical Center, Japan)

Exercising on Peritoneal Dialysis - The Latest

Paul Bennett

Adj Professor, Griffith University, QLD, Australia

Adj Professor, Adelaide University, SA, Australia

Nursing-Led Renal Rehabilitation Initiatives for Peritoneal Dialysis Patients: Supporting Life Satisfaction and Continuity of Care in an Aging Society

**Yukari Kikuchi, Keiji Matsumoto, Tsubasa Yuki, Hiroki Ito, Ikuko Yabana,
Takefumi Mori**

Division of Nephrology and Hypertension, Faculty of Medicine,
Tohoku Medical and Pharmaceutical University, Japan

Co-sponsored by : Vantive Japan

Utilizing Peritoneal Dialysis for Renal Rehabilitation

Chair : Takefumi Mori (Tohoku Medical and Pharmaceutical University, Japan)

Patient Rehabilitation-Oriented Selection of Dialysis Modality and Prescription Formulation

Jie Dong

Renal Division, Peking University First Hospital, China

Patient-Centered Care for Rehabilitation in Peritoneal Dialysis Patients

Ying Xu

Peking University First Hospital, China

Optimizing nutrition care in patients on PD.

Angela Yee-Moon Wang

Department of Renal Medicine, Singapore General Hospital,
Duke-National University of Singapore (NUS), Singapore

Program Schedule

8:15~9:00 Sponsored Morning Seminar

Chair : Jun Wada (Okayama University, Japan)

Diagnosis and management of IgA nephropathy

Kei Fukami

Division of Nephrology, Department of Medicine, Kurume University School of Medicine, Japan

Co-sponsored by : Medical Affairs, Otsuka Pharmaceutical Co.,Ltd.

9:00~10:10 Symposium 2

Renal Rehabilitation

Chair : Kunihiro Yamagata (University of Tsukuba, Japan)

Paul Bennett (University of South Australia, Australia)

Renal Rehabilitation: Past, Present and Future

Masahiro Kohzuki

1. International Society of Renal Rehabilitation
2. Japanese Society of Renal Rehabilitation
3. Yamagata Prefectural University of Health Sciences, Japan
4. Tohoku University, Japan

A patient's perspective on the importance of exercise in kidney failure

Nicole Scholes-Robartson

The University of Sydney, Sydney, Australia

What is the patient-relevant goal of renal rehabilitation?

Yugo Shibagaki

Division of Nephrology & Hypertension, St Marianna University, Japan

Pathophysiology in CKD

Chair : Ichiei Narita (Niigata Institute for Health and Sports Medicine, Japan)

Tetsuhiro Tanaka (Tohoku University Graduate School of Medicine, Japan)

Frailty and CKD:improving our patients' ability "to do"

Stephanie Thompson

University of Alberta, Canada

Muscle Quality Matters in CKD: A New Biomarker for Renal Risk Stratification

Tomoaki Takata, Yukari Mae, Hajime Isomoto

Division of Gastroenterology and Nephrology, Tottori University Hospital, Japan

Renoprotective effects and mechanisms of chronic exercise in CKD model rats

Osamu Ito¹⁾, Masahiro Kohzuki²⁾

1. Division of General Medicine and Rehabilitation, Faculty of Medicine, Tohoku Medical and Pharmaceutical University, Japan
2. Yamagata Prefectural University of Health Sciences, Japan

11:40~12:30 Sponsored Luncheon Seminar

Chair : Kunihiro Yamagata (University of Tsukuba, Japan)

Importance of hyperkalemia management in renal rehabilitation

Junichi Hoshino

Department of Nephrology, Tokyo Women's Medical University, Japan

Co-sponsored by : AstraZeneca K.K.

Poster Session1 [Sarcopenia / Frail / Nutrition]

Chair : Chie Saito (University of Tsukuba, Japan)

Yukie Kitajima (Tokyo Healthcare University, Japan)

P1-01 The Therapeutic Benefits of Continuous Exercise During Hemodialysis Sessions in the Prevention of Sarcopenia

Kazuko Arita, Kentaro Mise, Kimiko Takahashi, Aya Nakano, Katutoshi Maeda, Hiroaki Oda

ODA Medical Clinic Hiroshima, Japan

P1-02 Association between fall history and both physical function and ADL in frail patients undergoing hemodialysis.

Yu Shimano^{1,2)}, Masakazu Saitoh^{2,3)}, Tomoya Shukuri⁴⁾

1. Department of Rehabilitation, Saiyu Clinic, Japan
2. Department of Physical Therapy, Graduate School of Health Science, Juntendo University, Japan
3. Department of Physical Therapy, Faculty of Health Science, Juntendo University, Japan
4. Department of Internal Medicine, Saiyu Clinic, Japan

P1-03 Elevation of non-esterified fatty acids induced by hemodialysis sessions: Nutrition strategies for controlling lipid catabolism

Masako Fujiwara¹⁾, Hiroyuki Terawaki^{1,2,3)}, Itiro Ando¹⁾, You Shishido⁴⁾, Takafumi Ito¹⁾

1. Department of Internal Medicine, Nephrology, Teikyo University Chiba Medical Center, Japan
2. Clinical Laboratory Department, St. Lukes Internal University, Japan
3. Division of Advanced Community Based Care for Lifestyle Related Diseases, Fukushima Medical University, Japan
4. Midorinosato Clinic, Japan

P1-04 Predictive Value of Physical Function and Nutrition for Survival in patients undergoing hemodialysis: Sub-analysis of The REPnet-HD Study

Takahumi Noji^{1,2,3,4)}, Naoto Usui⁴⁾, Yoshifumi Abe⁴⁾, Daisuke Okamura⁴⁾, Sho Kojima⁴⁾, Yoichi Sato⁴⁾, Akihiro Sakuyama⁴⁾, Nobuyuki Shirai⁴⁾, Nobuhito Shinozaki⁴⁾, Yu Shimano^{3,4)}, Harunori Takahashi⁴⁾, Izumi Noda⁴⁾, Chika Matsudo⁴⁾, Kenta Mikami⁴⁾, Masakazu Saitoh^{3,4)}

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2. Odawara Nephrology Clinic, Japan
3. Department of Physical Therapy, Graduate school of Health Science, Juntendo University, Japan
4. Renal Exercise and Physical activity network

Poster Session2 [Renal function / Quality of Life]

Chair : Takuo Hirose (Tohoku Medical and Pharmaceutical University, Japan)
Takahiro Miura (Tohoku University, Japan)

P2-01 Association of muscle strength with age-related changes in renal resistive index: The Aging Kidney Study

Shun Yoshikoshi^{1,2)}, Keisei Kosaki^{1,2,3)}, Shoya Mori⁴⁾, Seiji Maeda⁵⁾,
Makoto Kuro-o⁶⁾, Kunihiro Yamagata^{2,7)}

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2. Division of Preventive and Sports Nephrology, Graduate School of Comprehensive Human Sciences, University of Tsukuba, Japan
3. Advanced Research Initiative for Human High Performance, University of Tsukuba, Japan
4. Department of Nutritional Science, Faculty of Applied Bioscience, Tokyo University of Agriculture, Japan
5. Faculty of Sport Sciences, Waseda University, Japan
6. Division of Mineral Metabolism, Center for Molecular Medicine, Jichi Medical University, Japan
7. Department of Nephrology, Institute of Medicine, University of Tsukuba, Japan

P2-02 Association Between Moderate to Vigorous Physical Activity and Renal Function Dynamics After Acute Myocardial Infarction

Toshimi Sato¹⁾, Daisuke Suzuki²⁾, Yuichiro Sasamoto³⁾, Shinichiro Morishita¹⁾,
Masahiro Kohzuki⁴⁾

1. Department of Physical Therapy, Fukushima Medical University, School of Health Sciences, Japan
2. Department of Rehabilitation, Southern Tohoku General Hospital, Japan
3. Department of Rehabilitation, Ohta General Hospital Foundation, Ohta Nishinouchi Hospital, Japan
4. Yamagata Prefectural University of Health Sciences, Japan

P2-03 Factors Affecting Quality of Life Measured by the KDQOL in Patients Receiving Maintenance Dialysis: A Retrospective Observational Study

Kenji Ina¹⁾, Yoshihiro Ohta²⁾, Takayuki Nanbu²⁾, Daisuke Fuwa²⁾,
Ayako Takahashi²⁾, Atsusi Morizane³⁾, Megumi Kabeya⁴⁾, Miki Nagasaka⁵⁾,
Ayami Sakaguchi⁵⁾, Airi Taniguchi⁵⁾, Sachiko Mizuta⁵⁾, Toshie Yonemochi⁵⁾

1. Department of Geriatrics, Shinseikai Dai-ichi Hospital, Japan
2. Department of Renal Disease, Shinseikai Dai-ichi Hospital, Japan
3. HOSPY Renal Dialysis Division Clinical Engineering, Japan
4. Department of Pharmacy, Nagoya Memorial Hospital, Japan
5. Department of Rehabilitation, Shinseikai Dai-ichi Hospital, Japan

P2-04 Mutagenesis of (pro)renin receptor cleavage site is associated with plasma renin activity and body weight

Takuo Hirose^{1,2)}, Shigemitsu Sato¹⁾, Hiroki Ito^{1,2)}, Chika Takahashi¹⁾,
Kentaro Yano²⁾, Takahito Kaburaki²⁾, Risa Ishikawa²⁾, Akari Endo²⁾,
Ayaka Kamada²⁾, Kenichi Akiyama²⁾, Ikuko Oba-Yabana²⁾, Takefumi Mori^{1,2)}

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2. Division of Nephrology and Hypertension, Faculty of Medicine, Tohoku Medical and Pharmaceutical University, Japan

Poster Session3 [Exercise therapy / Rehabilitation 1]

Chair : Takei Mitsuo (CEO and Founder of Medical Corporation KOSHINKAI, President of SUWANOMORI Hospital in JAPAN / Director of General incorporated association KYOSEINOKAI / CEO and Founder of GRAND FOREST JAPAN HOSPITAL in KENYA / Chairman of DREAM WORLD HEALTHCARE PROGRAMME in KENYA)

Misa Miura (Tsukuba University of Technology, Japan)

P3-01 PRE-REHABILITATION USING NEURO-MUSCULAR electrical stimulation IN PATIENTS ON AMBULATORY DIALYSIS

Alena Havelkova, Michal Pohanka, Pavel Vank, Pavel Homolka, Libor Dobsak, Alena Pokorna, Petr Dobsak

Department of Sports Medicine and Rehabilitation, Masaryk University Brno, Czechia

P3-02 The Impact of Exercise Therapy During Hemodialysis Sessions on the Prevention of Peripheral Arterial Disease

Kentaro Mise, Emi Kihara, Daisuke Okita, Takehiro Tanabe, Tomohiro Yawata, Haruna Uchida, Miruki Tamada, Miyu Inoue, Kazuko Arita, Katsutoshi Maeda, Hiroaki Oda

Oda Medical Clinic Hiroshima, Japan

P3-03 Effects of a Single Session of Intradialytic Cycling Exercise on Executive Function and Prefrontal Cerebral Oxygenation

Masato Shibuya^{1,2)}, Yuma Tamura¹⁾, Hajime Tamiya²⁾, Harunori Takahashi¹⁾, Takanori Yasu³⁾, Sinya Kawamoto³⁾, Tsubaki Atsuhiko²⁾

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3. Department of Cardiovascular Medicine and Nephrology, Nikko Medical Center, Dokkyo Medical University, Japan

P3-04 Exercise Therapy for Preventing Intradialytic Hypotension: A Retrospective Study and Literature Review

Misa Miura¹⁾, Masahiro Kohzuki²⁾, Chie Saito³⁾, Satoshi Sakai¹⁾, Akira Kanai⁵⁾, Kenji Kinoshita⁵⁾, Taku Moriya⁵⁾, Koji Matsunaga⁵⁾, Shingo Koyama¹⁾, Shigeru Oowada⁴⁾, Teruhiko Maeba⁴⁾, Osamu Ito⁶⁾, Yo Hirayama⁵⁾

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4. Asao Clinic, Japan
5. Hirayama Hospital, Japan
6. Division of General Medicine and Rehabilitation, Faculty of Medicine, Tohoku Medical and Pharmaceutical University, Japan

Poster Session4 [Exercise therapy / Rehabilitation 2]

Chair : Yoshiko Ogawa (Tohoku Medical and Pharmaceutical University, Japan)

Daisuke Ito (Sendai Seiyō Gakuin College, Japan)

P4-01 Heterogeneous Responses to Exercise Therapy in Hemodialysis Patients: A Responder-Based Analysis Using 6-Month Cardiopulmonary Exercise Testing Data

Harunori Takahashi¹⁾, Yuma Tamura¹⁾, Masato Shibuya¹⁾, Shinya Kawamoto²⁾, Takanori Yasu²⁾, Yasuhiro Maejima²⁾

1. Department of Rehabilitation, Dokkyo Medical University Nikko Medical Center, Japan
2. Department of Cardiology, Vascular Medicine and Nephrology, Dokkyo Medical University Nikko Medical Center, Japan

P4-02 Implementation and Outcomes of Intradialytic Exercise Using Japan's Medical Reimbursement System: A Practice-Based Report from Takeda General Hospital

Hiroki Bannai

Takeda General Hospital, Japan

P4-03 Shared decision making and Physical therapy in renal replacement therapy selection for an adult with severe cerebral palsy: a case report

Akira Mitamura¹⁾, Shin Fujimura¹⁾, Osamu Ito²⁾, Misato Oikawa³⁾, Takahito Kaburaki⁴⁾, Takefumi Mori⁴⁾

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2. Division of General Medicine and Rehabilitation, Tohoku Medical and Pharmaceutical University Hospital, Japan
3. Department of Nursing, Tohoku Medical and Pharmaceutical University Hospital, Japan
4. Division of Nephrology and Hypertension, Tohoku Medical and Pharmaceutical University Hospital, Japan

P4-04 A Case of Exercise Therapy for Autosomal Dominant Polycystic Kidney Disease

Kazuyuki Chiba¹⁾, Asako Takahashi²⁾, Osamu Ito²⁾, Takefumi Mori³⁾

1. Department of Rehabilitation, Tohoku Medical and Pharmaceutical University Hospital, Japan
2. Division of General Medicine and Rehabilitation, Tohoku Medical and Pharmaceutical University Hospital, Japan
3. Division of Nephrology and Hypertension, Tohoku Medical and Pharmaceutical University Hospital, Japan

Exercise Prescription and Guideline in CKD

Chair : Junichi Hoshino (Tokyo Women's Medical University, Japan)

Naohiko Fujii (Hyogo Prefectural Nishinomiya Hospital, Japan)

Mechanisms of exercise-induced protection in chronic kidney disease

João Viana

Research Center in Sports Sciences, Health Sciences and Human Development,
University of Maia, Portugal

Prescribing Exercise in CKD: A Training Program for Exercise and Health Professionals

Kenneth R Wilund¹⁾, Joao Viana²⁾

1. University of Arizona, School of Nutritional Sciences and Wellness, USA
2. University of Maia, Porto, Portugal

Supporting Greater Specificity in Exercise Guidelines to Address Phenotypes Apparent in CKD

Ria Arnold

1. School of Medical, Indigenous and Health Sciences, Faculty of Science, Medicine and Health, University of Wollongong, Wollongong, Australia
2. Department of Renal Medicine, Concord Repatriation General Hospital, Concord, Australia
3. School of Health Sciences, Faculty of Medicine and Health, UNSW, Sydney, Australia

Effects of Renal Rehabilitation

Chairperson : Masakazu Saitoh (Juntendo University, Japan)
Yugo Shibagaki (St Marianna University, Japan)

The Effect of Cardiac Rehabilitation on Patients with Chronic Kidney Disease

Tomoaki Hama

Department of Cardiology and Cardiac Rehabilitation Center, Tokyo Medical University, Japan

Potential effects of extended intradialytic exercise therapy on physical performance and health related quality of life in hemodialysis patients

Hiroo Kawarazaki, Daisuke Uchida, Yu Honda, Shigeki Kojima, Hiromasa Miyake, Masatoshi Nishimoto, Akihito Hishikawa, Shun Tonomura, Tadashi Sofue, Naohiko Fujii, Masakazu Saitoh, Ichiei Narita, Kunihiro Yamagata, Junichi Hoshino, Tsutomu Sakurada

Teikyo University Hospital Mizonokuchi, Japan

Prehabilitation for solid organ / kidney transplant recipients

Sharlene A Greenwood

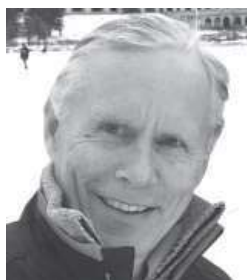
King's College Hospital, London, UK

16:20~16:30 Closing Remarks

Masahiro Kohzuki (International Society of Renal Rehabilitation)

Kunihiro Yamagata (Japanese Society of Renal Rehabilitation)

Paul Bennett (Global Renal Exercise Network)



Exercising on Peritoneal Dialysis - The Latest

Paul Bennett

Adj Professor, Griffith University, QLD, Australia

Adj Professor, Adelaide University, SA, Australia

People receiving peritoneal dialysis (PD) experience high levels of physical deconditioning, sarcopenia and reduced cardiorespiratory fitness, contributing to diminished quality of life and adverse clinical outcomes. Exercise has emerged as a feasible and increasingly evidence-based intervention in PD care. The most recent recommendations address clinical practice points such as timing of exercise and activity (post-catheter insertion, peritoneal space empty or full) , the uptake of specific activities (work, sex, swimming, core exercise) , potential adverse outcomes related to activity and exercise (exit site care, perspiration, cardiovascular compromise, fatigue, intra-abdominal pressure) , the effect of exercise and activity on conditions of interest (mental health, obesity, frailty, low fitness) and exercise nutrition. Both aerobic and resistance exercise are safe for people on PD when appropriately prescribed and supervised. Home and clinic-based exercise programs have shown improvements in physical function, muscle strength, balance and patient-reported outcomes. Recent trials highlight the value of low- to moderate-intensity resistance training in mitigating sarcopenia and frailty. Telehealth-enabled exercise supervision and wearable activity monitoring have expanded access for people on PD. Patient motivation, confidence and perceived safety as key determinants of exercise participation, reinforcing the need for individualised and behaviourally informed approaches. International guidelines now increasingly acknowledge exercise as a core component of holistic PD care, rather than an optional adjunct.



Nursing-Led Renal Rehabilitation Initiatives for Peritoneal Dialysis Patients: Supporting Life Satisfaction and Continuity of Care in an Aging Society

Yukari Kikuchi, Keiji Matsumoto, Tsubasa Yuki, Hiroki Ito,
Ikuko Yabana, Takefumi Mori

Division of Nephrology and Hypertension, Faculty of Medicine,
Tohoku Medical and Pharmaceutical University, Japan

【Introduction】 Peritoneal dialysis (PD) is a treatment that allows patients to live at home with minimal disruption to their quality of life (QOL). While renal rehabilitation aims to reduce psychological and physical impairments, the recent increase in elderly PD patients has highlighted the need to support multifaceted life satisfaction. This report details our hospital's nursing-led renal rehabilitation initiatives for PD patients.

【Maintaining QOL until end-of-life】 Supporting PD Patients' Daily Lives and Mental Well-being Maintaining quality of life is a crucial role for nurses in supporting PD patients. Therefore, when initiating dialysis, we use shared decision-making to listen to patients' aspirations for meaning in life-particularly for the elderly, regarding their wishes for where, with whom, and how they wish to spend their end-of-life period-and translate this into support.

【Physical Rehabilitation and Sarcopenia Prevention】 Furthermore, preventing sarcopenia and providing mental care are vital for supporting the sense of purpose in elderly PD patients. At our hospital, nurses in the PD outpatient clinic involve in bioimpedance measurements. Combined with DEXA-measured fat-free mass, we assess body composition, including muscle mass, and strive to prevent sarcopenia through personalized exercise programs.

【Continuity of Care through Community Collaboration】 To provide psychological care and prevent social isolation among PD patients, we maintain close collaboration with nurses from facilities such as visiting nursing services, small-scale multifunctional home care, and service-provided senior housing. This enables us to deliver continuous PD nursing care to elderly PD patients.

【Conclusion】 PD is a form of healthcare deeply integrated into daily life, and the act of performing PD itself is part of renal rehabilitation. We hospital nurses believe that collaborating with visiting nurses who provide PD nursing care in the PD patient's living environment, and continuing support that upholds the sense of purpose in life for elderly PD patients, is crucial for renal rehabilitation in PD patients.

Patient Rehabilitation-Oriented Selection of Dialysis Modality and Prescription Formulation

Jie Dong

Renal Division, Peking University First Hospital, China

Patients with chronic kidney disease (CKD) endure a prolonged and debilitating disease course. Upon progressing to end-stage renal disease (ESRD), many experience a partial loss of social functionality, a decline in socioeconomic status, and insufficient support from family and social welfare systems. Establishing a rehabilitation-oriented dialysis program is paramount to enable a lifestyle that closely approximates that of the general population.

When initiating peritoneal dialysis (PD), the primary objective is to select the most humanistic modality to ensure patients can sustain their academic, professional, and social lives. Automated Peritoneal Dialysis (APD) offers unparalleled advantages over Continuous Ambulatory Peritoneal Dialysis (CAPD). Beyond ensuring dialysis adequacy and reducing the incidence of PD-associated peritonitis, APD significantly enhances the quality of life (QoL). I will discuss strategies for the seamless transition and induction of patients into APD.

Regarding prescription formulation, developing individualized, patient-centric, and even "nuanced" dialysis regimens is critical to facilitating comprehensive rehabilitation. I will elaborate on the selection of specific PD parameters tailored to individual patient needs to minimize the therapeutic burden.

Furthermore, exercise rehabilitation and nutritional guidance are indispensable components of holistic recovery. I will share the long-term clinical experience and insights accumulated at our center, specifically focusing on individualized dietary counseling and the maintenance of optimal nutritional status.



Patient-Centered Care for Rehabilitation in Peritoneal Dialysis Patients

Ying Xu

Peking University First Hospital, China

Peritoneal dialysis (PD) is a vital renal-replacement therapy for people with end-stage kidney disease, playing a key role in improving quality of life and prolonging survival. As frontline caregivers, PD nurses assume multiple roles in delivering patient-centered rehabilitation care.

1. Health education: knowledge education and self-management skills training

PD is a long-life therapy. Nurses provide continuous training at different stage, conduct regular follow-up to check self-care problems, and reinforce training as needed.

2. Psychosocial support: relieving anxiety and enhancing adherence

We assess psychological status, offer individualized counseling, and help build family support networks to create a positive treatment environment.

3. Follow-up and monitoring: guarding safety and quality

Combining traditional clinic visits with remote monitoring, we perform comprehensive assessments, respond rapidly to issues, and tailor follow-up schedules.

4. Rehabilitation guidance: restoring function and enhancing quality of life

We give personalized dietary and exercise advice and encourage patients to re-engage with social activities.

5. Team collaboration: united for patient well-being

We work closely with physicians, dietitians, and nurses from other specialties to deliver holistic, high-quality rehabilitation services.

Patient-centered rehabilitation in PD is a complex, systematic process in which the PD nurse is indispensable. Through education, psychological support, Follow-up and monitoring, rehabilitation guidance, and teamwork, we provide PD patients with superior, comprehensive rehabilitative care.



Optimizing nutrition care in patients on PD.

Angela Yee-Moon Wang

Department of Renal Medicine, Singapore General Hospital,
Duke-National University of Singapore (NUS), Singapore.

Nutrition management is a vital component in renal rehabilitation in PD as patients doing PD are commonly complicated with protein-energy wasting (PEW) and poor nutrition status predicts adverse clinical outcomes including higher mortality, poor physical and psychosocial function and quality of life of patients. According to a global systematic review in patients doing PD, the prevalence of PEW can mount to 60%. Optimizing nutrition care requires a specialized, proactive multidisciplinary approach to address the unique metabolic demands of daily PD. PD treatment using the glucose-based PD solutions increases calorie absorption, alters glucose metabolism and incurs metabolic risks. There is dialysate protein loss through the peritoneal membrane which increases further in the setting of peritonitis. Patients doing PD are also prone to develop volume overload. Furthermore, they may have poor appetite, reduced dietary intake or being educated to have a restricted diet and are prone to develop infective complications, increasing their risk of PEW. Optimizing nutrition care is therefore essential to improve patients' survival, preserve functional status, and enhance patients' overall well-being and quality of life.

This talk will provide the key summaries from the first joint International Society of Renal Nutrition and Metabolism (ISRNM) and International Society of Peritoneal Dialysis (ISPD) practice recommendations in adult patients doing PD 2026, developed by a multidisciplinary group of nephrologists, dietitians, nurses and our patient stakeholders worldwide.

The new practice recommendations cover 5 key themed topics: nutrition screening and assessment, dietary recommendations for patients doing PD, nutrition interventions for patients who develop complications while on PD, nutrition supplementation and nutrition education. The implementation of this global nutrition practice recommendations requires a multidisciplinary team of health professionals (nephrologists, dietitians and dialysis nurses) adopting an individualized patients' centred approach, empowering patients for better self-management of their diets and enabling them to live well on PD with better nutrition status.



Diagnosis and management of IgA nephropathy

Kei Fukami

Division of Nephrology, Department of Medicine, Kurume University School of Medicine,
Japan

IgA nephropathy (IgAN) is the most common primary glomerulonephritis and a major cause of chronic kidney disease worldwide. Diagnosis is established by kidney biopsy, showing dominant IgA deposition in the glomerular mesangium. Recent advances in disease pathogenesis are summarized by the widely accepted four-hit hypothesis. This model proposes that IgAN develops through (i) increased production of galactose-deficient IgA1, (ii) formation of autoantibodies against this aberrant IgA1, (iii) generation of circulating immune complexes, and (iv) mesangial deposition of these complexes, resulting in glomerular inflammation and progressive kidney injury. Current treatment strategies are based on risk stratification and emphasize optimized supportive care, including blood pressure control and renin-angiotensin system inhibition. In patients at high risk of progression, immunosuppressive therapy may be considered. In addition, emerging targeted therapies aimed at specific steps of the four-hit pathway are expanding therapeutic options. This review outlines the diagnostic approach and current treatment strategies for IgA nephropathy in the context of the four-hit hypothesis.



Renal Rehabilitation: Past, Present and Future

Masahiro Kohzuki

1. International Society of Renal Rehabilitation
2. Japanese Society of Renal Rehabilitation
3. Yamagata Prefectural University of Health Sciences, Japan
4. Tohoku University, Japan

Chronic kidney disease (CKD) is a global health problem. In patients with CKD, exercise endurance is decreased, especially as renal dysfunction advances. This is due to the combined effects of protein-energy wasting, uremic acidosis, and inflammatory cachexia, which lead to sarcopenia and are aggravated by a sedentary lifestyle, resulting in a progressive downward spiral of deconditioning.

Renal rehabilitation (RR) is a coordinated, multifaceted intervention designed to optimize a patient's physical, psychological, and social functioning, as well as to stabilize, slow, or even reverse the progression of renal deterioration, improving exercise tolerance and preventing the onset and worsening of heart failure, thereby reducing morbidity and mortality.

The Japanese Society of Renal Rehabilitation (JSRR) was established in 2011 as the world's first academic society of renal rehabilitation, and has approximately 3,500 members. I was the first president of the board of directors from 2011–2020. We hold academic conferences every year, established a system for certified renal rehabilitation instructors, and have disseminated guidelines in both Japanese and English. The International Society of Renal Rehabilitation (ISRR) was established in 2019 and has held annual academic conferences featuring lectures by prominent researchers. Global Renal Exercise Network (GREX) consists of approximately 380 individual researchers worldwide who are interested in increasing physical activity and improving health outcomes in kidney disease, and it holds lectures and other events irregularly.

To our knowledge, Japan is the only country in the world with a national health insurance system for RR. In 2016, Japan's Ministry of Health, Labor and Welfare decided to expand the scope of rehabilitation to diabetic patients with CKD stages 4 to 5 through the world's first national health insurance reimbursement system. Each hospital or clinic can receive one additional medical fee per month for each CKD patients with RR. The content of the exercise should be in accordance with JSRR guidelines, and it is desirable to have a Registered Instructor of RR (RIRR) qualifications. Additionally, from 2018, exercise training for diabetic patients with CKD stage 3b is covered by the National Health Insurance. Furthermore, from 2022, exercise training for CKD patients with HD is covered by the National Health Insurance.

RR is an effective, feasible, and safe secondary prevention strategy in CKD and is a promising model for a new field of rehabilitation. Future large RCTs should focus more on the effects of rehabilitation and exercise programs, as these topics and exercise types have not been studied as extensively as cardiovascular and pulmonary rehabilitation. Moreover, efforts to increase RR implementation rates are urgently needed.

Symposium 2



A patient's perspective on the importance of exercise in kidney failure

Nicole Scholes- Robertson

The University of Sydney, Sydney, Australia

Abstract:

Exercise is increasingly recognized as a cornerstone of care for individuals living with kidney failure, yet patient engagement remains a challenge. This presentation offers a unique perspective from someone who is both a patient and a healthcare professional—a researcher and physiotherapist—navigating the complexities of chronic kidney disease while advocating for exercise as a vital component of treatment. Drawing on lived experience and scientific evidence, the session will explore the physical, psychological, and social benefits of exercise, as well as practical strategies for overcoming barriers to participation. Attendees will gain insight into how patient-centered approaches can empower individuals, improve quality of life, and enhance clinical outcomes. By bridging personal experience with professional expertise, this talk aims to inspire collaborative efforts between patients, clinicians, and researchers to make exercise an integral part of kidney care.

Presenter Biography:

Nicole Scholes-Robertson is a Research Fellow, physiotherapist, and patient living with kidney failure. She has lived experience of peritoneal dialysis and is currently living her best life with a living donor transplant that she received from her Brother in 2014. Her unique perspective combines clinical expertise with lived experience, driving her passion for improving patient-centered care through exercise interventions. Nicole's research focuses on optimizing physical activity strategies for individuals with chronic kidney disease, aiming to enhance quality of life and functional outcomes. She is committed to bridging the gap between evidence-based practice and real-world patient experiences.



What is the patient-relevant goal of renal rehabilitation?

Yugo Shibagaki

Division of Nephrology & Hypertension, St Marianna University, Japan

Japan is entering an era of unprecedented population aging accompanied by rapid depopulation of the working-age generation. Projections indicate that while the number of older adults will remain substantial, the working population will shrink markedly, undermining the fiscal base that sustains social security and health care. At the community and household level, the rise of single-person households and “older-couple-only” households has accelerated, increasing the prevalence of solitary living and “old-old” caregiving. In parallel, social capital that once supported informal mutual aid has been eroding, and socioeconomic disparities are becoming more visible. Consequently, even when acute medical problems are successfully treated, many older patients experience in-hospital decline in physical and cognitive function, making discharge home difficult and leading to unwanted institutionalization. This gap highlights a critical limitation of current acute-care practice: clinicians may “treat diseases” without necessarily improving the well-being of “patients.”

Despite these societal changes, contemporary medicine largely remains anchored in a disease-based model that prioritizes new drugs/devices and guideline-driven standardization to prolong survival. While this approach has contributed to increased life expectancy, gains in healthy life expectancy have been limited, implying that rising medical expenditures may be extending years lived with disability. Similar concerns are apparent in nephrology: dialysis has dramatically improved survival in kidney failure, yet further technological advances and expanding service volume have not translated into proportional improvements in long-term outcomes, raising questions about sustainability in an increasingly constrained economic environment.

A central reason for this mismatch is the dominance of multimorbidity and frailty in older adults. Frailty encompasses not only physical vulnerability but also psychological and social dimensions amplified by isolation, poverty, and loss of support networks. In such complex systems, single-disease interventions may worsen coexisting conditions (e.g., intensive blood pressure lowering may increase risks of kidney dysfunction, falls, fractures, and cognitive decline). Applying multiple guidelines simultaneously often results in polypharmacy, increasing adverse events, nonadherence, economic waste, and reduced quality of life. Moreover, outcomes prioritized by trials and guidelines (mortality, organ endpoints) do not always align with what matters most to very old patients—maintaining function, autonomy, and dignity.

To move toward goal-concordant care in a super-aged society, three priorities are proposed: (1) greater emphasis on patient-centered outcomes, including function, quality of life, and treatment burden, supported by shared decision-making; (2) improved clinical research literacy, particularly the appraisal of external validity and the interpretation of absolute risk, number needed to treat, and number needed to harm; and (3) multidisciplinary interventions that do not rely solely on costly pharmacologic or device-based solutions but instead aim to preserve physical and cognitive function and activate patients’ latent capacity through behavior change strategies and coordinated support from rehabilitation, nutrition, pharmacy, nursing, psychology, and social work.



Frailty and CKD:improving our patients' ability "to do"

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We will review contemporary frailty concepts relevant to rehabilitation, situated within the pathophysiological context of chronic kidney disease (CKD). Frailty in CKD reflects the interaction between age-related biological changes and disease-specific mechanisms that accelerate loss of physiological reserve. While age-related frailty is driven by gradual declines in neuromuscular function, mitochondrial efficiency, endocrine signalling, and repair capacity, CKD -associated frailty is characterized by earlier onset and greater severity due to superimposed processes such as chronic inflammation, uremic toxin accumulation, metabolic acidosis, anemia, hormonal dysregulation, microvascular dysfunction, and dialysis-related physiological stress. This distinction helps explain why frailty is prevalent even among younger individuals with advanced CKD and why its trajectory may differ from frailty observed in community-dwelling older adults. Key advances in frailty science will be highlighted, including recognition of frailty as a dynamic and potentially modifiable state characterized by trajectories over time; the emergence of intrinsic capacity as a strengths-based framework i.e. the ability “to do” for mapping biological impairments to rehabilitative targets; and growing interest in resilience as an distinct outcome reflecting recovery of function following physiological stressors such as dialysis initiation, hospitalization, or surgery. Measurement and management approaches will be discussed, emphasizing exercise as the key interventional component for all types of frailty.



Muscle Quality Matters in CKD: A New Biomarker for Renal Risk Stratification

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Sarcopenia and frailty are frequent comorbidities in chronic kidney disease (CKD) and are linked to functional decline, hospitalization, and adverse renal and survival outcomes. Despite their clinical impact, CKD risk stratification and many therapeutic decisions still rely predominantly on serum creatinine and creatinine-based estimated glomerular filtration rate (eGFR_{cre}), while sarcopenia assessment in routine practice often focuses on muscle quantity. As creatinine generation is largely determined by skeletal muscle, impairments in muscle quantity and quality can reduce creatinine production and lead to overestimation of kidney function by eGFR_{cre}, with potential misclassification of renal risk and medication dosing. Muscle quality has emerged as a relevant construct in sarcopenia research; however, it is not routinely incorporated into CKD assessment, and its relevance to kidney-function interpretation and renal outcomes remains insufficiently defined.

In CKD, muscle quality reflects not only age-related changes but also kidney-specific catabolic stress, including protein-energy wasting, uremic toxin exposure, chronic inflammation, metabolic acidosis, anemia, and reduced physical activity. Muscle quality refers to the integrity of skeletal muscle, such as myofiber density, ectopic fat infiltration, and cellular health, and determines strength and physical performance. These CKD-related insults can decrease the proportion of viable contractile tissue and increase non-contractile components, leading to reduced muscle. Because serum creatinine is generated primarily by viable contractile tissue, deterioration in muscle quality may further reduce creatinine generation and contribute to systematic overestimation of kidney function by creatinine-based eGFR.

Muscle quality can be quantified by imaging-based measures of myosteatosis, such as CT, MRI, or ultrasound, functional assessments, and bedside surrogates derived from bioimpedance. Among these, bioimpedance-derived phase angle (PhA) is a pragmatic option because it is rapid and noninvasive and captures aspects of cellular integrity and tissue composition. In this symposium, we synthesize the emerging evidence on muscle quality in CKD and present our recent observations as an illustrative example, suggesting that incorporating muscle quality may (i) identify patients in whom creatinine-based eGFR overestimates true kidney function and (ii) refine renal risk stratification beyond muscle mass-focused definitions.

We will also discuss implementation pathways that operationalize muscle quality for routine nephrology practice. One approach is to integrate muscle quantity and quality into a single metric, the Effective Muscle Index (EMI = appendicular skeletal muscle mass × phase angle), recently proposed by our group as an estimate of functional muscle reserve, alongside serum-based proxies combining creatinine and cystatin C when device-based measures are unavailable. Priorities include harmonizing measurement protocols, establishing pragmatic reference ranges across populations and CKD stages, and testing whether interventions that improve muscle quality translate into slower CKD progression and better patient-centered outcomes.



Renoprotective effects and mechanisms of chronic exercise in CKD model rats

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Exercise therapy improves physical function, exercise tolerance, and health-related quality of life in patients with chronic kidney disease (CKD). However, some reports show that exercise therapy improves renal function in CKD patients, whereas others show no improvement. Studies in CKD models, which allow for a consistent FITT (frequency, intensity, time, type) of exercise, have demonstrated the renoprotective effects of chronic exercise, and the underlying mechanisms are becoming clearer. We have conducted basic research on chronic exercise and have elucidated the renoprotective effects and underlying mechanisms of chronic exercise in various CKD model rats including 5/6 nephrectomy-induced renal failure, drug-induced nephrotic and chronic nephritis, hypertensive nephropathy, diabetic nephropathy, and high-fructose-induced metabolic syndrome.

In the renin-angiotensin system (RAS), angiotensinogen (AGT) produced in the liver is cleaved by renin and angiotensin-converting enzyme (ACE) to form angiotensin II (Ang II).

In addition, ACE2, a homolog of ACE, converts Ang II into angiotensin (1-7) (Ang (1-7)). Ang II binds Ang II type 1 receptor (AT1R) and induces potent vasoconstriction, sodium reabsorption, cell proliferation, hypertrophy, oxidative stress, and inflammation. Ang (1-7) binds Mas receptor and counteracts the Ang II/AT1R pathway. Separate from the systemic circulatory RAS, there exists a tissue RAS that produces Ang II and Ang (1-7) locally in tissues, and abnormalities of the renal RAS is thought to be involved in the progression of CKD, independently of activation of the systemic circulatory RAS.

In CKD model rats, 5/6 nephrectomy increased renal expression of AGT, ACE, and angiotensin II type 1 receptor (AT1R), but chronic exercise with treadmill reduced AGT and ACE expression. 5/6 nephrectomy also reduced renin, ACE2, angiotensin II type 2 receptor (AT2R), and Mas receptor (MasR), and chronic exercise reversed these decreases. In Dahl salt-sensitive rats, 8% high-salt diet increased renal expression of AGT, ACE, and AT1R, but chronic exercise reversed these decreases. High-salt diet also reduced renin, ACE2, AT2R, and MasR expression, and chronic exercise reversed these decreases. These results suggest that chronic exercise reduces the expression of AGT/ACE/AT1R, which acts on renal injury, and increases the expression of ACE2/AT2R/MasR, which acts on renal protection.

In addition to improving abnormalities of RAS components, various effects of chronic exercise have been revealed, such as reducing oxidative stress and carbonyl stress, enhancing the nitric oxide (NO) system, and improving fatty acid metabolism and mitochondrial dysfunction, which are thought to be involved in the renal protective effects. Chronic exercise has pleiotropic effects and is thought to exert its renal protective effect by acting abnormalities of different systems in the kidney of each CKD model.



Importance of hyperkalemia management in renal rehabilitation

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With the rapid aging of the population, the number of patients with chronic kidney disease (CKD) complicated by frailty and sarcopenia is steadily increasing in Japan. The mean age at dialysis initiation now exceeds 71 years, and dialysis therapy can be regarded as a form of comprehensive geriatric care. Although frailty and sarcopenia are well-established risk factors for poor prognosis in CKD, evidence for effective interventions remains limited. Extending the healthy life expectancy of this vulnerable population is therefore an urgent challenge in Japan.

The Japanese Society of Renal Rehabilitation (JSRR) published its first clinical practice guideline in 2018 to disseminate the concept of renal rehabilitation, standardize clinical practice, and clarify the available evidence. In 2022, Japan became the first country in the world to introduce a reimbursement system for exercise therapy during dialysis, which markedly accelerated nationwide implementation of renal rehabilitation programs.

In the same year, a renal rehabilitation study group was established within the JSRR Academic Committee to generate new clinical evidence. Furthermore, in 2023, a new committee was launched to revise the JSRR guidelines, initiating systematic reviews addressing 11 clinical questions. These systematic reviews have demonstrated emerging evidence supporting the importance of multidisciplinary care for CKD patients, as well as the combined effects of nutritional therapy and exercise interventions.

In this presentation, we highlight the current status of frailty among Japanese dialysis patients and discuss ongoing initiatives and future strategies to address this growing problem, with particular emphasis on multidisciplinary care and the management of hyperkalemia as an integral component of renal rehabilitation.



Mechanisms of exercise-induced protection in chronic kidney disease

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While the physiological benefits of regular exercise for patients with chronic kidney disease (CKD) are well-documented, the underlying biological drivers remain an area of intense investigation. This presentation will discuss the multifaceted molecular pathways and tissue crosstalk that mediate the systemic protective effects of exercise across the spectrum of CKD, specifically focusing on: (i) chronic inflammation: addressing how exercise promotes an anti-inflammatory leukocyte profile and mitigates uraemia-associated immune dysfunction; (ii) cardiovascular health: exploring mechanisms of improved endothelial function, reduced myocardial fibrosis, and favourable left ventricular remodelling; (iii) sarcopenia: discussing how exercise stimulates anabolic signalling and counteracts muscle wasting driven by protein degradation; (iv) bone health: examining the potential of exercise to counteract CKD-mineral and bone disorder through mechanotransduction and endocrine regulation. By integrating clinical and mechanistic data, this presentation provides the biological rationale necessary for developing targeted exercise interventions to optimize patient outcomes.



Prescribing Exercise in CKD: A Training Program for Exercise and Health Professionals

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A major barrier to implementing exercise programs in CKD around the world is a lack of trained individuals who are capable of either prescribing exercise or helping support exercise programs. Recognizing this limitation, the Global Renal Exercise (GREX) Network developed a 2-part training program to address this problem. The program consists of 2 components: 1) Online Modules; and 2) an Internship Program. The purpose of the online modules is to provide a comprehensive overview of concepts needed to understand how to prescribe exercise or facilitate the implementation of exercise programs. Topics covered in the modules include the following: 1) CKD Pathophysiology and Treatment; 2) Understanding CKD from the Patient Perspective; 3) Overview of Exercise in CKD/ESKD; 4) Screening, Needs Assessment, and Outcomes Testing; 5) Strategies for Exercise Prescription in CKD; 6) Behavior Change Principles/Strategies; 7) Class management techniques; and 8) Implementation Strategies. The modules are freely available at: <https://grexercise.arizona.edu/renal-exercise-education-resources/exercise-ckd-course>. The second component of the GREX training is an Internship program whose purpose is to provide hands-on training at qualified sites around the globe to reinforce important concepts covered in the online modules. Topics covered in the internship program will include: 1) Demonstrating how to assess patients for inclusion into exercise programs; 2) instruction on how to conduct appropriate physical function testing that can be used to inform exercise prescription; 3) Demonstrating how to prescribe exercise using the FITT-VP principle (Frequency, Intensity, Type, Time, Volume and Progression) ; 4) Principles of Behavior change; and 5) Implementation strategies for your home clinic or practice. GREX is disseminating this program at major international events through workshops that include an overview of the program and practical hands-on experience of critical components of the program. A primary goal of the program is to provide a mechanism for providing appropriate training for health care workers to facilitate the implementation of exercise and physical activity interventions in CKD globally. This talk will provide an overview of the GREX online modules and internship program and the benefits of participating in this training.



Supporting Greater Specificity in Exercise Guidelines to Address Phenotypes Apparent in CKD

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Abstract The evidence base supporting exercise in Chronic Kidney Disease (CKD) is now robust, establishing physical activity as a cornerstone of management for improving quality of life and reducing cardiovascular risk. However, a significant disconnect remains between generalized stage-based guidelines and the complex reality of clinical practice. In our renal exercise clinic, referrals are frequently prompted by a change in status or a high burden of symptoms such as progressive frailty, profound fatigue, dyspnea, various forms of pain, and issues requiring weight management (e.g. cachexia and obesity) . For these patients, stage-based guidelines provide a valid physiological goal but often lack the adaptive nuance required for a safe, pragmatic starting point.

In this presentation, we will explore findings from a multi-phase research program designed to address this translational gap. Firstly, we will quantify the gap using a meta-epidemiological review that contrasted participants of randomized controlled trials (RCT) with those in retrospective cohort data. This work showed that participants of exercise RCTs presented a 'Robust Phenotype' characterized by significantly younger age and fewer comorbidities than real-world populations. In contrast, our Australian clinical benchmark revealed a 'Geriatric/Multimorbid Phenotype,' while a Global Benchmark of non-exercise RCTs occupied the middle ground.

Secondly, we will present data from a clinical cluster analysis of 439 adults attending the renal outpatient unit. This data identified distinct patient profiles driven by comorbidity and symptom burden and, to a lesser degree CKD stage. Profiles found in this analysis included frailty, cardiac dysfunction, atherosclerotic conditions, mental health disorders, musculoskeletal conditions, and metabolic CKD. Crucially, from an exercise prescription perspective these profiles require differing strategies ranging from falls prevention in frailty to aggressive HIIT style training for high functioning metabolic CKD. This work underscores how two patients with Stage 4 CKD may require vastly different exercise prescriptions and anticipated outcomes.

To conclude, we will discuss how nephrology can work towards more granular exercise guidelines for distinct CKD-related health outcomes by benchmarking against adaptive protocols, such as those used in exercise oncology. This presentation proposes that the path to precision medicine requires two pivotal shifts: firstly, augmenting guidelines with a phenotype-specific layer to guide safety, strategy, and adaptation for complex presentations; and secondly, shifting evidence generation toward inclusive, pragmatic trial designs to close the representativeness gap. This dual strategy supports clinicians treating multimorbid CKD today, while building the representative evidence base needed for the future.



The Effect of Cardiac Rehabilitation on Patients with Chronic Kidney Disease

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Cardiac rehabilitation, including exercise therapy, nutritional and medication guidance, and psychosocial assessment, is implemented in many countries worldwide, and its benefits are now recognized to extend beyond improvements in exercise capacity and life prognosis to include favorable effects on various organs. Several reports have not only shown improvements in exercise capacity and life prognosis, but also a reduction in readmission rates and an improvement in renal function in patients with cardiovascular disease complicated by chronic kidney disease who underwent cardiac rehabilitation. The Japanese Society of Renal Rehabilitation and the Japanese Association of Cardiac Rehabilitation are collaborating to provide comprehensive rehabilitation programs to a large number of patients. The recognition that cardiac rehabilitation should be implemented for patients with cardiovascular disease has gradually spread among healthcare professionals. However, the understanding that greater attention and intervention should be directed toward cardiovascular disease patients with chronic kidney disease has yet to become widespread. In this presentation, based on a review of relevant literature, I would like to explore various beneficial effects of cardiac rehabilitation on patients with chronic kidney disease.



Potential effects of extended intradialytic exercise therapy on physical performance and health related quality of life in hemodialysis patients

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Background:

Patients on maintenance hemodialysis (HD) often experience reduced physical function and health-related quality of life (HRQoL). While exercise therapy is recommended, the optimal duration and domain-specific effects, particularly regarding long-term interventions, remain uncertain.

Methods:

We conducted a systematic review and meta-analysis of randomized controlled trials (RCTs) comparing structured exercise with non-exercise controls in adult HD patients, searching MEDLINE (PubMed) through November 2024. This research was conducted to be utilized in the next edition of the Guideline for Renal Rehabilitation, and the protocol was registered in PROSPERO (CRD42025642273). Outcomes included physical measures (VO_2 peak/max, 6-minute walk distance [6MWD], handgrip strength, timed up and go test [TUG], sit-to-stand [STS] test), biochemical markers (hemoglobin, Kt/V), and HRQoL domains (SF-36 physical component score [PCS]/ mental component score [MCS], fatigue, depression). Data were synthesized using random-effects models and stratified by intervention duration (≤ 3 months vs. >3 months).

Results:

From up to 94 identified RCTs (5,228 participants), exercise therapy demonstrated significant broad-spectrum benefits. For interventions longer than 3 months (>12 weeks), significant improvements were observed in the following:

Physical Performance

6 MWD (mean difference [MD] 52.4 m, 95% CI 35.4–69.3 m), VO_2 peak (MD 3.5 ml/kg/min, 95% CI 1.96–5.04), and VO_2 max (MD 5.29 ml/kg/min, 95% CI 2.36–8.22).

Biochemical Markers

Hemoglobin (MD 0.94 g/dL, 95%CI, 0.09–1.78 g/dL) and Kt/V (MD 0.16, 95%CI, 0.12–0.20).

HR-QoL & Mental Health: Fatigue, general health, and PCS (MD 5.83, 95% CI 0.71–10.94).

In contrast, effects on MCS and pain remained uncertain due to substantial heterogeneity. While TUG, handgrip strength, and STS showed overall improvements in integrated analyses, trends in trials strictly exceeding 12 weeks were non-significant.

Discussions and Conclusions:

Structured exercise therapy confers significant benefits on aerobic capacity, physical performance, fatigue, and depressive symptoms in hemodialysis patients. These findings support the clinical utility of long-term exercise programs. However, uncertainty regarding optimal duration and domain-specific effects remains a challenge for establishing standardized long-term protocols. Further trials are also needed to clarify sustainable support systems.



Prehabilitation for solid organ / kidney transplant recipients

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Prehabilitation has emerged as a critical strategy to optimise outcomes for patients undergoing solid organ transplantation, including kidney transplantation. Transplant candidates frequently present with complex multimorbidity, frailty, sarcopenia, cardiovascular deconditioning, and psychosocial burden, all of which contribute to increased peri-operative risk, delayed recovery, graft dysfunction, and reduced long-term survival. Traditional models of care have focused predominantly on post-transplant rehabilitation; however, there is increasing recognition that the period prior to transplantation represents a valuable and often underutilised window for intervention.

Prehabilitation is a multimodal, patient-centred approach that aims to enhance physiological reserve and functional capacity before surgery through structured exercise training, nutritional optimisation, psychological support, and education. In kidney transplant candidates, prolonged exposure to chronic kidney disease and dialysis is associated with reduced aerobic capacity, muscle wasting, inflammation, and impaired quality of life. These factors not only affect transplant eligibility but also influence post-transplant outcomes. Emerging evidence demonstrates that targeted prehabilitation interventions can improve physical function, cardiorespiratory fitness, frailty status, and health-related quality of life in patients awaiting kidney and other solid organ transplants.

Exercise-based prehabilitation programmes, including aerobic, resistance, and functional training, have been shown to be safe and feasible in transplant candidates, even among those with advanced disease. Improvements in walking capacity, muscle strength, and fatigue have been reported, alongside reductions in anxiety and depressive symptoms. Importantly, prehabilitation may support equitable access to transplantation by enabling patients previously considered “too frail” or “high risk” to be re-evaluated for listing. Early data also suggest potential benefits for post-operative recovery, reduced length of hospital stay, and faster return to independence, although larger trials are needed to confirm effects on graft and patient survival.

Despite its promise, implementation of prehabilitation in transplant pathways remains inconsistent. Barriers include limited time on the waiting list, heterogeneity of patient needs, resource constraints, and lack of integration between nephrology, transplant, and rehabilitation services. Innovative models, including home-based, digital, and community-delivered programmes, offer opportunities to overcome these challenges and increase scalability.

This presentation will review the current evidence for prehabilitation in solid organ and kidney transplantation, explore practical considerations for programme design and delivery, and highlight future research priorities. Integrating prehabilitation into routine transplant care represents a paradigm shift towards proactive, preventative, and holistic management, with the potential to improve outcomes for patients, grafts, and healthcare systems worldwide.

P1-01 The Therapeutic Benefits of Continuous Exercise During Hemodialysis Sessions in the Prevention of Sarcopenia

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Background and Objectives:

With aging, there is an acceleration in the decline of muscle strength and nutritional status. In dialysis patients, fatigue following hemodialysis (HD) treatment and prolonged bed rest during HD sessions further impair activities of daily living (ADL). The aim of this study is to investigate the preventive effects of continued intradialytic exercise therapy on sarcopenia.

Subjects and Methods:

Ten maintenance HD outpatients were enrolled, divided into an exercise group (n=5; 4 males, 1 female; mean age 68 ± 13 years) and a non-exercise group (n=5; 3 males, 2 females; mean age 74 ± 8 years). The exercise intervention involved 30 minutes of lower limb ergometer exercise initiated immediately after starting each HD session, with a Borg scale rating of 13 as the target exertion level. Measurements taken at the start of the intervention in 2014 and in 2024 included body weight, body fat percentage, BMI, muscle mass (TANITA DC-270A), grip strength, serum albumin (ALB), total cholesterol (T-C), triglycerides (T-G), Geriatric Nutritional Risk Index (GNRI), normalized protein catabolic rate (nPCR), and percentage of creatinine generation rate (%CGR). Comparative analysis was performed using JMP 9.

Results:

No significant changes were observed in body fat percentage or BMI over the period. Both groups exhibited a significant decline in grip strength. The exercise group showed no significant changes in muscle mass or %CGR, whereas the non-exercise group showed significant reductions in body weight, muscle mass, %CGR, GNRI, and serum ALB levels.

Discussion:

Engaging in exercise therapy during HD sessions contributed to the maintenance of muscle strength and nutritional status. Conversely, patients not participating in intradialytic exercise showed declines in muscle strength and deterioration of nutritional parameters.

Conclusion:

Implementing exercise therapy during dialysis sessions is effective in preventing sarcopenia.

P1-02 Association between fall history and both physical function and ADL in frail patients undergoing hemodialysis.

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[Background]

Frailty and falls increase each other's risks, creating a "negative spiral" that threatens to decline Activities of Daily Living (ADL). Hemodialysis (HD) patients are at particularly high risk of both frailty and falling due to disease-specific factors. This study aimed to investigate the characteristics of physical function and ADL in frail HD patients with a history of falls.

[Methods]

We included 62 frail HD patients (Japanese version of the Cardiovascular Health Study criteria ≥ 3) who completed assessments between July 2023 and August 2024 in this study. Based on their fall history over the past year, patients were divided into two groups: the Non-fall group and the Fall group. We collected data of patient's backgrounds, assessed physical function (grip strength, gait speed, Short Physical Performance Battery [SPPB]), physical activity (International Physical Activity Questionnaire Short Form [IPAQ-SF]: weekly activity and daily sedentary time), mental function (Geriatric Depression Scale [GDS], Mini-Mental State Examination [MMSE]), and ADL (Functional Independence Measure [FIM], ADL-difficulty). Statistical analyses were performed using t-tests, chi-square tests, or Fisher's exact tests with a significance level of 5% for all tests.

[Results]

Twenty-eight patients (44%) were in the Non-fall group and 34 (56%) patients were in the Fall group. There were no significant differences between the two groups in patient backgrounds, physical activity, or mental function. However, the Fall group showed significantly lower SPPB scores (7.0 ± 2.6 vs. 8.5 ± 2.7 ; $p < 0.05$) and ADL-difficulty scores (28 ± 10 vs. 35 ± 9 ; $p < 0.05$) compared to the Non-fall group.

[Conclusion]

In frail HD patients, a history of falls is associated with lower physical function (SPPB) and higher subjective difficulty in ADL. It may be important to address not only physical decline but also subjective difficulty during interventions for frail HD patients with a history of falls.

P1-03 Elevation of non-esterified fatty acids induced by hemodialysis sessions: Nutrition strategies for controlling lipid catabolism

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Backgrounds:

Hemodialysis (HD) procedures *inherently* involve catabolic processes, including the loss of amino acids during the session, which induces protein breakdown. Previously, we demonstrated increased circulating branched-chain amino acids and ketone bodies, accompanied by reduced plasma immunoreactive insulin (IRI), during fasting despite maintained glucose levels. This metabolic disorder indicates 'cell starvation' in muscle and adipose cells, resulting in protein and lipid breakdown. The increase in ketones results from hepatic oxidation of non-esterified fatty acids (NEFA), which are catabolized from triglycerides in the adipose cell. Although an increase in plasma NEFA levels has been reported during HD, the precise temporal profile, underlying pathophysiology, and effective therapeutic strategies remain unclear.

Method:

The hourly time course of plasma NEFA and IRI levels during five-hour HD sessions was evaluated in seven patients with end-stage kidney disease across three phases: (i) no intervention (control phase), (ii) intradialytic parenteral nutrition with an amino acid solution (IVAA phase), and (iii) intradialytic parenteral nutrition with amino acid and glucose solutions (IVAA + IVG phase).

Results:

In both the control and IVAA phases, plasma NEFA levels increased rapidly within the first hour of HD to approximately 3 mEq/L, exceeding the normal range (0.1- 0.8 mEq/L), and remained elevated until the end of the sessions. Concurrently, plasma IRI levels decreased rapidly to below fasting levels (10 μ U/mL) within the first hour and then gradually declined thereafter. In contrast, in the IVAA+IVG phase, the NEFA levels remained within the normal range throughout the sessions. IRI levels increased markedly from baseline within the first hour and then gradually decreased toward the initial levels by the end of the sessions.

Discussion:

Muscle and adipose tissues are insulin-sensitive organs, and we demonstrated that increased IRI secretion induced by concomitant glucose administration exerts a clear preventive effect on lipid catabolism. Therefore, nutritional therapy should be designed to ensure the secretion or addition of IRI. NEFA constitutes an important energy source that is directly taken up by energy-deprived tissues. However, in excess, NEFA can have adverse effects: elevated circulating levels can lead to albumin detoxification dysfunction, increased insulin resistance with a subsequent decrease in anabolic efficacy (in proteins and lipids), and the pathogenesis of atherosclerosis. The present study revealed elevated plasma NEFA levels persisting for nearly four hours during each session, which may represent a potential mechanism contributing to frailty and sarcopenia in patients undergoing long-term HD.

Conclusion:

The present study demonstrated an increase in plasma NEFA levels to abnormally high levels with a decrease in plasma IRI during the HD session. Plasma NEFA elevation was suppressed by the presence of plasma IRI, owing to the secretion introduced by IVAA + IVG.

Elevation of non-esterified fatty acids induced by hemodialysis sessions: Pathophysiology and management strategies, M Fujiwara, H Terawaki, I Ando, Y Shishido, T Ito, *Fukushima Journal of Medical Science*, in press.

P1-04 Predictive Value of Physical Function and Nutrition for Survival in patients undergoing hemodialysis: Sub-analysis of The REPnet-HD Study

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[Background] Physical function and nutritional status are key predictors of survival in patients undergoing hemodialysis. Nutritional status is assessed using both questionnaires and biochemical marker. This study aimed to identify subgroups in which integrating physical function and multiple nutritional indicators enhances prognostic predictive value.

[Methods] A total of 483 patients (60.9% male; median age, 72 [interquartile range, 63–78] years) were enrolled from a multicenter prospective cohort study (the REPnet-HD study) after applying exclusion criteria. Physical function was evaluated using the Short Physical Performance Battery (SPPB). Nutritional status was evaluated using the Mini Nutritional Assessment Short-Form (MNA-SF), Geriatric Nutritional Risk Index (GNRI), and Nutrition Risk Index for Japanese Hemodialysis Patients (NRI-JH). Survival was followed for up to three years. Multivariate Cox proportional hazards models were used to identify predictors of mortality, with SPPB and each nutritional indicator as primary independent variables. Models were adjusted for age, sex, ischemic heart disease, dialysis vintage, diabetes, and C-reactive protein. Subgroup analyses were conducted by stratifying patients according to age (< 65 vs ≥ 65 years), physical frailty (SPPB 9 vs >9 points), and dialysis vintage (<4.8 vs ≥ 4.8 years). Model discrimination was evaluated using the C-statistic. Based on the C-statistic, model discrimination was evaluated using changes in the area under the curve (Δ AUC) from the covariate-based model to models incorporating the SPPB and each nutritional indicator.

[Results] During a median follow-up period of 2.2 m1.1–3.0 nyears, 93 deaths occurred. Median scores were 11 [8–11] for SPPB, 12 [11–14] for MNA-SF, 95 [90–101] for GNRI, and 3 [0–5] for NRI-JH. Among patients aged 65 years or older, both MNA-SF (Hazard ratio [HR], 0.80; [95% confidence interval mCI n, 0.71–0.90]; $P < 0.01$) and GNRI (HR, @0.96; [95%CI, 0.94–0.99]; $P = 0.01$) were independently associated with mortality, in addition to SPPB (HR, 0.84; [95%CI, 0.80–0.91]; $P = 0.01$). The addition of SPPB combined with either GNRI or MNA-SF resulted in an identical improvement in AUC (Δ AUC, 0.06; 95%CI, 0.02–0.12; $P = 0.01$ for both). On the other hand, among patients with physical frailty, MNA-SF (HR, 0.78; [95%CI, 0.68–0.91]; $P < 0.01$) and GNRI (HR, 0.96; 95%CI, 0.93–0.99; $P = 0.01$) were significantly associated with mortality; however, adding these nutritional indicators to the covariate model did not significantly improve predictive performance. In patients with dialysis vintage of less than 4.8 years, MNA-SF (HR, 0.78; [95%CI, 0.66–0.93]; $P = 0.01$) was independently associated with mortality alongside SPPB and improved predictive ability (Δ AUC, 0.07; 95%CI, 0.02–0.13; $P = 0.01$).

[Conclusion] In older adults undergoing hemodialysis, incorporating SPPB, MNA-SF, and GNRI into prognostic assessments improve predictive accuracy. However, the addition of nutritional indicators does not enhance the prognostic performance in patients with physical frailty. These findings suggested that the optimal nutritional indicators for prognostic evaluation differ according to the target patients subgroup.

P2-01 Association of muscle strength with age-related changes in renal resistive index: The Aging Kidney Study

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Introduction: The renal resistive index (RI), a practical and reproducible surrogate marker of systemic and intrarenal vascular health, is increasingly recognized as an early indicator of age-related kidney function decline. Identifying modifiable determinants of renal RI may offer new opportunities for the prevention of progressive kidney dysfunction. Although cross-sectional studies have reported associations between muscle strength and renal RI, the longitudinal relationship between muscle weakness and changes in renal RI remains unclear. To address this gap, we examined the association between muscle weakness and subsequent increases in rRI among middle-aged and older adults with reduced kidney function.

Methods: This prospective cohort study included 173 community-dwelling adults aged ≥ 45 years with eGFR < 90 mL/min/1.73 m² from the Aging Kidney Study conducted in southern Ibaraki Prefecture, Japan. The renal RI was assessed using Doppler ultrasonography at baseline, 1 year, and 4 years. Muscle strength was evaluated at baseline using handgrip strength (HGS) and knee extensor strength (KES). Participants were categorized into three groups according to combined muscle strength status: (1) robust (high HGS and high KES), (2) predynapenia (low HGS/high KES or high HGS/low KES), and (3) dynapenia (low HGS and low KES). Linear mixed-effects models were used to examine whether muscle strength categories were associated with longitudinal changes in renal RI, adjusting for baseline age, sex, body mass index, smoking status, hypertension, dyslipidemia, diabetes, heart rate, pulse pressure, eGFR and renal RI.

Results: Among the 173 participants included in the analysis, the median age was 68.0 years and 52% were women. The mean eGFR was 72.5 ± 16.6 mL/min/1.73 m². In linear mixed-effects models, the predynapenia group did not show a statistically significant longitudinal increase in renal RI compared with the robust group ($p = 0.10$). In contrast, a significant dynapenia $\times$ time interaction was observed for the dynapenia group ($\beta = 0.64 \times 10^2$ per year, 95% CI $0.34\text{--}0.93 \times 10^2$; $p < 0.001$), indicating an accelerated increase in renal RI over time.

Conclusion: Lower muscle strength was independently associated with a greater longitudinal increase in renal RI among middle-aged and older adults with reduced kidney function. These findings suggest that skeletal muscle strength may be an important modifiable factor linked to early renal vascular aging.

P2-02 Association Between Moderate to Vigorous Physical Activity and Renal Function Dynamics After Acute Myocardial Infarction

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Background:

Acute myocardial infarction (AMI) is frequently accompanied by a decline in renal function, which adversely affects prognosis and the success of percutaneous coronary intervention. Although previous research has shown that higher levels of daily physical activity, such as step counts, are associated with a slower decline in renal function after AMI, the role of exercise *intensity and frequency* has not been well examined. Clinical guidelines recommend engaging in at least 30 minutes of moderate to vigorous physical activity (MVPA) on most days of the week for patients with heart disease; however, its specific impact on renal function after AMI remains unclear.

Objectives:

This study investigated whether performing MVPA for ≥ 30 minutes on multiple days per week influences changes in cystatin C-based estimated glomerular filtration rate (eGFR_{cys}) during the first 3 months following AMI onset.

Methods:

A prospective observational study was conducted in 87 AMI patients (mean age 65.2 ± 12.5 years; 75 men) hospitalized for AMI and treated with PCI. All participants received guideline-based inpatient cardiac rehabilitation and were instructed to perform walking-based exercise after discharge. Physical activity was monitored for 3 months using a triaxial accelerometer, and MVPA was defined as ≥ 3.0 METs. Representative data were obtained from 7 consecutive days one month after discharge. Patients were categorized by weekly MVPA frequency: 0 days, 1–2 days, or 3–7 days with ≥ 30 min/day. Renal function (eGFR_{cys}), blood biomarkers, and physical function were measured at discharge and after 3 months. Generalized estimating equations (GEE) were applied to analyze longitudinal changes in eGFR_{cys}, adjusting for age, baseline eGFR_{cys}, glucose, triglycerides, systolic blood pressure, and left ventricular ejection fraction. Sensitivity analyses employed MVPA thresholds of 40 and 60 minutes.

Results:

The 3–7 days group accumulated substantially higher daily MVPA and steps than the 0 days group. Baseline characteristics were generally similar across groups, although the 3–7 days group was younger. Over 3 months, the 0 days group exhibited a decline in eGFR_{cys}, whereas the 3–7 days group showed significant improvement. GEE analysis demonstrated a significantly higher positive eGFR_{cys} slope in the 3–7 days group versus the 0 days group ($B = 2.9 \text{ mL/min/1.73 m}^2$; 95% CI 1.5–4.2; $p < 0.001$). Multivariate logistic regression revealed that the 3–7 days group had a 5.4-fold higher likelihood of renal function improvement ($\geq 5 \text{ mL/min/1.73 m}^2$ increase) compared with the 0 days group ($p = 0.013$). Sensitivity analyses using 40- and 60-minute thresholds yielded similar findings, supporting the robustness of results.

Conclusions:

Engaging in MVPA for at least 30 minutes on 3–7 days per week is significantly associated with improved renal function during the early recovery period after AMI. These findings suggest that the intensity and frequency of physical activity—rather than simple step counts—play a vital role in protecting renal function. Incorporating structured MVPA into post-AMI rehabilitation programs may represent a practical and effective strategy for preventing renal deterioration and improving prognosis.

P2-03 Factors Affecting Quality of Life Measured by the KDQOL in Patients Receiving Maintenance Dialysis: A Retrospective Observational Study

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Background

Quality of life (QOL) is defined as an individual's perception of their position in life in the context of the culture and value systems. Previous studies have shown that hemodialysis markedly affects patients' QOL and health-related QOL has been increasingly recognized as an important medical outcome in patients undergoing maintenance hemodialysis (MHD).

Methods

A two-week hospitalization program for patients undergoing MHD was introduced in 2023 to evaluate frailty, along with a comprehensive geriatric assessment and evaluation of motor and oral cavity functions. During this program, QOL was assessed via the Kidney Disease Quality of Life-36 (KDQOL-36) questionnaire. After the incidence of each item was determined, the associations between these factors were retrospectively analyzed to identify those that affect QOL.

Results

QOL as determined via the physical component summary (PCS) and mental component summary (MCS), decreased in more than 40% of the enrolled patients. Motor function was often impaired in patients undergoing MHD. In univariate analyses, the PCS score was strongly correlated with seven variables, including the 5-m walk speed, the EAT-10 score, the Geriatric Depression Scale-15 (GDS-15) score, the Short Physical Performance Battery (SPPB), the 6-minute walk test (6MWT), lower-limb strength/body weight (%), and the TMIG index of competence, but not with age, sex, dialysis duration, primary disease, comorbidities, or nutritional status. For the MCS, only the 5-m walk speed (m/s) and GDS-15 score were significantly correlated. In the multivariate analysis, the PCS score remained independently associated with the 6MWT ($\beta = 0.0727$, $p = 0.0109$) and GDS-15 score ($\beta = -2.14$, $p = 0.0068$), whereas the GDS-15 score was the sole independent determinant of the MCS score ($\beta = -2.81$, $p = 0.0047$).

Conclusions

Patients undergoing hemodialysis experience an increased risk of hospitalization and mortality, as well as reduced health-related QOL. The results of the current analysis revealed that RR intervention could increase the overall QOL of patients undergoing MHD through the dual action of improving walking ability and alleviating the depressive symptoms.

P2-04 Mutagenesis of (pro) renin receptor cleavage site is associated with plasma renin activity and body weight

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Introduction: The (pro) renin receptor [(P)RR] was originally identified as a receptor for renin and prorenin, and is now recognized as a multifunctional protein involved in cellular homeostasis. In addition to activating the renin-angiotensin system activation, (P)RR contributes to vacuolar H⁺-ATPase function and regulation of Wnt signaling. Full-length (P)RR undergoes post-translational cleavage by proteases, including furin and site-1 protease (S1P), in the trans-Golgi network, generating an N-terminal soluble form and a C-terminal transmembrane fragment. However, the physiological roles of these forms remain poorly understood. This study aimed to generate rats harboring mutations at the (P)RR protease cleavage site using clustered regularly interspaced short palindromic repeats (CRISPR) /CRISPR-associated protein 9 (Cas9) -based genome editing and to characterize the phenotypes of the cleavage site mutant rats.

Methods: Genome editing of the (P)RR cleavage site was performed in Sprague-Dawley rats using the rat genome-editing via oviductal nucleic acids delivery (rGONAD) technique, an in vivo CRISPR/Cas9-based mutagenesis method. At 8 weeks of age, blood pressure was measured in wild-type and mutant rats using the tail-cuff method, followed by euthanized. Biochemical, molecular and histological analyses were subsequently performed.

Results: Two types of gene-modified rats were generated: a furin/S1P cleavage-site mutant and a furin cleavage-site deletion mutant. In both gene-modified rats, soluble (P)RR was completely absent from plasma. Plasma renin activity and aldosterone concentrations were significantly reduced in gene-modified rats compared with wild-type rats, whereas plasma total renin concentration, aldosterone-to-renin ratio, and blood pressure were unchanged. Body weight was decreased in both gene-modified rats, although organ-to-body weight ratios of the kidney, heart, and brain, were comparable to those of wild-type rats. In the kidney, expression levels and localization patterns of (P)RR, renin-angiotensin system components, and vacuolar H⁺-ATPase subunits were preserved.

Conclusion: Genetic modification of the (P)RR cleavage site abolished generation of soluble (P)RR and was associated with reduced plasma renin activity and lower body weight, without detectable renal structural or molecular abnormalities. These findings suggest that soluble (P)RR may modulate renin conformation or activity in plasma, and contribute to systemic body growth. Further studies are required to clarify the physiological and pathophysiological roles of each (P)RR form.

P3-01 PRE-REHABILITATION USING NEURO-MUSCULAR electrical stimulation IN PATIENTS ON AMBULATORY DIALYSIS

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Introduction: Loss of leg muscle mass in hemodialysis (HD) patients is a typical manifestation of a chronic uremic/toxic internal environment, causing muscle weakness and poor fitness. This can significantly limit the tolerance of training intensity at the level of 1st ventilatory threshold (VT-1) determined by spirometry (CPX). **Aim:** The aim of this study was to strengthen leg muscles with a simple pre-rehabilitation (pre-RHB) program using neuromuscular electrical stimulation (NMES) before starting standard aerobic intradialytic RHB (ID-RHB) program. **Patients and methods:** In this randomized study, at baseline all the patients (n = 27) underwent CPX, 6-minute walk test (6MWT) and arterial stiffness measurement using cardio-ankle vascular index (CAVI). Before the inclusion into the ID-RHB program, the intervention group (pre-RHB; n = 11) had 3 weeks of NMES at home (2x30 min/day) using battery-powered stimulators (Rehab X-2, Cefar, Malmö, Sweden) and self-adhesive electrodes (80 x 130mm; PALS Platinum, Axelgaard Manufacturing, Lystrup, Denmark). NMES was applied simultaneously to the mm. quadriceps of both legs. The stimulation protocol was designed as follows: biphasic current of 25 Hz frequency, pulse width 200 msec, mode "on-off" (8s stimulation, 12 s rest), and maximal amplitude of 60 mA. The patients in the control group (CON; n = 10) underwent only aerobic ID-RHB. The total duration of ID-RHB program (each session 2x20 min; 3x per week) on bed-side ergometers (MOTomed® letto-2, Reck-Technik GmbH & Co, Germany) in both groups was 12 weeks. All the tests were repeated after the end of ID-RHB program. **Results:** In the pre-RHB group, there was a statistically significant improvement in VO_{2peak}/kg ($p < 0.001$) and an increase in distance walked ($p < 0.001$). A statistically significant improvement, but much weaker, was also present in the CON group: VO_{2peak}/kg ($p < 0.03$) and distance walked ($p < 0.05$). In both groups we recorded an improvement in arterial stiffness assessed by the CAVI parameter, however without statistical significance. As an important observation can be considered the very good tolerance of the prescribed training workload intensity in the pre-RHB group, where almost all patients were able to train at the VT-1 level from the first week of ID-RHB. In contrast, in the CON group, the intensity (and length) of the workload had to be reduced for almost all patients, so that they reached the prescribed intensity at VT-1 only after approximately 4 weeks. **Conclusion:** A pre-RHB program using NMES is able to improve skeletal muscle function in the legs and thus help HD patients tolerate full training doses at the intended intensity from the beginning. This may have a significant effect not only on the general fitness, but also positively influence the motivation and adherence of HD patients and increase the effectiveness of the ID-RHB program.

P3-02 The Impact of Exercise Therapy During Hemodialysis Sessions on the Prevention of Peripheral Arterial Disease

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Background:

A significant number of patients undergoing hemodialysis (HD) have concomitant peripheral arterial disease (PAD). PAD increases the risk of decreased activities of daily living (ADL), reduced quality of life (QOL), limb amputation, and cardiovascular complications. Therefore, early detection and prevention of PAD are crucial.

Objective:

This study was conducted to investigate the effects of exercise therapy during HD sessions on the prevention of PAD.

Methods:

A total of 30 HD outpatients were enrolled in this study. Fifteen patients who participated in exercise therapy during HD sessions (male/female: 12/3; mean age: 65.5 years; mean duration of HD: 136 months; mean duration of exercise therapy: 4.8 years) were assigned to the exercise group, while the remaining 15 patients who did not perform exercise therapy during HD (male/female: 12/3; mean age: 65.7 years; mean duration of HD: 135 months) served as the non-exercise group.

Starting immediately after HD sessions, all patients performed 30 minutes of exercise therapy using a lower limb ergometer, with the workload set to Borg scale "13." Over a three-year period, measurements of the cardio-ankle vascular index (CAVI), ankle-brachial index (ABI), toe-brachial index (TBI), and toe skin perfusion pressure (SPP) were compared between the groups.

Results:

In the non-exercise group, SPP decreased significantly over three years from 82.0 ± 10.7 mmHg to 64.4 ± 18.2 mmHg, representing approximately a 23% decline. Conversely, in the exercise group, SPP remained relatively stable, decreasing from 78.2 ± 20.0 mmHg to 72.5 ± 18.8 mmHg, with no significant change. CAVI, ABI, and TBI did not show significant changes in either group.

Discussion:

Since SPP reflects microcirculatory blood flow in the skin, early decline of SPP values may indicate the onset of PAD. The preservation of toe skin microcirculation in the exercise group suggests that exercise therapy during HD sessions may help maintaining peripheral circulation in the toes.

Conclusion:

Exercise therapy during HD sessions are beneficial to maintain peripheral circulation in the toes' skin and are useful for the prevention of peripheral artery disease (PAD).

P3-03 Effects of a Single Session of Intradialytic Cycling Exercise on Executive Function and Prefrontal Cerebral Oxygenation

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Background

The number of patients undergoing dialysis is increasing worldwide, particularly in Asian countries. In Japan, approximately 340,000 individuals receive dialysis therapy, most of whom are treated with hemodialysis (HD). Cognitive impairment is common among HD patients, with executive dysfunction being especially prevalent. Dialysis-related hemodynamic changes, including ultrafiltration and blood pressure fluctuations, may reduce cerebral blood flow and regional cerebral oxygen saturation (rSO₂), potentially contributing to executive dysfunction. However, the relationship between intradialytic cerebral oxygenation and executive function remains unclear. Near-infrared spectroscopy (NIRS) enables noninvasive and continuous monitoring of cerebral oxygenation during HD. Intradialytic aerobic exercise (IDE) has been reported to attenuate dialysis-induced reductions in cerebral oxygenation, but its effects on executive function during HD are not fully understood.

Objective

This study aimed to investigate the effects of a single session of IDE on executive function assessed by the Stroop test and on cerebral oxygenation during task performance in patients undergoing HD.

Methods

This randomized controlled crossover study was conducted across three dialysis centers. Outpatients receiving HD at least twice per week were screened, and six eligible patients were included. Each participant completed both a control (CON) and an IDE condition with an adequate washout period. In the IDE condition, participants performed aerobic exercise using a cycle ergometer at a moderate intensity corresponding to a Borg rating of perceived exertion of 13, starting 90 minutes after HD initiation. Cerebral oxygenation was assessed using NIRS over the prefrontal cortex, measuring oxygenated hemoglobin (O₂Hb), deoxygenated hemoglobin (HHb), total hemoglobin (THb), and rSO₂. The Stroop test was administered within 30 minutes after HD initiation, at 120 minutes, and within 30 minutes after HD completion.

Results

No significant main effects of condition or time were observed for relative changes in O₂Hb, HHb, or THb. In contrast, rSO₂ showed significant main effects of condition and time, demonstrating a progressive decline during HD, with significantly lower values in the IDE condition than in the CON condition. Regarding executive function, no significant main or interaction effects were observed for Stroop interference time. Reaction time in incongruent trials shortened as HD progressed; however, no significant improvement attributable to IDE compared with CON was observed. No significant correlation was found between changes in O₂Hb from baseline and Stroop interference time.

Discussion

The lack of IDE-related improvement in executive function may be explained by insufficient exercise intensity, as exercise intensity was determined using the Borg scale and may have been overestimated due to dialysis-related fatigue. In addition, ultrafiltration-related hemodynamic changes and impaired neurovascular coupling in patients with end-stage renal disease may have influenced cerebral oxygenation responses and disrupted the association between cerebral oxygenation and executive function.

P3-04 Exercise Therapy for Preventing Intradialytic Hypotension: A Retrospective Study and Literature Review

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【Background】

Intradialytic hypotension (IDH) occurs in approximately 20–30% of hemodialysis sessions and is associated with dialysis interruption, cardiovascular complications, and increased mortality. Exercise therapy may improve hemodynamic stability, but optimal exercise prescription remains unclear. Recurrent IDH episodes are associated with myocardial stunning and long-term cardiac dysfunction, emphasizing the need for preventive strategies.

【Objective】

To evaluate the effectiveness of exercise therapy in preventing IDH by analyzing exercise intensity, timing, and modality through a retrospective clinical study and literature review.

【Methods】

A retrospective observational study was conducted in 190 maintenance hemodialysis patients with stable baseline hemodynamic status (mean age 72.1 years; 60% male). Patients performed moderate-intensity exercise during dialysis sessions, typically once weekly for up to 60 minutes. IDH incidence was compared before and after exercise intervention. Clinical parameters including cardiothoracic ratio (CTR), cardiac function, and diabetes status were analyzed. A literature search using PubMed and Ichushi-Web identified 15 original studies evaluating exercise therapy targeting IDH.

【Results】

Moderate-intensity intradialytic exercise significantly reduced IDH incidence from 48.0% to 28.8% ($p < 0.05$). No serious adverse events were observed. Subgroup analyses suggested greater benefit in elderly patients with frailty or mild-to-moderate cardiac dysfunction. Patients with severe orthostatic hypotension or advanced cardiac disease required careful evaluation before exercise prescription. Cardiothoracic CTR, cardiac function, and diabetes were not associated with IDH incidence. Across the reviewed studies, exercise interventions performed during or around dialysis sessions consistently reduced IDH incidence (30.2% to 17.6%, $p < 0.05$). Most studies used moderate-intensity aerobic exercise with cycle ergometers performed 2–3 times weekly for 15–30 minutes. Proposed mechanisms included improved venous return through muscle pump activation, enhanced autonomic regulation, and improved endothelial function.

【Discussion】

These findings suggest that exercise therapy may improve hemodynamic stability through enhanced venous return and autonomic regulation. Elderly and frail patients may particularly benefit from individualized exercise programs, supporting the integration of exercise-based rehabilitation into routine dialysis care.

【Conclusion】

Exercise therapy may represent a safe and practical strategy for reducing IDH incidence when appropriately prescribed and monitored.

P4-01 Heterogeneous Responses to Exercise Therapy in Hemodialysis Patients: A Responder-Based Analysis Using 6-Month Cardiopulmonary Exercise Testing Data

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【Background】

Exercise therapy is recommended for patients undergoing maintenance hemodialysis; however, individual responses vary substantially. Evaluations based solely on mean changes may mask clinically significant improvements in subsets of patients. This study aimed to investigate the heterogeneity of responses to exercise therapy using a responder-based approach.

【Methods】

We analyzed 29 maintenance hemodialysis patients (age 69.1 ± 7.9 years; 23 men [79.3%]) who completed cardiopulmonary exercise testing (CPX) at both baseline and 6 months. The primary outcome was the change in peak oxygen uptake (peak VO_2). Responders were defined as patients with a $\geq 10\%$ increase in peak VO_2 . Exploratory univariate logistic regression was performed to examine associations between responder status and baseline peak VO_2 , physical function, and muscle strength.

【Results】

Mean peak VO_2 was 15.7 ± 4.4 mL/kg/min at baseline and 16.2 ± 4.6 mL/kg/min at 6 months (mean change: $+0.5 \pm 2.62$ mL/kg/min; $p = 0.313$). Despite the non-significant mean change, substantial inter-individual variability was observed, with nine patients (31.0%) classified as responders. Sensitivity analyses revealed that 37.9% and 24.1% of patients achieved increases in peak VO_2 of ≥ 1 mL/kg/min and ≥ 2 mL/kg/min, respectively. Univariate logistic regression identified no statistically significant baseline predictors of responder status.

【Conclusion】

Although exercise therapy did not result in a statistically significant mean improvement in peak VO_2 , approximately one-third of patients demonstrated clinically meaningful physiological gains. These findings highlight marked heterogeneity in exercise responsiveness and underscore the importance of responder-based evaluation to better capture clinical benefits and support personalized rehabilitation strategies in hemodialysis patients.

P4-02 Implementation and Outcomes of Intradialytic Exercise Using Japan's Medical Reimbursement System: A Practice-Based Report from Takeda General Hospital

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Background

Patients with chronic kidney disease (CKD), particularly those on maintenance hemodialysis, are at high risk of sarcopenia and frailty, leading to reduced activities of daily living (ADL), impaired quality of life (QOL), and increased cardiovascular and cerebrovascular risk. In 2022, Japan introduced an additional reimbursement for intradialytic exercise guidance, formally promoting structured exercise during hemodialysis. However, real-world implementation reports remain limited. At our hospital, an intradialytic exercise program was initiated in 2023 using this reimbursement framework.

Objective

To describe the implementation and operational framework of intradialytic exercise guidance at our hospital and to examine short-term changes in physical function and frailty-related indicators in two outpatient hemodialysis cases. Future perspectives on exercise support systems for non-dialysis CKD patients, including community-based programs, were also discussed.

Methods

Two female outpatients (one in her 70s, one in her 80s) participated in a three-month intradialytic exercise program. Individualized resistance training and stretching exercises were performed during dialysis sessions. Although an ergometer was not used, aerobic exercise via the Escargot system has recently been introduced at our institution. Physical function was assessed before and after intervention using the Short Physical Performance Battery (SPPB), SARC-CalF, Japanese Cardiovascular Health Study criteria (J-CHS), and handgrip strength. Posters, pamphlets, and multidisciplinary conferences supported patient selection and program implementation.

Results

After three months, both patients maintained SPPB (12), SARC-CalF (10), and J-CHS (0) scores.

- Case 1 (70s): handgrip 19/8 kg (R/L), +0.5 kg (left)
- Case 2 (80s): handgrip 25/22 kg (R/L), +2 kg (right)

Both patients reported improved postural stability and reduced daily fatigue, suggesting subjective improvements in ADL and QOL.

Discussion

This practice-based report demonstrates the feasibility and short-term outcomes of intradialytic rehabilitation under Japan's reimbursement framework. In elderly hemodialysis patients, prone to rapid functional decline, maintaining objective physical function over three months is clinically meaningful. Improvements in handgrip strength and subjective functional status suggest acceptability and potential benefits of individualized exercise during dialysis.

This model illustrates how policy change can facilitate structured exercise programs within routine dialysis care. Furthermore, integration with sustainable community resources—such as fee-based fitness facilities and community rehabilitation programs—can support ongoing exercise for non-dialysis CKD patients and may help prevent functional decline, CKD progression, and cardiovascular risk.

Conclusion

A reimbursement-supported intradialytic exercise program was feasible and contributed to maintaining physical function, frailty status, and QOL in elderly hemodialysis patients. Beyond dialysis populations, integrating community-based exercise resources—including gyms and local rehabilitation programs—is essential for long-term CKD management and cardiovascular risk reduction.

P4-03 Shared decision making and Physical therapy in renal replacement therapy selection for an adult with severe cerebral palsy: a case report

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Background

Adults with cerebral palsy (CP) are at increased risk of developing advanced chronic kidney disease (CKD) due to motor impairment, urologic and bowel dysfunction, dehydration, and recurrent infections. In CKD G5, treatment decisions should extend beyond survival and incorporate lifestyle, caregiving capacity, and long-term sustainability within an integrated kidney care framework that includes kidney supportive care. Shared decision making (SDM) is therefore essential; however, the role of Physical therapy in SDM for patients with severe physical disabilities remains underreported.

Methods

This case report describes the SDM process for renal replacement therapy selection in an adult with severe CP. The patient was classified as having severe cerebral palsy with spastic quadriplegia and profound mobility limitations. SDM followed a structured approach consistent with the choice talk-option talk-decision talk model. Physical therapy assessed habitual daily movements, including prone positioning, crawling, scooting, and wheelchair transfers. The potential impact of peritoneal dialysis (PD) catheter exit-site location on daily activities was evaluated. Assessments were video-recorded and reviewed collaboratively with the nephrologist, and the final exit-site location was determined through joint confirmation. Feasibility of automatic peritoneal dialysis (APD), required caregiver assistance, and key environmental modifications were also assessed.

Results

The patient was a man in his 50s with severe CP (spastic quadriplegia) living with his older brother and requiring daily home-helper support. His lifestyle depended on floor-based mobility, and he slept on a futon on the floor. He used a powered wheelchair and could drive independently outdoors under supervision, indicating partial community mobility. Following acute deterioration of renal function, he was diagnosed with CKD G5D and offered hemodialysis (HD). While his brother prioritized survival, the patient strongly feared functional decline, hospitalization, and loss of his established home-based lifestyle. Through repeated multidisciplinary conferences, HD and PD were discussed in terms of prognosis, disaster-related risks, and home-care capacity. The patient ultimately chose PD. Based on Physical therapy-led movement assessment and physician confirmation using video analysis, the catheter exit-site was placed on the lateral abdomen, allowing continuation of floor-based mobility. APD was successfully maintained at home with visiting nurse and helper support, without major PD-related complications during follow-up.

Conclusion

In patients with severe CP and CKD G5, SDM should integrate habitual movement patterns, caregiving resources, and supportive care needs. This case demonstrates that Physical therapy-led movement assessment, combined with physician confirmation using video analysis, can inform PD catheter exit-site selection and enable lifestyle-compatible dialysis initiation. Team-based care is essential for safe, patient-centered home dialysis.

P4-04 A Case of Exercise Therapy for Autosomal Dominant Polycystic Kidney Disease

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【Introduction】 Basic research on rats with polycystic kidney disease has reported that long-term exercise suppresses the enlargement of renal and hepatic cysts and has renal protection. However, the clinical efficacy of exercise therapy for autosomal dominant polycystic kidney disease (ADPKD) remains unclear. We report a case of ADPKD in which exercise therapy was implemented after initiation of hemodialysis.

【Case】 A female ADPKD patient in her 40s with concomitant hepatic cysts and vertebral artery stenosis. Following initiation of hemodialysis, bilateral renal artery embolization was performed for renal cyst hemorrhage. At discharge, cardiopulmonary exercise test (CPX) and muscle strength testing showed low exercise tolerance and muscle strength; peak VO_2 of 14.5 ml/min/kg (4.15 METs), AT of 10.2 mL/min/kg (2.91 METs), grip strength of 19.9/19.5 kg, and knee extension strength of 26.4/24.1 kgf. Exercise therapy at the anaerobic threshold level was performed in the outpatient setting once every two weeks for approximately six months. Since tachycardia and elevated blood pressure were also observed at the start of the intervention, monitoring and adjustments to the exercise load were implemented while continuing the intervention. After the intervention ended, improvements in exercise tolerance, grip strength, and lower limb muscle strength were observed; peak VO_2 of 19.2 ml/min/kg (5.50 METs), AT of 13.3 ml/min/kg (3.80 METs), grip strength of 21.1/21.7 kg, and knee extension strength of 28.3/27.0 kgf. Additionally, an increase in activities of daily living was observed, and the patient expressed a positive attitude toward continuing the exercise program.

【Discussion and Conclusion】 In ADPKD, exercise restrictions are often imposed after diagnosis. Furthermore, declining renal function and initiation of dialysis therapy lead to restrictions in daily living activities. In this case, while the patient perceived their activity level as high, their actual daily living activity was below 3000 steps/day. Intervention with an optimized exercise program led to improved exercise tolerance alongside increased daily living activity, contributing to the establishment of an exercise habit. Exercise therapy is effective for improving physical function and establishing exercise habits even in ADPKD patients.

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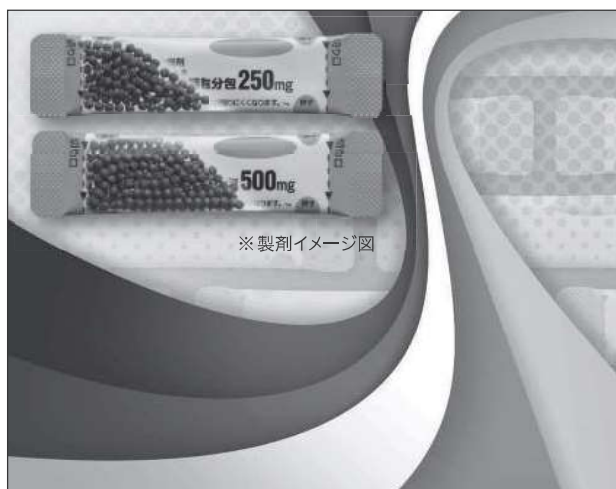
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