Renal Replacement Therapy

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Renal rehabilitation learning in Japanese physical therapy schools: a fact-finding study

Toshiki Kutsuna[1*], Yuhei Otobe[2] and Ryota Matsuzawa[3]

Abstract

Background The scope and content of pregraduate education in renal rehabilitation, a comprehensive program for patients with chronic kidney disease (CKD), at training institutions remain unclear. Therefore, this cross-sectional study aimed to evaluate the state of renal rehabilitation education at physical therapy schools in Japan via a survey.

Methods Questionnaire forms were distributed to instructors responsible for physical therapy across 277 physical therapy schools in Japan. The questionnaire comprised items that assessed the opinions of the respondents on the necessity of learning renal rehabilitation during their student days and after graduation and the content covered at institutions that offered classes on renal rehabilitation. The participating institutions were divided into Renal Rehab Education and No Renal Rehab Education groups. Fisher's exact and chi-squared tests were used to compare variables between the groups.

Results Among the 154 schools that responded to the survey between 14 June 2023 and 31 August 2023 (response rate 55.6%), 123 schools (79.9%) were included in the Renal Rehab Education group. The percentage of classes on rehabilitation for patients with endocrine/metabolic diseases, digestive system diseases, and cancer was higher in the Renal Rehab Education group than that in the No Renal Rehab Education group ($P=0.02$, $P<0.001$, and $P=0.003$, respectively). The distribution of the perceived need to learn renal rehabilitation during student days and after graduation differed significantly between the Renal Rehab Education and No Renal Rehab Education groups ($P<0.001$ and $P=0.004$, respectively). Exercise therapy for patients with CKD (83.7%); definition, diagnosis, severity classification, and testing for CKD (81.3%); general remarks on renal rehabilitation (80.5%); pathophysiology of CKD (78.9%); and renal replacement therapy (69.9%) were the most frequently implemented contents. Prioritization of other fields (45.2%), insufficient class hours (41.9%), and lack of specialized faculty (38.7%) were identified as reasons for not implementing renal rehabilitation courses in the No Renal Rehab Education group; however, 77.4% of schools in this group aimed to commence courses in the future.

Conclusions Approximately 80% of physiotherapy schools offered renal rehabilitation courses. Awareness campaigns must be conducted to facilitate the widespread implementation of renal rehabilitation.

Keywords Chronic kidney disease, Renal rehabilitation, Physical therapist, Education

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Background

Chronic kidney disease (CKD) is a risk factor for cardiovascular and cerebrovascular diseases that is known to progress to end-stage renal failure and cause a deterioration in vital prognosis [1–3]. The prevalence of CKD varies by country and region, with tendencies to be high and exhibit either increasing or decreasing trends [4–7]. Moreover, globally, the number of patients with end-stage renal failure undergoing dialysis is increasing, resulting in a rise in healthcare costs and an increase in the number of patients with CKD lacking adequate treatment [8]. Therefore, the increasing prevalence and mortality rates of CKD are recognized as significant global health issues [9]. Conversely, patients with CKD often exhibit a high incidence of frailty, which has been strongly associated with adverse events, such as hospitalization and falls [10]. Consequently, preventing the progression of pathology and occurrence of frailty in patients with CKD has become a significant medical, healthcare, and socioeconomic challenge.

Regarding treatment of CKD, it is recommended to implement appropriate disease management, including lifestyle guidance and pharmacotherapy, from the early stages after diagnosis [1–3]. Recently, renal rehabilitation, as a comprehensive program for patients with CKD, including exercise therapy, dietary therapy and fluid management, pharmacotherapy, education, and psychosocial support, has attracted attention [11, 12]. Renal rehabilitation, being a diverse program, is effectively delivered to patients by a multidisciplinary team of various healthcare professionals, each leveraging their expertise [13]. To operate a multidisciplinary team, it is considered crucial for each profession to collaborate smoothly with others, share knowledge, and leverage their expertise while ensuring effective coordination among different professions [14]. Among these professions, physical therapy plays a central role in renal rehabilitation and is particularly effective in preventing and improving frailty [15]. Therefore, there are high expectations for the role of physical therapists specializing in exercise therapy.

Widely promoting renal rehabilitation necessitates the cultivation of professionals with a broad range of knowledge and skills through appropriate education. Japan is at the forefront of institutionalizing renal rehabilitation and forming career paths for medical professionals. The country has an organization by the name of the Japanese Society of Renal Rehabilitation, which has prepared and publicly released renal rehabilitation guidelines, established the System for Registered Instructors of Renal Rehabilitation to ensure the quality of medical professionals, and implemented a national health insurance system that partially reimburses renal rehabilitation services [16]. Despite the robust postgraduate education for healthcare professionals, the scope and content of pregraduate education in renal rehabilitation at training institutions remain unclear. Therefore, this study aimed to elucidate the current state of renal rehabilitation education at physical therapy schools in Japan through a survey.

Methods

Study design

This survey was conducted as a cross-sectional study, and the response period was from 14 June 2023 to 31 August 2023. Request letters, information brochures, and questionnaire forms were distributed to the target facilities, seeking their cooperation in the survey. The request letters included a quick response (QR) code and uniform resource locator (URL) for an internet-based questionnaire. Respondents were given the option to choose their preferred method of response, either through the internet or by returning the questionnaire form by mail.

Participants

The survey targeted all 277 physical therapy schools in Japan listed on the Japanese Physical Therapy Association website (https://www.japanpt.or.jp/) as of 31 March 2023. The respondents were primarily instructors responsible for physical therapy in the internal medicine curriculum, and in cases where responses were unavailable, responses from instructors knowledgeable about related curricula were accepted.

This study was conducted with the approval of the Tokyo University of Technology Ethics Committee (approval no. E22HS-025). All participants received an information brochure outlining the purpose and methods of the survey, and the research details were communicated in writing. Participants provided their consent for research participation by signing the relevant section of the questionnaire form, which was either conducted through an online survey or sent via mail.

Question items in the questionnaire

The questionnaire items were constructed independently by the authors. The online survey questionnaire was created by the lead author using Microsoft Forms. The number of questions was set to ensure that respondents could complete the questionnaire within 15 min, taking into consideration their burden and response rate.

The basic information collected for each physical therapy school included location, classification by the establisher, classification of the educational institution, class hours, program duration, capacity of one academic year, number of faculty members in the department or specialization, and the number of faculty members (full-time, part-time) involved in the education of physical therapy

in internal medicine. Moreover, basic information about respondents, including age, gender, occupation, involvement in the education of physical therapy in internal medicine, and possession of certified qualifications from professional associations, was surveyed.

Regarding the learning content related to physical therapy in internal medicine, the survey investigated the presence of classes on rehabilitation for patients with each disease. In instances where such classes were conducted, the number of class periods (1 period = 90 min) was also surveyed by academic year. The main diseases causing internal medicine disorders were selected based on the Physical Therapy Education Model Core Curriculum [17] issued by the Japanese Physical Therapy Association in 2019. These diseases included respiratory diseases, circulatory diseases, endocrine and metabolic diseases, digestive diseases, cancer, and renal and urological diseases.

In this survey, rehabilitation for renal and urological diseases was defined as renal rehabilitation. Respondents were asked about their opinions on the necessity of learning renal rehabilitation during their student days and after graduation. Additionally, the content covered in those classes was assessed in institutions offering classes on renal rehabilitation. The content of renal rehabilitation was determined on the basis of previous research on the minimum standards for renal rehabilitation [18]. Conversely, in schools that did not offer classes on renal rehabilitation, the reasons for not conducting these classes and any plans to start classes on renal rehabilitation in the future were investigated.

Statistical analysis

The survey results were aggregated using Microsoft Excel, and numerical data are presented as response rates (%) or medians [25th percentile, 75th percentile]. In subgroup analysis, variables were compared between two groups: schools offering classes on renal rehabilitation (Renal Rehab Education group) and schools not offering such classes (No Renal Rehab Education group). Fisher's exact and chi-squared tests were employed for the comparison of each variable between the two groups. EZR (Saitama Medical Center, Jichi Medical University, Saitama) [19] was used for the analysis, and the significance level was set at $P = 0.05$.

Results

Of the 277 schools surveyed, 154 schools provided responses, which equates to a response rate of 55.6%. Among these 154 schools, 123 schools (79.9%) were classified into the Renal Rehab Education group.

Table 1 presents the basic information of the training schools. A significant difference in the distribution of locations was observed between the Renal Rehab Education group and the No Renal Rehab Education group ($P = 0.008$). Table 2 presents the basic information of the respondents. A significant difference in the distribution of ages was observed between the Renal Rehab Education and No Renal Rehab Education groups ($P = 0.006$).

Table 3 presents the learning content related to physical therapy in internal medicine. The Renal Rehab Education group showed a significantly higher percentage of classes on rehabilitation for patients with endocrine/metabolic diseases, digestive diseases, and cancer than the No Renal Rehab Education group ($P = 0.02$, $P < 0.001$, and $P = 0.003$, respectively).

Figure 1 illustrates the perceived need to learn renal rehabilitation as indicated by respondents. A significant difference in the distribution of the perceived need to learn renal rehabilitation during both student days and after graduation was observed between the Renal Rehab Education and No Renal Rehab Education groups ($P < 0.001$ and $P = 0.004$, respectively).

Figure 2 presents the contents of the renal rehabilitation courses implemented in the Renal Rehab Education group. The top five areas included exercise therapy for patients with CKD (83.7%); definition, diagnosis, severity classification, and testing for CKD (81.3%); general remarks on renal rehabilitation (80.5%); pathophysiology of CKD (78.9%); and renal replacement therapy (69.9%).

Figure 3 illustrates the reasons for not offering renal rehabilitation courses in the No Renal Rehab Education group. The top three reasons included having other fields to prioritize teaching (45.2%), insufficient class hours (41.9%), and faculty members not specialized in the subject (38.7%). Figure 4 shows the plans of the No Renal Rehab Education group to start courses on renal rehabilitation in the future, with 77.4% of this group indicating plans to initiate such courses.

Discussion

In this study, we conducted a questionnaire survey targeting physical therapy schools in Japan with the aim of elucidating the learning status of renal rehabilitation in the pregraduate education of physical therapists. The survey results showed that renal rehabilitation courses were offered in approximately 80% of the physiotherapy schools. The implementation of these courses was found to be associated with the location of the schools, age of the faculty members, presence of courses related to other diseases in physical therapy in internal medicine disorders, and perspectives of faculty members on learning renal rehabilitation.

The survey results revealed that many physical therapy schools, particularly in the Tohoku, Kanto, and Chubu regions, offer courses on renal rehabilitation. A regional

Table 1 Basic information on physical therapy training schools

		All	Renal Rehab Education group	No Renal Rehab Education group	*P*-value
Characteristic		154	123	31	
Location	Hokkaido	8 (5.2)	6 (4.9)	2 (6.5)	0.008 *
	Tohoku	13 (8.4)	12 (9.8)	1 (3.2)	
	Kanto	37 (24.0)	36 (29.3)	1 (3.2)	
	Chubu	21 (13.6)	19 (15.4)	2 (6.5)	
	Kinki	30 (19.5)	20 (16.3)	10 (32.3)	
	Chugoku	13 (8.4)	9 (7.3)	4 (12.9)	
	Shikoku	6 (3.9)	3 (2.4)	3 (9.7)	
	Kyushu	26 (16.9)	18 (14.6)	8 (25.8)	
Classification by establisher	National	9 (5.8)	6 (4.9)	3 (9.7)	0.07
	Public	13 (8.4)	13 (10.6)	0 (0.0)	
	Private	132 (85.7)	104 (84.6)	28 (90.3)	
Classification of institution	University	80 (51.9)	64 (52.0)	16 (51.6)	0.58
	Junior college	3 (1.9)	3 (2.4)	0 (0.0)	
	Professional university	2 (1.3)	1 (0.8)	1 (3.2)	
	Vocational school	69 (44.8)	55 (44.7)	14 (45.2)	
Lecture times	Daytime only	141 (91.6)	113 (91.9)	28 (90.3)	0.77
	Nighttime only	1 (0.6)	1 (0.8)	0 (0.0)	
	Day/night	12 (7.8)	9 (7.3)	3 (9.7)	
Length of study	3 years	45 (29.2)	35 (28.5)	10 (32.3)	0.67
	4 years	109 (70.8)	88 (71.5)	21 (67.7)	
Max. students per year		43 [40, 80]	45 [40, 80]	40 [40, 60]	0.31
Number of faculty members affiliated with department/major		11 [7, 14]	11 [7, 14]	10 [8, 13.5]	0.82
Number of faculty members involved in education on physical therapy in internal medicine disorders (full-time)		2 [1, 2]	2 [1, 2.5]	2 [1, 2]	0.16
Number of faculty members involved in education on physical therapy in internal medicine disorders (part-time)		0 [0, 2]	0 [0, 2]	1 [0, 2]	0.14

* Chi-squared test

Values expressed as response rate (%) or median value [25th percentile, 75th percentile]

imbalance was observed, with a higher prevalence in the eastern part of Japan. The national academic conferences, organized by the Japanese Society of Renal Rehabilitation, have been conducted multiple times in various regions, including five times in the Kanto region, four times in the Tohoku region (including one held online owing to the impact of COVID-19), two times in the Chugoku region, and two times in the Kyushu region, covering the period from 2011 to 2023 (Japanese Society of Renal Rehabilitation website: https://jsrr.smoosy.atlas.jp/ja/) [20]. Additionally, the number of institutional members, comprising universities and related hospitals, in the Japanese Society of Renal Rehabilitation is as follows: 4 facilities in the Hokkaido region (0 university-related facilities), 11 facilities in the Tohoku region (1 university-related facility), 45 facilities in the Kanto region (5 university-related facilities), 36 facilities in the Chubu region (3 university-related facilities), 21 facilities in the Kinki region (2 university-related facilities), 19 facilities in the Chugoku region (0 university-related facilities), 6 facilities in the Shikoku region (1 university-related facility), and 26 facilities in the Kyushu region (1 university-related facility), indicating a slightly higher number of facilities in eastern Japan (Japanese Society of Renal Rehabilitation website: https://jsrr.smoosy.atlas.jp/ja/). On the basis of the above details, it can be considered that regional factors, including academic activity in renal rehabilitation, the number of facilities practicing renal rehabilitation in clinical settings, and the presence of faculty members with degrees in renal rehabilitation at universities emphasizing renal rehabilitation, may influence the implementation of renal rehabilitation courses in physical therapy schools.

The findings indicate that, the younger the age of the faculty members, the higher the percentage of implementation of renal rehabilitation courses. The importance of creating appropriate programs based on medical data

Table 2 Basic information of respondents

		All	Renal Rehab Education group	No Renal Rehab Education group	*P*-value
Characteristic		154	123	31	
Age	30 s	38 (24.7)	36 (29.3)	2 (6.5)	0.006
	40s	64 (41.6)	51 (41.5)	13 (41.9)	
	50s	42 (27.3)	31 (25.2)	11 (35.5)	
	60s	10 (6.5)	5 (4.1)	5 (16.1)	
Gender	Female	19 (12.3)	16 (13.0)	3 (9.7)	0.55
	Male	132 (85.7)	105 (85.4)	27 (87.1)	
	Other	1 (0.6)	1 (0.8)	0 (0.0)	
	No response	2 (1.3)	1 (0.8)	1 (3.2)	
Occupation	Physical therapist	154 (100.0)	123 (100.0)	31 (100.0)	—
(multiple answers OK)	Other	2 (1.3)	2 (1.6)	0 (0.0)	
Involvement in internal medicine physical therapy education? (Yes)		140 (90.9)	113 (91.9)	27 (87.1)	0.48
Academic qualification	Specialist cardiovascular physical therapy	26 (16.9)	21 (17.1)	5 (16.1)	1
(multiple answers OK)	Specialist respiratory physical therapy	25 (16.2)	17 (13.8)	8 (25.8)	0.17
	Specialist diabetes physical therapy	19 (12.3)	16 (13.0)	3 (9.7)	0.77
	Certificated physical therapist in cardiovascular disease	15 (9.7)	12 (9.8)	3 (9.7)	1
	Certificated physical therapist in pulmonary disease	15 (9.7)	10 (8.1)	5 (16.1)	0.19
	Certificated physical therapist in metabolic disease	9 (5.8)	8 (6.5)	1 (3.2)	0.69
	Registered instructor of cardiac rehabilitation	41 (26.6)	37 (30.1)	4 (12.9)	0.07
	Certified heart failure educator	2 (1.3)	2 (1.6)	0 (0.0)	1
	Tripartite-certified respiratory therapist	63 (40.9)	50 (40.7)	13 (41.9)	1
	Certified diabetes educator in Japan	12 (7.8)	12 (9.8)	0 (0.0)	0.13
	Registered instructor of renal rehabilitation	14 (9.1)	14 (11.4)	0 (0.0)	0.07
	Other	12 (7.8)	8 (6.5)	4 (12.9)	0.26
	None	39 (25.3)	31 (25.2)	8 (25.8)	1

Values expressed as response rate (%) or median value [25th percentile, 75th percentile]

for renal rehabilitation was proposed in the early 1980s [21]. Subsequently, in the 1990s, academic papers on the effectiveness of renal rehabilitation, particularly for dialysis patients, began to increase substantially [12]. In Japan, there has been a long-standing practice of recommending exercise restrictions in lifestyle guidance for patients with CKD from the perspective of renal protection. It is only in recent years that healthcare professionals have started to show interest in the practical application of exercise therapy for patients with CKD [22]. Furthermore, the implementation of appropriate aerobic exercise has been reported to improve renal function indicators, such as estimated glomerular filtration rate and serum creatinine, and the safety of exercise therapy for patients with CKD has become widely known [23]. Accumulation of evidence regarding the safety of exercise therapy for patients with CKD has led to a shift in guidelines and textbooks from recommending exercise restrictions to endorsing appropriate exercise [24]. Younger faculty members, who had increased exposure to renal rehabilitation during their student days or shortly after acquiring their healthcare qualifications, may strongly perceive the need for renal rehabilitation. This perception could contribute to the offering of courses on renal rehabilitation in pregraduate education. Furthermore, in the Renal Rehab Education group, there was a high ratio of courses related to rehabilitation for patients with endocrine/metabolic diseases, digestive diseases, and cancer. Rehabilitation for patients with these diseases, similar to renal rehabilitation, has gained attention recently [25, 26]. Therefore, it is presumed that faculty members who are responsive to recent trends in rehabilitation and schools focusing on physical therapy for internal medicine disorders are offering diverse courses to address various aspects of rehabilitation.

The pregraduate education in renal rehabilitation at physical therapy schools was observed to encompass not only exercise therapy but also various aspects of CKD pathology and treatment. However, the implementation rates for educational content, such as dietary therapy, nursing care, pharmacotherapy, and psychological support, were less than 60%. The reason for this may be that,

Table 3 Learning content related to physical therapy in internal medicine

		All	Renal Rehab Education group	No Renal Rehab Education group	*P*-value
Characteristic		154	123	31	
Availability of lessons related to rehabilitation for respiratory disease patients (Yes)		148 (96.1)	119 (96.7)	29 (93.5)	0.35
[If implemented]	Year 1	0 [0, 0]	0 [0, 0]	0 [0, 0]	0.92
Number of periods	Year 2	5 [0, 13.5]	5 [0, 14]	2.5 [0, 10.75]	0.37
	Year 3	10 [0, 15]	8 [0, 15]	14.5 [1.5, 16]	0.10
	Year 4	0 [0, 0]	0 [0, 0]	0 [0, 0]	0.92
	Total	15 [13, 19.5]	15 [12, 19]	15.5 [15, 21.5]	0.16
Availability of lessons related to rehabilitation for circulatory disease patients (Yes)		149 (96.8)	119 (96.7)	30 (96.8)	1
[If implemented]	Year 1	0 [0, 0]	0 [0, 0]	0 [0, 0]	0.39
Number of periods	Year 2	4 [0, 10.25]	4 [0, 10.5]	1 [0, 10]	0.41
	Year 3	8 [0.75, 13.25]	8 [0.5, 13.5]	8 [4, 13]	0.56
	Year 4	0 [0, 0]	0 [0, 0]	0 [0, 0]	0.62
	Total	15 [10, 19]	15 [10, 19]	15 [11, 20]	0.84
Availability of lessons related to rehabilitation for endocrine/metabolic disease patients (Yes)		148 (96.1)	121 (98.4)	27 (87.1)	0.02
[If implemented]	Year 1	0 [0, 0]	0 [0, 0]	0 [0, 0]	0.98
Number of periods	Year 2	1 [0, 5]	2 [0, 5]	1 [0, 5]	0.67
	Year 3	3 [0, 5]	3 [0, 5]	3 [0, 5.5]	0.78
	Year 4	0 [0, 0]	0 [0, 0]	0 [0, 0]	0.67
	Total	6 [4, 9]	6 [3, 9]	7 [4, 9]	0.40
Availability of lessons related to rehabilitation for digestive disease patients (Yes)		52 (33.8)	50 (40.7)	2 (6.5)	< 0.001
[If implemented]	Year 1	0 [0, 0]	0 [0, 0]	—	0.20
Number of periods	Year 2	0 [0, 2]	0 [0, 2]	—	0.08
	Year 3	1 [0, 2]	1 [0, 2]	—	0.04
	Year 4	0 [0, 0]	0 [0, 0]	—	0.86
	Total	2 [1, 4]	2 [1, 4]	—	0.04
Availability of lessons related to rehabilitation for cancer patients (Yes)		132 (85.7)	111 (90.2)	21 (67.7)	0.003
[If implemented]	Year 1	0 [0, 0]	0 [0, 0]	0 [0, 0]	0.21
Number of periods	Year 2	0 [0, 2]	0 [0, 2]	0 [0, 0]	0.10
	Year 3	2 [0, 3]	2 [0, 3]	2 [0, 6]	0.55
	Year 4	0 [0, 0]	0 [0, 0]	0 [0, 0]	0.20
	Total	3 [2, 5]	3 [2, 5]	3 [2, 6]	0.83
Availability of lessons related to rehabilitation for renal and urological disease patients (Yes)		123 (79.9)	123 (100.0)	0 (0.0)	—
[If implemented]	Year 1	0 [0, 0]	0 [0, 0]	—	—
Number of periods	Year 2	0 [0, 2]	0 [0, 2]	—	—
	Year 3	1 [0, 2]	1 [0, 2]	—	—
	Year 4	0 [0, 0]	0 [0, 0]	—	—
	Total	3 [2, 4]	3 [2, 4]	—	—

Values expressed as response rate (%) or median value [25th percentile, 75th percentile]

while the knowledge and skills that physical therapists should learn in pregraduate education are increasing with the advancement of medical technology, the limited time for pregraduate education results in insufficient time dedicated to learning renal rehabilitation. Renal rehabilitation involves not only exercise therapy but also the correction of lifestyle habits, and it is considered effective to implement these aspects appropriately [27]. Therefore, students aspiring to become physical therapists should also be knowledgeable about methods for guiding patients with CKD in lifestyle habits, and addressing how to allocate time for learning these aspects while maintaining a balance with other subjects remains a future challenge.

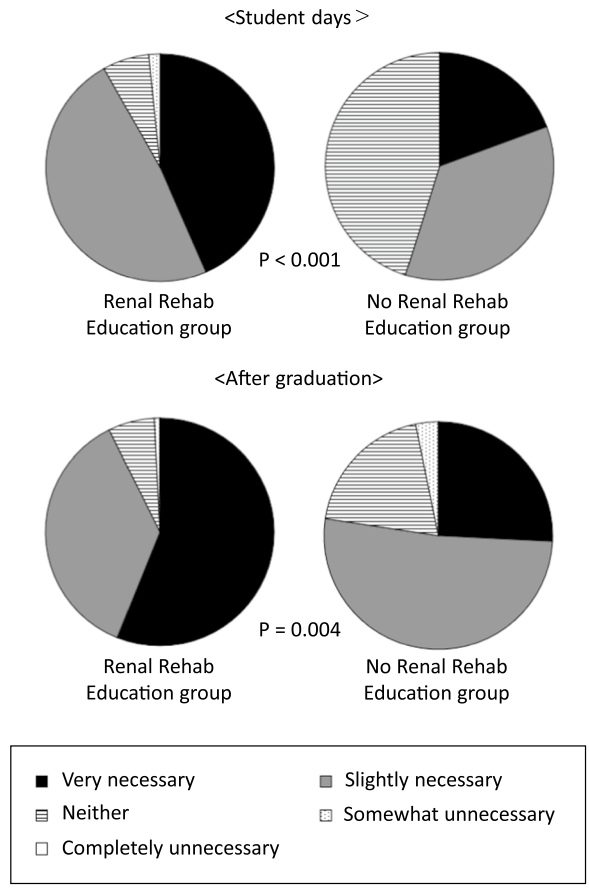

Fig. 1 Necessity of learning renal rehabilitation as perceived by respondents

To promote renal rehabilitation, it is necessary to increase awareness of its importance among the faculty of training schools. First, it would be effective to include a curriculum on renal rehabilitation in the postgraduate education of physical therapists. It will also be necessary to develop up-to-date guidelines and standard textbooks on renal rehabilitation. In addition, it would be effective to expand the medical fee, so when students enter clinical practice, they are more likely to treat patients with CKD as standard physical therapy. We believe it would be effective to implement these activities through the efforts of academic organizations, such as the Japanese Society of Renal Rehabilitation, after expanding the evidence level for renal rehabilitation.

This study had some limitations. First, despite being conducted as a nationwide survey of all physical therapy schools in Japan, the response rate was slightly low. It is possible that a high proportion of nonresponding facilities do not offer renal rehabilitation courses. However, the locations and classifications of the responding schools were similar to the national distribution, allowing us to regard the results of this study as being representative of the entire country. Second, detailed information about the respondents was not collected. While the study revealed that the implementation of renal rehabilitation courses is influenced by the respondents' experiences and perspectives, insufficient information was available about their educational background, years of experience as healthcare professionals, and other relevant details. Third, this study was limited by focusing the survey on schools training physical therapists. In the model core curriculum for medical doctors, the concept and indications of rehabilitation medicine are included as part of the learning content; however, renal rehabilitation is not mentioned [28]. In addition, the model core curriculum for nurses only describes the concept of rehabilitation [29]. Renal rehabilitation is a multidisciplinary effort, and considering the education of each profession separately is crucial

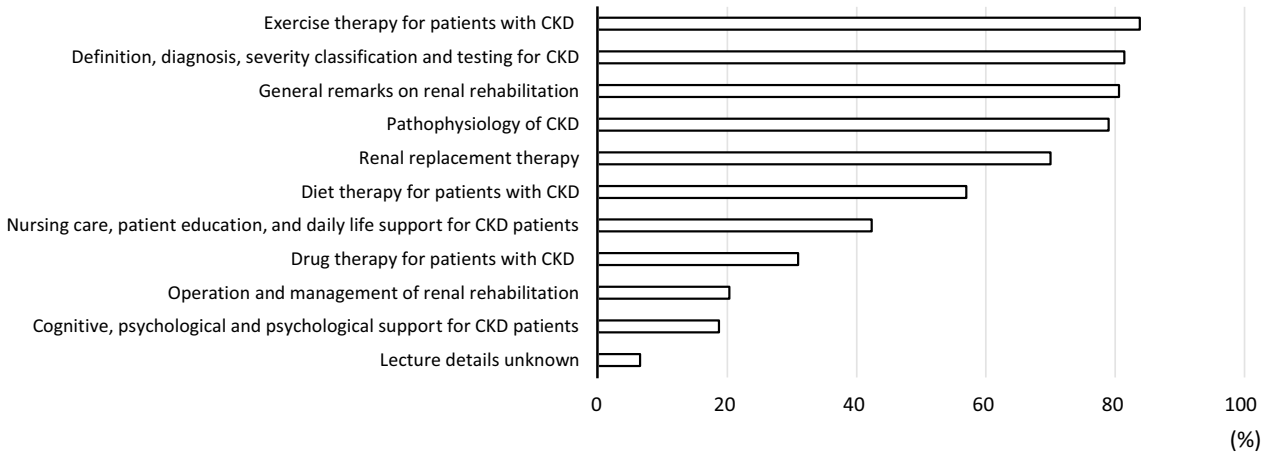

Fig. 2 Details of implemented lessons related to renal rehabilitation in the Renal Rehab Education group. *CKD* chronic kidney disease

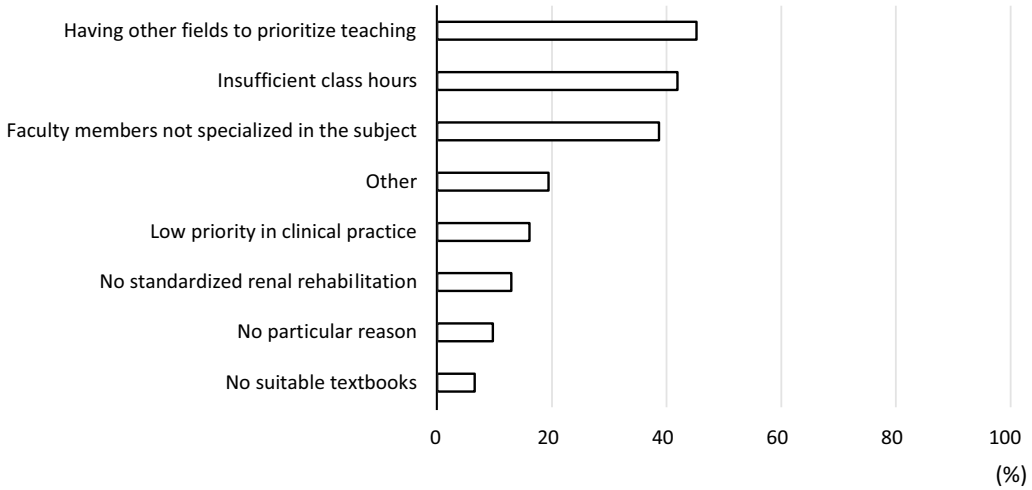

Fig. 3 Reason for not offering lessons on renal rehabilitation in the No Renal Rehab Education group

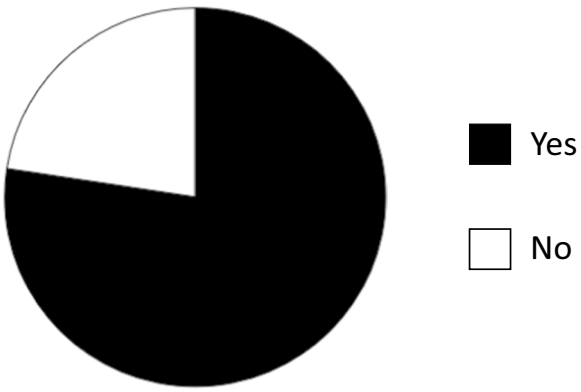

Fig. 4 Plans to start lessons on renal rehabilitation in the future in the No Renal Rehab Education group

for the widespread implementation of renal rehabilitation. In the future, it will be important to examine the pregraduate education for each discipline individually.

Conclusions

Approximately 80% of physical therapy training schools in Japan offer courses on renal rehabilitation, and the implementation of such courses is associated with the location of the school, age of the instructors, availability of courses on physical therapy of other internal medicine conditions, and attitudes of the faculty members toward learning renal rehabilitation. To promote the widespread adoption of renal rehabilitation, it is necessary to advance awareness campaigns to ensure that faculty members at training schools recognize its importance.

Abbreviation

CKD Chronic kidney disease

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Author contributions

All authors made substantial contributions to the conception and design of the study. T.K. prepared the questionnaire and analyzed the dataset. All authors interpreted the data. T.K. drafted the work. All authors read and approved the final version of the manuscript.

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Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate

This study was performed according to the ethical principles of the Declaration of Helsinki and approved by the ethics committee of Tokyo University of Technology (approval no. E22HS-025). Informed consent was obtained from all participants included in the present study.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

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