

## Original article

# Trends in outpatient rehabilitation practices in Japan: analysis using the National Database of Health Insurance Claims Open Data

Shinsuke Hori<sup>1</sup>, Kenta Ushida<sup>1</sup>, and Ryo Momosaki<sup>1</sup>

<sup>1</sup>Department of Rehabilitation Medicine, Mie University Graduate School of Medicine, Japan

### Abstract

**Objective:** Many countries have recently established registration databases in the field of rehabilitation to clarify their current status. However, these databases are primarily created for inpatients, with only a few large-scale databases for outpatients. The present study aimed to clarify secular changes, age distribution, and regional disparities in the implementation of outpatient rehabilitation in Japan using the National Database of Health Insurance Claims.

**Materials and Methods:** Using the National Database of Health Insurance Claims Open Data published by the Ministry of Health, Labor, and Welfare, the number of outpatient rehabilitation units from 2014 to 2018 were extracted and examined.

**Results:** The total number of units for outpatient rehabilitation increased gradually from 2014 to 2018. Orthopedic rehabilitation accounted for more than 80% of the total number of units for outpatient rehabilitation in 2018. The total number of units for outpatient rehabilitation according to age was highest among those in their late 70s, while cerebrovascular and dysphagia rehabilitation had the highest number of units in children.

**Conclusion:** The total number of units for outpatient rehabilitation gradually increased from 2014 to 2018; whereas the number of total units for outpatient rehabilitation according to age was the highest among those in their late 70s. However, cerebrovascular rehabilitation and dysphagia rehabilitation had the highest number of units in children. The implementation status of rehabilitation in each region varied greatly among prefectures, suggesting the need for policy planning to eliminate regional disparities.

**Key words:** outpatient rehabilitation, National Database of Health Insurance Claims Open Data (NDB Open Data), epidemiology

(J Rural Med 2022; 17(3): 125–130)

## Introduction

As the global population ages together with increasing life expectancies among people with disabilities, the need for rehabilitation has continued to increase worldwide<sup>1</sup>. Notably, the World Health Organization estimates that approximately 1 billion people suffer from disabilities worldwide (15% of the world's population)<sup>2</sup>. Patients with orthopedic, neurological, cardiac, pulmonary, and other diseases

often receive outpatient rehabilitation given the decline in their physical function, hence the need for rehabilitation is increased. Moreover, patients whose physical function declines after hospitalization for acute diseases often receive outpatient rehabilitation after discharge. Unlike inpatient rehabilitation, outpatient rehabilitation requires patients return to their homes after treatment. Consequently, they receive treatment near their homes and use the local medical resources.

At present various countries have established registry databases in the field of rehabilitation to clarify their current status. For instance, the United States has the Uniform Data System for Medical Rehabilitation database<sup>3</sup>, the largest rehabilitation registry database in the United States, while Japan has the Japan Rehabilitation Database<sup>4</sup>, the largest rehabilitation registry database in Japan. Although descriptive epidemiological studies have been conducted on rehabilitation, none have, thus far, focused on outpatient rehabilitation given that the databases are mainly for inpatients, with only a few large-scale databases available for outpatients.

Received: October 1, 2021

Accepted: February 14, 2022

Correspondence: Ryo Momosaki, Department of Rehabilitation Medicine, Mie University Graduate School of Medicine, 2-174 Edobashi, Tsu, Mie 514-8507, Japan

E-mail: momosakiryoyo@gmail.com

This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial No Derivatives

(by-nc-nd) License <<http://creativecommons.org/licenses/by-nc-nd/4.0/>>.



The National Database of Health Insurance Claims and Specific Health Checkups of Japan (NDB), one of the most comprehensive national health management databases worldwide, does cover outpatients<sup>5</sup>). The understanding of the detailed payment status in outpatient rehabilitation can provide useful insights for developing effective medical plans by aiding in the identification of diseases, ages, and demand for outpatient rehabilitation in communities. Therefore, the current study, aimed to clarify the current status of outpatient rehabilitation in Japan, its changes over time, age distribution, and regional differences using the NDB.

## Materials and Methods

This study used the NDB constructed by the Ministry of Health, Labor, and Welfare. The NDB is a database that includes information on medical claims and specific health examinations collected by the Ministry of Health, Labor, and Welfare since 2008, as well as information on over 20 million medical claims and specific health examinations per year. Moreover, the Ministry of Health, Labor, and Welfare has been providing data to researchers and government agencies since 2011. The NDB is considered a useful source of data for determining the actual medical trends and health status of covered individuals. To promote further use of the NDB, the Ministry of Health, Labor and Welfare has been publishing aggregate NDB data from a general perspective since 2016 as NDB open.

Outpatient rehabilitation in Japanese hospitals is provided using medical fees for the rehabilitation of specific diseases such as cardiovascular disease, cerebrovascular disease, orthopedic disease, respiratory disease, and disuse syndrome. Outpatient rehabilitation is performed by physical, occupational, and speech therapists under the supervision of a physician. The healthcare fee for disease-specific rehabilitation is determined as one unit per 20 minutes. To provide disease-specific rehabilitation, the number of physicians, therapists, training room area, and equipment standards must meet the defined requirements. The fees for swallowing therapy can be reimbursed when a physician or dentist, speech therapist, nurse, assistant nurse, dental hygienist, physical therapist, or occupational therapist provides training and education. Such fees can be reimbursed once a day when the therapy is performed for at least 30 minutes. During disease-specific rehabilitation, only rehabilitation for cardiovascular disease can have multiple patients simultaneously.

We obtained outpatient rehabilitation data from the National Database of Health Insurance Claims and Specific Health Checkups of the Japan dataset from April 2014 to March 2019<sup>6–10</sup>). This study collected data on rehabilitation and swallowing therapy according to diseases such as cardiovascular disease, cerebrovascular disease, orthope-

dic disease, respiratory disease, and disuse syndrome. For disease-specific rehabilitation, the number of units per day was determined, whereas for swallowing therapy, one session was counted as one unit. This study used data on the number of rehabilitation units for cardiovascular rehabilitation, cerebrovascular rehabilitation, disuse syndrome rehabilitation, orthopedic rehabilitation, respiratory rehabilitation, and dysphagia rehabilitation and following which we examined the changes in the total number of units per year, changes in the total number of units by age, changes in the number of units per type of rehabilitation, and changes in the number of units according to age per type of rehabilitation. We described the number of rehabilitation units in the outpatient setting using the 2018 data. The total number of units corresponding to the prefecture represents the number of units per 100,000 population in 2018. Population numbers corresponding to the prefecture were obtained from the census (October 1, 2017) of the Statistic Bureau, Ministry of Internal Affairs and Communications data<sup>11</sup>).

## Results

Some of the figures are available on figshare as Appendix<sup>12</sup>.

### *Total number of units for outpatient rehabilitation*

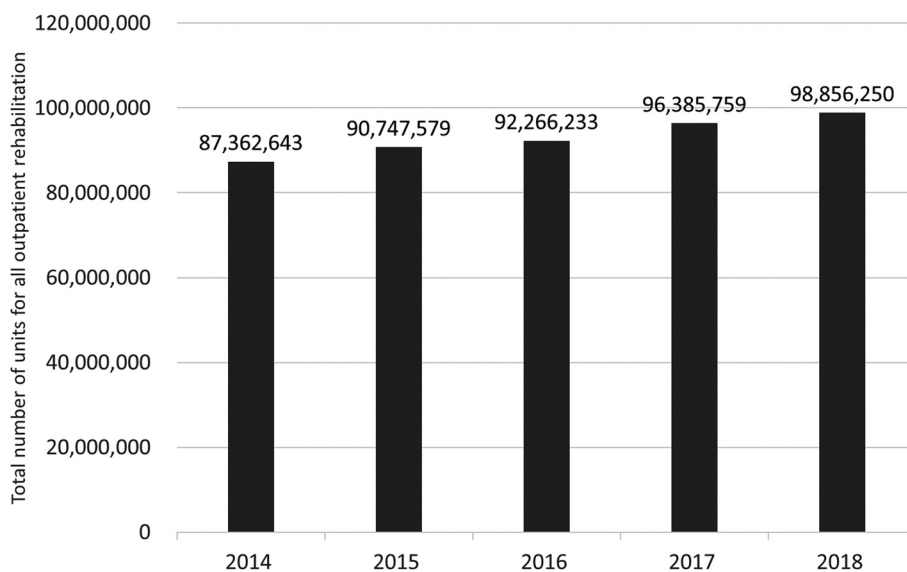
The total number of units for outpatient rehabilitation patients gradually increased from approximately 87 million units in 2014 to approximately 99 million units in 2018 (Figure 1). The greatest number of total units for outpatient rehabilitation according to age was observed among those in their late 70s (Figure 2). Orthopedic rehabilitation was the most frequent rehabilitation unit per disease in 2018 (83.6%), followed by cerebrovascular rehabilitation (13.5%) and cardiovascular rehabilitation (2.2%) (Figure 3). The frequency of disuse syndrome rehabilitation, respiratory rehabilitation, and dysphagia rehabilitation was <1%.

### *Cardiovascular rehabilitation*

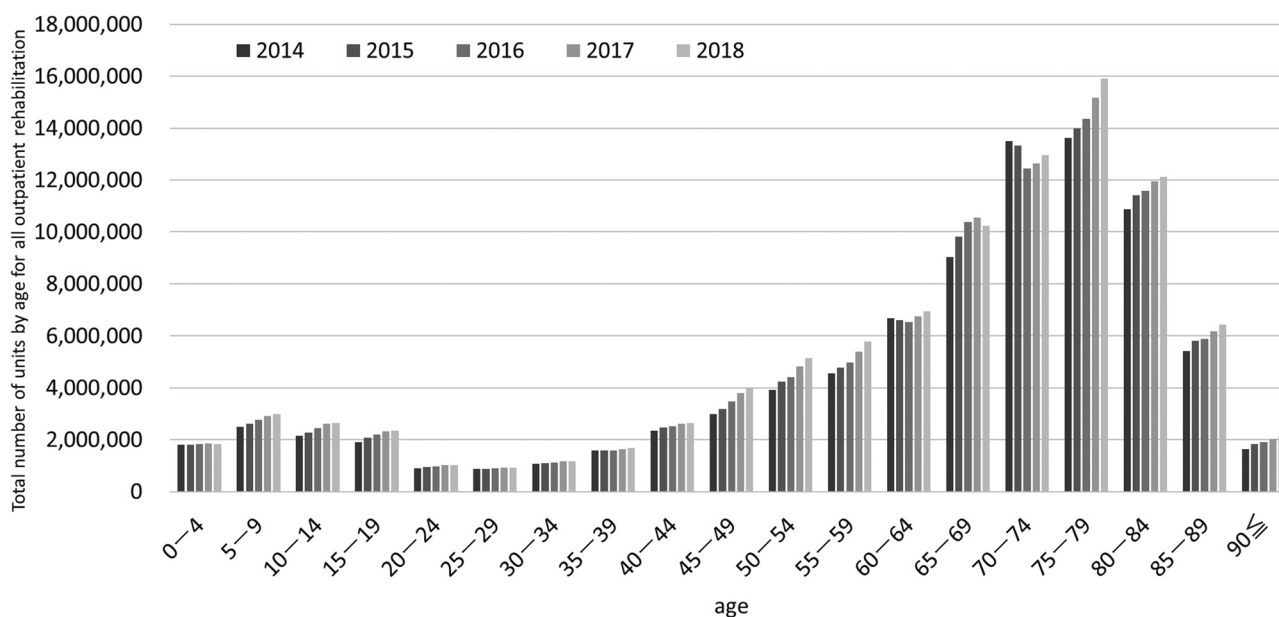
The total number of units for cardiovascular rehabilitation increased from approximately 1.2 million in 2014 to approximately 2.3 million in 2018 (Appendix 1). Cardiovascular rehabilitation was most frequent among those in their early 70s in 2014, but was most frequent among those in their late 70s in 2016 (Appendix 2). The maximum regional disparity in cardiovascular rehabilitation according to the prefecture in 2018 was approximately 19 times greater (Appendix 3).

### *Cerebrovascular rehabilitation*

The total number of units for cerebrovascular rehabilitation was roughly 14 million and 13 million in 2014 and 2018,



**Figure 1** Total number of units for outpatient rehabilitation from 2014 to 2018



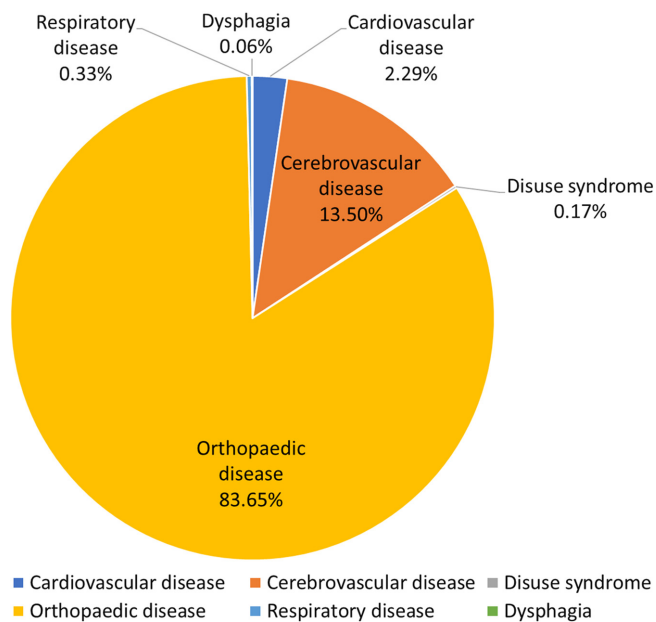
**Figure 2** Total number of units according to age for outpatient rehabilitation from 2014 to 2018

respectively (Appendix 4). During 2014 and 2018, cerebrovascular rehabilitation was most common in children aged 5 to 9 years, followed by those aged 0 to 4 years (Appendix 5). Cerebrovascular rehabilitation showed a large number of units in children aged 0 to 9 years and people over 65, between 2014 and 2018. The maximum regional disparity in cerebrovascular rehabilitation according to the prefecture in 2018 was approximately 8 times greater (Appendix 6).

### Disuse syndrome rehabilitation

In 2014, the total number of units in disuse syndrome

rehabilitation were around 214,000. It decreased from 2015 to approximately 172,000 in 2018 (Appendix 7). Disuse syndrome rehabilitation was most frequent among those in their early 70s in 2014, although from 2017, it was most frequent among those in their early 80s. The second most frequent age group for disuse syndrome rehabilitation was the late 70s and the third was the late 80s (Appendix 8). The maximum regional disparity in disuse syndrome rehabilitation according to the prefecture in 2018 was approximately 35 times (Appendix 9).



**Figure 3** Percentage of units for disease-specific rehabilitation among outpatients in 2018

## Orthopedic rehabilitation

The total number of units for orthopedic rehabilitation was approximately 83 million in 2018, increased from approximately 70 million in 2014 (Appendix 10). The number of units of orthopedic rehabilitation were the highest among those in their late 70s from the years 2014–2018 (Appendix 11). The second and third most frequent age groups for orthopedic rehabilitation were the early 70s and early 80s, respectively. The maximum regional disparity in orthopedic rehabilitation according to the prefecture in 2018 was approximately 10 times (Appendix 12).

## Respiratory rehabilitation

The total number of units for respiratory rehabilitation increased from roughly 260,000 in 2014 to almost 320,000 in 2018 (Appendix 13). Respiratory rehabilitation was most common among those in their late 70s from the years 2014–2018. Although variations existed, the second and third most common age groups were the early 70s and the early 80s, respectively (Appendix 14). The maximum regional disparity in respiratory rehabilitation according to the prefecture in 2018 was approximately 28 times (Appendix 15).

## Dysphagia rehabilitation

The total number of units for dysphagia rehabilitation decreased slightly, from roughly 63,000 units in 2014 to almost 57,000 units in 2018 (Appendix 16). Dysphagia rehabilitation was most frequent in the age group of 0 to 4 years from the years 2014–2018 (Appendix 17). Although some variation existed, the second and third most frequent age

groups in 2018 were the early and late 80s, respectively. The maximum regional disparity in dysphagia rehabilitation according to the province in 2018 was 36 times (Appendix 18).

## Discussion

The total number of units for all outpatient rehabilitation services increased gradually between 2014 and 2018. Cieza *et al.*, who reported the need for rehabilitation worldwide<sup>13</sup>, stated that the number of people requiring rehabilitation had increased by 69% from 1990 to 2019, possibly due to population growth and an aging population. Indeed, studies have shown that population aging has caused a decline in muscle mass, strength, and functional performance<sup>14</sup>, which also increases the demand for rehabilitation<sup>15</sup>.

The total population of Japan has increased from about 120 million in 1990 to 130 million in 2019, with the number of older people aged 65 years and above becoming more than double from about 15 million to 36 million<sup>16</sup>. These circumstances increased the demand for rehabilitation, thereby increasing the total number of units for all outpatients in rehabilitation. The number of physical and occupational therapists in Japan has continued to increase annually<sup>17</sup>. Similarly, the number of speech-language pathologists has also increased from approximately 27,000 to 34,000 between the years 2016–2020<sup>18</sup>. The increase in the total number of outpatient rehabilitation units could be attributed to an increase in the number of therapists. In 2018, orthopedic rehabilitation accounted for more than 80% of the total units for rehabilitation according to disease, followed by cerebrovascular rehabilitation (14%) and cardiovascular rehabilitation (2.3%). After categorizing patients worldwide who would benefit from rehabilitation according to disease, Cieza *et al.* reported that musculoskeletal and neurological disorders were the greatest factors for rehabilitation in people over 65 years of age<sup>13</sup>. The number of disease-specific rehabilitation units in the current study was consistent with that reported by Cieza *et al.* One of the reasons for the high rate of rehabilitation for musculoskeletal diseases (>80%) in the current study was that a large number of patients who required rehabilitation for musculoskeletal diseases did not receive inpatient treatment.

Patients aged over 70 years received a large number of units of disease-specific rehabilitation, whereas patients aged between 0 to 9 years received a large number of units of cerebrovascular rehabilitation, and patients aged between 0 to 4 years received a large number of units of dysphagia rehabilitation. The number of units of disease-specific rehabilitation according to age was higher in individuals aged over 70 years, which could be due to age-related changes. People are more susceptible to diseases such as cardiovascular rehabilitation, pulmonary rehabilitation, and orthopedic rehabilitation as they age<sup>14</sup>, which has increased the demand

for rehabilitation. However, the number of units for cerebrovascular rehabilitation and dysphagia rehabilitation was higher for children than for older people. A 2006 survey conducted by the Ministry of Health, Labor, and Welfare found that cerebral palsy was the most common cause of physical disability among children under 18 years of age (25.9%). Overall, 53.8% of the patients had limb disabilities, 18.6% had auditory-verbal disabilities, and 1.6% had speech, language, and masticatory dysfunction<sup>19</sup>. Indeed, cerebral palsy has been a target of cerebrovascular rehabilitation, with limb disability, auditory language impairment, and masticatory dysfunction also being targets of cerebrovascular and dysphagia rehabilitation in Japan. Kim *et al.* reported that the rate of outpatient rehabilitation was higher than that of inpatient rehabilitation in pediatric patients with cerebral palsy throughout Korea<sup>20</sup>. The same study also speculated a high demand for outpatient rehabilitation in Japan. The demand for rehabilitation in pediatric patients before school age is anticipated to be high. The presence of parents may have contributed to the ease of attending the outpatient rehabilitation. The current study found an increasing trend in the number of units for cerebrovascular rehabilitation in the 5–9 years age group, whereas the number of units for dysphagia rehabilitation showed a gradual decrease in the 0–4 years age group, albeit still showing high rates. These results suggest a high demand for cerebrovascular and dysphagia rehabilitation in children.

The results obtained herein can be useful for planning medical care for outpatient rehabilitation given the few large-scale database studies on outpatient rehabilitation. Accordingly, the current study found a large variation in the percentage of rehabilitation performed according to the region. Studies on cerebrovascular, cardiovascular, and chronic obstructive pulmonary diseases have shown that transportation, motivation, and medical costs are barriers to outpatient rehabilitation<sup>21–24</sup>. Additionally, regional disparities in outpatient rehabilitation may be caused by disparities in disease frequency, patient age, and the number of patients requiring care. These problems may also have been a constraint on the implementation of outpatient rehabilitation in the current study. As such, more detailed information regarding the patient and local environment will need to be collected for a comprehensive analysis of the number of units according to the prefecture. For patients with limited access to outpatient rehabilitation, telerehabilitation may be effective, and the demand for telerehabilitation is expected to increase, especially after the COVID-19 pandemic. Indeed, telerehabilitation has been reported to have similar or even greater effect as compared to face-to-face rehabilita-

tion in patients with stroke and total knee replacement<sup>25, 26</sup>. Moreover, telerehabilitation has also been reported in patients with COVID-19<sup>27</sup>, suggesting its potential efficacy for improving regional disparities in rehabilitation implementation.

This study has several strengths, one of which is the use of a large database such as NDB Open Data. This database contains health insurance claims for more than 90% of the Japanese population. Therefore, this database contains almost all available cases, suggesting little bias in the information. This study provides an overview of the current status of outpatient rehabilitation as well as basic data for future outpatient rehabilitation provision. However, this study has some limitations. First, this study was unable to obtain details regarding the diseases that necessitated rehabilitation. The need for rehabilitation may differ depending on the causative disease, and additional research including the causative disease is required for a more detailed study. Second, it is unclear which therapists performed rehabilitation in this study. During outpatient rehabilitation, physical therapists, occupational therapists, and speech-language pathologists primarily provide rehabilitation. This study could not examine the rehabilitation implementation status of each therapist. Third, the NDB Open Data are collected from hospitals and clinics and do not include daycare centers and home-visit rehabilitation. Further research is required to examine long-term care and rehabilitation services.

## Conclusion

The current study investigated changes in the provision of outpatient rehabilitation in Japan according to time, age distribution, and regional differences from the years 2014–2018 using NDB open data. The total number of units for outpatient rehabilitation had gradually increased from 2014 to 2018. Orthopedic rehabilitation accounted for more than 80% of the total number of units for outpatient rehabilitation in 2018. The total number of units for outpatient rehabilitation according to age was highest among those in their late 70s. Meanwhile, cerebrovascular and dysphagia rehabilitation had the highest number of units in children. A large difference in the implementation status of rehabilitation in each region was observed among the prefectures, suggesting the need for policy planning to address regional disparities.

**Conflict of interest:** The authors do not have any conflict of interest related to this research.

## References

1. World Health Organization. World Report on Ageing and Health. [https://apps.who.int/iris/bitstream/handle/10665/186463/9789240694811\\_eng.pdf?sequence=1&isAllowed=y](https://apps.who.int/iris/bitstream/handle/10665/186463/9789240694811_eng.pdf?sequence=1&isAllowed=y) (Accessed Sep. 2021)
2. World Health Organization. World report on disability 2011. [http://www.who.int/disabilities/world\\_report/2011/report.pdf?ua=1](http://www.who.int/disabilities/world_report/2011/report.pdf?ua=1) (Accessed Sep. 2021)
3. Fiedler RC, Granger CV, Post LA. The uniform data system for medical rehabilitation: Report of first admissions for 1998. *Am J Phys Med Rehabil* 2000; 79: 87–92. [Medline] [CrossRef]
4. Sawabe M, Momosaki R, Hasebe K, *et al.* Rehabilitation characteristics in high-performance hospitals after acute stroke. *J Stroke Cerebrovasc Dis* 2018; 27: 2431–2435. [Medline] [CrossRef]
5. Ministry of Health, Labour and Welfare. Commentary on 1st NDB open data Japan. <https://www.mhlw.go.jp/file/06-Seisakujouhou-12400000-Hokenkyoku/0000141549.pdf> (Accessed Sep. 2021)
6. Ministry of Health, Labour and Welfare. 1st NDB open data Japan 2016. <https://www.mhlw.go.jp/file/06-Seisakujouhou-12400000-Hokenkyoku/0000139445.xlsx>; <https://www.mhlw.go.jp/file/06-Seisakujouhou-12400000-Hokenkyoku/0000139446.xlsx> (Accessed Sep. 2021)
7. Ministry of Health, Labour and Welfare. 2nd NDB open data Japan 2017. <https://www.mhlw.go.jp/file/06-Seisakujouhou-12400000-Hokenkyoku/0000193327.xlsx>; <https://www.mhlw.go.jp/file/06-Seisakujouhou-12400000-Hokenkyoku/0000193328.xlsx> (Accessed Sep. 2021)
8. Ministry of Health, Labour and Welfare. 3rd NDB open data Japan 2018. <https://www.mhlw.go.jp/content/12400000/000347720.xlsx>; <https://www.mhlw.go.jp/content/12400000/000347721.xlsx> (Accessed Sep. 2021)
9. Ministry of Health, Labour and Welfare. 4th NDB open data Japan 2019. <https://www.mhlw.go.jp/content/12400000/000711849.xlsx>; <https://www.mhlw.go.jp/content/12400000/000711850.xlsx> (Accessed Sep. 2021)
10. Ministry of Health, Labour and Welfare. 5th NDB open data Japan 2020. <https://www.mhlw.go.jp/content/12400000/000539708.xlsx>; <https://www.mhlw.go.jp/content/12400000/000539709.xlsx> (Accessed Sep. 2021)
11. Statistics Bureau of Japan. Population by Sex and Sex ratio for Prefectures. <https://www.e-stat.go.jp/stat-search/file-download?statInfId=000031690317&fileKind=0> (Accessed Sep. 2021)
12. Shinsuke H. Trends in outpatient rehabilitation practices throughout Japan: analysis using the National Database of Health Insurance Claims Open Data. [figshare. https://figshare.com/articles/figure/Trends\\_in\\_the\\_outpatient\\_rehabilitation\\_in\\_Japan\\_NDB\\_open\\_data/16569732](https://figshare.com/articles/figure/Trends_in_the_outpatient_rehabilitation_in_Japan_NDB_open_data/16569732)
13. Cieza A, Causey K, Kamenov K, *et al.* Global estimates of the need for rehabilitation based on the Global Burden of Disease study 2019: a systematic analysis for the Global Burden of Disease Study 2019. *Lancet* 2021; 396: 2006–2017. [Medline] [CrossRef]
14. Pils K. Aspects of physical medicine and rehabilitation in geriatrics. *Wien Med Wochenschr* 2016; 166: 44–47. [Medline] [CrossRef]
15. Kamenov K, Mills JA, Chatterji S, *et al.* Needs and unmet needs for rehabilitation services: a scoping review. *Disabil Rehabil* 2019; 41: 1227–1237. [Medline] [CrossRef]
16. Statistics Bureau of Japan. Population trends and future population. <http://www.stat.go.jp/data/nihon/02.html> (Accessed Sep. 2021)
17. Ministry of Health, Labour and Welfare. <https://www.mhlw.go.jp/stf/shingi2/0000122677.html> (Accessed Sep. 2021)
18. Japanese Association of Speech-Language-Hearing Therapists. Membership Trends. <https://www.japanslht.or.jp/about/trend.html> (Accessed Sep. 2021)
19. Ministry of Health, Labour and Welfare. Results of the 2006 Survey of Physically Challenged Children and Persons. <https://www.mhlw.go.jp/toukei/saikin/hw/shintai/06/index.html> (Accessed Sep. 2021)
20. Kim SW, Jeon HR, Youk T, *et al.* The nature of rehabilitation services provided to children with cerebral palsy: a population-based nationwide study. *BMC Health Serv Res* 2019; 19: 277. [Medline] [CrossRef]
21. Sahin H, Naz I. Why are COPD patients unable to complete the outpatient pulmonary rehabilitation program? *Chron Respir Dis* 2018; 15: 411–418. [Medline] [CrossRef]
22. Meng G, Qazi H, Chen H. Factors associated with non-enrollment of center-based cardiovascular rehabilitation program among transient ischemic attack or mild stroke patients: a mixed-method retrospective study. *J Cardiopulm Rehabil Prev* 2021; 41: 116–121. [Medline] [CrossRef]
23. Zeng C, Melberg MW, Tavel HM, *et al.* Development and validation of a model for predicting rehabilitation care location among patients discharged home after total knee arthroplasty. *J Arthroplasty* 2020; 35: 1840–1846.e2. [Medline] [CrossRef]
24. Baatiema L, Sanuade O, Kuumuori Ganle J, *et al.* An ecological approach to understanding stroke experience and access to rehabilitation services in Ghana: a cross-sectional study. *Health Soc Care Community* 2021; 29: e67–e78. [Medline] [CrossRef]
25. Sarfo FS, Ulasavets U, Opare-Sem OK, *et al.* Tele-rehabilitation after stroke: an updated systematic review of the literature. *J Stroke Cerebrovasc Dis* 2018; 27: 2306–2318. [Medline] [CrossRef]
26. Jiang S, Xiang J, Gao X, *et al.* The comparison of telerehabilitation and face-to-face rehabilitation after total knee arthroplasty: a systematic review and meta-analysis. *J Telemed Telecare* 2018; 24: 257–262. [Medline] [CrossRef]
27. Sakai T, Hoshino C, Yamaguchi R, *et al.* Remote rehabilitation for patients with COVID-19. *J Rehabil Med* 2020; 52: jrm00095. [Medline]