




## SYSTEMATIC REVIEW

# Physical therapy registries worldwide: A systematic review

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## Abstract

**Introduction:** Nowadays, the demand for physical therapy services has grown significantly over the last few decades due to an aging population, a rise in chronic conditions, and increased awareness of the benefits of physical therapy for injury recovery and managing various health issues. Collecting and managing data from physical therapy services is highly significant and beneficial. One of the information management systems that facilitates data collection related to physical therapy services is a physical therapy registry. In this systematic review, we aimed to identify physical therapy registries worldwide and examine the characteristics and data elements of each registry.

**Methods:** PubMed, Scopus, Web of Science, and IEEE databases were searched from inception until March 19, 2023 by using keywords and Medical Subject Headings (MeSH) terms regarding "registries" and "physical therapy." The criteria for inclusion in the study were: (1) studies with the English language; (2) original studies, and online access to the physical therapy registry is available; (3) full-text available; (4) studies related to the aims of the study, and (5) studies that have sufficient available information regarding the minimum datasets and other characteristics physical therapy registry. The methodological quality of the included studies was independently assessed by two reviewers using the Effective Public Health Practice Project's (EPHPP) quality assessment tool.

**Results:** Sixteen studies were eligible to be included. The findings of this review indicated that the oldest physical therapy registry was established in 1992, while the newest one was established in 2017. The USA has the highest number of physical therapy registries ( $n = 7$ ). Ten registries were funded by the government, and the data source for most registries was collected in clinics ( $n = 11$ ). The geographical coverage of 10 registries was national. All registries collected administrative data (such as sociodemographic data, healthcare provider's data, and others) and clinical data (such as diagnosis, type of physical therapy intervention, pain location, comorbidities, and others) through web-based systems. The data collection method in half of the registries was retrospective ( $n = 8$  out of 16). According to the EPHPP

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quality assessment tool, 11 studies (73%) were rated as moderate, 3 (20%) as weak, and 1 (7%) as strong.

**Conclusion:** This systematic review found that most developed countries have implemented web-based physical therapy registries to collect administrative and clinical data at the national level. It is recommended that developing countries design and implement similar registries based on these characteristics and extracted data elements. Additionally, these registries should be designed to enable data sharing and interoperability with other international health information systems.

#### KEYWORDS

minimum data set, musculoskeletal disease, physical therapy, registry

## 1 | INTRODUCTION

Musculoskeletal disorders (MSDs) are considered a major cause of pain and disability worldwide.<sup>1</sup> MSDs are injuries or disorders that affect muscles, spinal discs, nerves, joints, cartilage, and tendons.<sup>2</sup> They can occur in countries with low, middle, and high incomes, and affect people of all ages, from children to the elderly.<sup>3</sup> Accidents, surgery, falls, senility, prolonged immobilization, awkward postures, and other chronic diseases are among the major causes of MSDs.<sup>4</sup> MSDs are responsible for public health and socioeconomic problems, absence from work, considerable economic implications, and quality of life (QoL).<sup>5,6</sup> The World Health Organization (WHO) reports that around 1.71 billion people worldwide suffer from MSDs, which include low back pain (LBP), neck pain, other injuries, fractures, rheumatoid arthritis, and osteoarthritis. Among these, LBP is the primary cause of disability in 160 countries.<sup>7</sup> MSDs are conditions that are intricate and have various factors contributing to both pain and disability. Biomechanical factors involve how the body moves and the physical stresses on tissues and joints. Environmental factors can include workplace conditions, ergonomic setups, and even climate or terrain. Biopsychosocial factors encompass psychological aspects (such as stress), social factors (such as socioeconomic status), and biological factors (such as genetics). Understanding all these facets is crucial for managing and treating MSDs effectively. Moreover, lifestyle factors that lead to poorer general health, such as reduced physical activity, smoking, and obesity, are associated with the occurrence of MSDs.<sup>3</sup>

Physical therapy is a recommended treatment for musculoskeletal disorders such as back pain, and it is considered an important component in their management. This nonpharmacological intervention is a conservative approach that can help improve physical function in patients with MSDs.<sup>8,9</sup> The main aims of physical therapy are reducing pain, maintaining joint mobility (increasing joint range of motion [ROM]), improving muscle strength, maximizing function, and finally improving health-related QoL (HR-QoL) without adverse effects.<sup>8,10</sup> Physical therapists use various interventions to help their patients achieve therapy goals. These interventions are broadly

categorized as thermal modalities, manual therapies, electrotherapy modalities, acupuncture, or exercise.<sup>11</sup> Physical therapists are healthcare professionals who provide care for patients with musculoskeletal conditions. Patients who suffer from idiopathic neck pain, LBP, or hip and knee osteoarthritis often seek physical therapy treatment on an outpatient basis to manage pain and improve functional mobility.<sup>12</sup>

Collecting data on physical therapy interventions performed by physical therapists allows for detailed documentation of treatment processes and specific interventions utilized in clinical settings. These data are essential for conducting scientific analyses of treatment procedures, assessing the effectiveness of interventions, and improving the overall quality of physical therapy services. Furthermore, documenting this information supports future research in physical therapy, aiding in the development of evidence-based treatment protocols and guidelines.<sup>13</sup> These data can also be utilized for evaluating intervention and treatment plans, educational purposes, research endeavors, epidemiological studies, developing physical therapy guidelines, influencing policy-making, and ultimately enhancing the quality of patient care.<sup>14</sup> One of the systems that facilitate the data collecting related to physical therapy services is a patient registry.<sup>15</sup>

Gliklich et al. define a patient registry as “an organized system that uses observational study methods to collect uniform data (clinical and other) to evaluate specified outcomes for a population defined by a particular disease, condition, or exposure, and that serves one or more predetermined scientific, clinical, or policy purposes.”<sup>16</sup> They can be useful instruments in tackling important issues in research, healthcare, and policymaking.<sup>17</sup> Patient registries collect data elements that have standard definitions and are linked to the original data sources. This ensures that a centralized, comprehensive data set is provided.<sup>16</sup> Longitudinal information on patient outcomes, which is crucial for comprehending particular health conditions and assessing the efficacy of interventions, can also be obtained from registry data.<sup>16</sup> One of the benefits of patient registries is that they allow for the observation of caseload and population characteristics over time. This can facilitate the evaluation of various aspects related to disease, such as incidence,

etiology, planning, operation, and evaluation of services, treatment patterns, and diagnostic classification.<sup>18</sup> There are various purposes for which a patient registry can be created, such as observational research, study planning, public health, and research recruitment. However, it is important to collect high-quality data for the registry to be useful for its intended purpose.<sup>19</sup> Therefore, patient registries utilize standard minimum data sets (MDS) to collect and report relevant data, facilitate data analysis, improve healthcare quality, and inform clinical decisions.<sup>20–22</sup> MDS is a standard assessment tool used during the data collection process to ensure that decision-makers have access to a consistent and uniform set of data.<sup>23</sup> MDS includes standard data on demographics, treatment, outcomes, and the general health status of individuals. These data can be customized for each area of healthcare based on the goals specific to that area.<sup>24</sup> Patient registries were first established in Scandinavian countries toward the end of the 19th century. The growing public health concern with chronic diseases during the 1950s resulted in a surge of registries.<sup>18</sup> The Scandinavian countries, including Denmark, Finland, and Sweden, are global leaders in terms of their extensive register networks and the linkage of individual-level data from various sources.<sup>17</sup>

The objective of establishing various physical therapy registries is to gather reliable data, assess treatments, and utilize health outcomes as quality indicators to ensure transparency in service delivery. These registries help in monitoring and enhancing the quality of patient care and clinical support services. They also enable clinicians and administrators to comprehend the documented patterns of care that influence their practice and organizational functions that impact patient outcomes.<sup>15,25,26</sup> A lack of sufficient education and poor awareness of ergonomic issues have led to an increase in musculoskeletal disorders in developing countries.<sup>27</sup> By examining and analyzing the characteristics and data elements within physical therapy registries, researchers, managers, and healthcare providers can design and develop their registries tailored to their specific objectives. The creation and maintenance of a physical therapy registry, especially one concentrated on musculoskeletal therapy, along with the collection of high-quality related data, are highly beneficial in the healthcare industry. These registries enable healthcare providers, researchers, and policymakers to evaluate the effectiveness of physical therapy interventions, measure health-related outcomes, establish clinical guidelines, monitor healthcare systems, and make informed decisions.

Numerous systematic reviews have been carried out to identify and review the characteristics of each registry in various healthcare domains, including cancer,<sup>28</sup> trauma,<sup>29</sup> and renal replacement therapy.<sup>30</sup> However, no such reviews have been conducted for physical therapy as of yet. Therefore, the purpose of our systematic review was to identify physical therapy registries and review the characteristics of each registry and data elements.

RQ1: How many physical therapy registries are there worldwide?

RQ2: What are the characteristics of physical therapy registries?

RQ3: What data elements does each physical therapy registry include?

## 2 | METHODS

### 2.1 | Study design

This systematic review was conducted according to the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) 2020 statement.<sup>31</sup> The PROSPERO website was searched and no previous systematic review on similar topics was found, which validated the novelty of our review. The protocol of this systematic review is registered in the PROSPERO database (CRD42023443249). The steps of this systematic review are depicted in Figure 1.

### 2.2 | Information sources and search strategy

We searched four electronic databases, including PubMed, Scopus, Web of Science (WoS), and IEEE Xplore, from inception until March 19, 2023. The first 10 pages of the Google Scholar database and Google search engine were reviewed to identify all related studies and website registries. Additionally, backward and forward searching by reviewing the reference lists and citations of the included studies was performed to retrieve more related studies. A search term was used in free-text and Medical Subject Headings (MeSH) and included (registry OR registries OR register) AND (“physical therapy” OR “physical therapies” OR physiotherapy OR physiotherapies) AND (musculoskeletal OR orthopedic). The detail of the full search strategy is presented in the Supporting Information S1: Table S1.

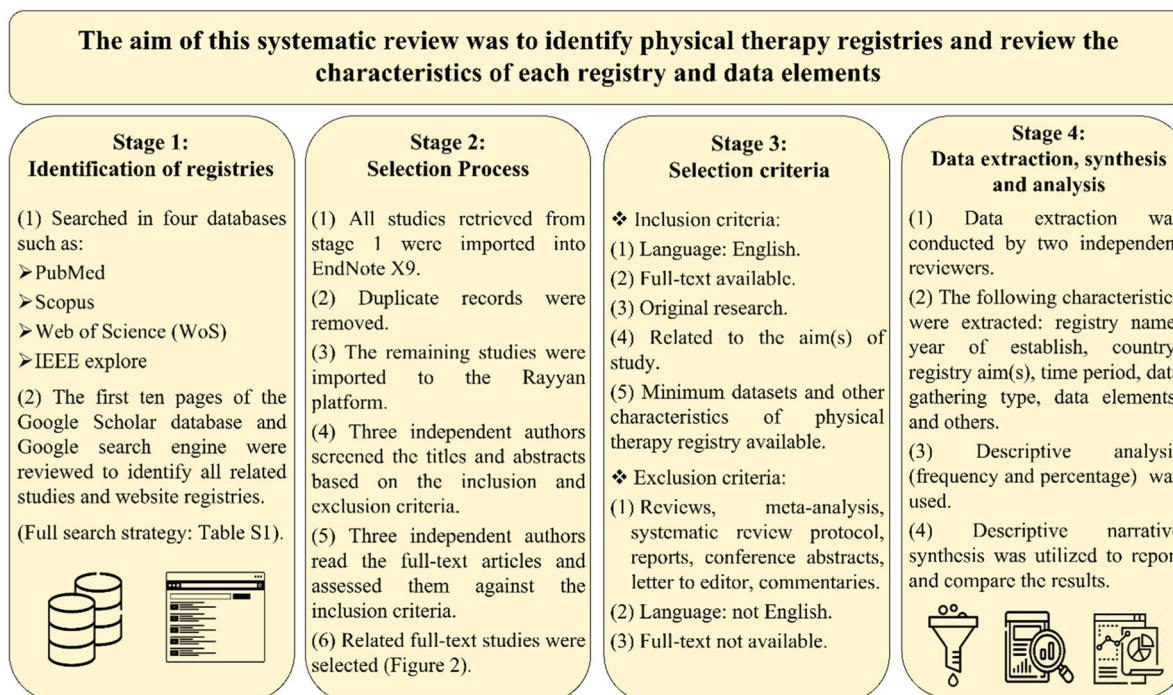
### 2.3 | Selection criteria

We applied inclusion and exclusion criteria for study selection. The main inclusion criteria in this study were: (1) the study was published in English; (2) the full-text study was available; (3) the study was original research on physical therapy registries, and online access to the physical therapy registry is available; and (4) the study provided sufficient information on minimum datasets and other characteristics for the physical therapy registry.

The main exclusion criteria were as follows: (1) reviews, meta-analyses, systematic review protocols, reports, conference abstracts, letters to the editor, and commentaries; (2) studies in languages other than English; (3) full texts of studies were not available; and (4) studies did not provide sufficient information regarding minimum datasets and other characteristics of the physical therapy registry.

### 2.4 | Study selection process

All studies identified were imported into reference management software (EndNote X9). Duplicate records were removed by using this software. In addition, records were manually screened for remaining duplicates. After removing duplicate records, the studies were imported to the Rayyan platform.<sup>32</sup> Through this platform, three



**FIGURE 1** The aim and steps of the study.

independent authors (A. B. Y., G. A., and S. M. A.) screened the titles and abstracts of all records to identify relevant studies based on the inclusion and exclusion criteria. Subsequently, the full-texts of the remaining relevant studies were obtained, and three authors (A. B. Y., G. A., and S. M. A.) read the full-text articles and assessed them against the inclusion criteria. Studies that did not meet the inclusion criteria were removed, and the reasons for exclusion of them were noted. Finally, the related full-text studies were selected. All disagreements between the authors were resolved through discussion and consensus.

## 2.5 | Data extraction

Two independent reviewers (A. B. Y. and G. A.) used a data collection form in a Microsoft Excel spreadsheet to carry out data extraction. All disagreements between the authors were resolved through discussion and consensus. Data collection forms were used to extract data on the title, author(s), year of publication, journal title, country/geographical area, name of registry, country/geographical area of registry, year of establish, aim of registry, registry geographical coverage (international, national, or local/regional/statewide level), name of registry creator, funding, time period, data sources, data exchange platform, data gathering type, and data elements.

## 2.6 | Quality assessment

The quality of the included studies was assessed by two independent reviewers (A. B. Y. and G. A.) using the Effective Public Health Practice Project quality assessment tool (EPHPP).<sup>33</sup> This tool is

applicable across multiple study designs and contains six components: (1) selection bias; (2) study design; (3) control for confounders; (4) blinding of participants and study staff; (5) validity and reliability of the data collection tools; and (6) withdrawals and drop-outs. Each component was initially rated as “strong,” “moderate,” or “weak” based on the EPHPP dictionary of standardized criteria. Subsequently, a global quality rating was determined based on the six component ratings. For the global rating of each study, “strong” was defined as having no weak ratings, “moderate” was defined as having one weak rating, and “weak” was defined as having two or more weak ratings. Any discrepancy between two reviewers on the quality rating process was resolved by discussion or by a third reviewer (L. S.).

## 2.7 | Data synthesis and analysis

The study's variables were used to calculate and present a descriptive analysis, which included frequency and percentage parameters. The results were presented in the form of tables and graphs. A descriptive narrative synthesis was used to report and compare the results. Microsoft Excel was used to plot the distribution of physical therapy registries worldwide on a map. The VOSviewer software was used to analyze the co-occurrence of keywords.

## 2.8 | Ethics approval

This review was part of a doctoral thesis that was approved by the Ethics Committee of the Tehran University of Medical Sciences, Iran (IR.TUMS.SPH.REC.1401.261).

### 3 | RESULTS

#### 3.1 | Search results

In total, we identified 4375 articles from the databases, and 4 articles were identified through backward and forward searching. Among the identified articles, 1429 duplicates were removed (manually and using Endnote X9), and 2949 articles remained for title and abstract screening. After title and abstract screening, 2903 articles were excluded due to low relevance based on the title and abstract, while 46 articles were considered eligible for full-text review. Thirty articles did not satisfy the inclusion criteria and were excluded from the study. Ultimately, we selected 16 articles that met the inclusion criteria and reviewed the full text of each one. The study selection PRISMA 2020 flow diagram is shown in Figure 2.

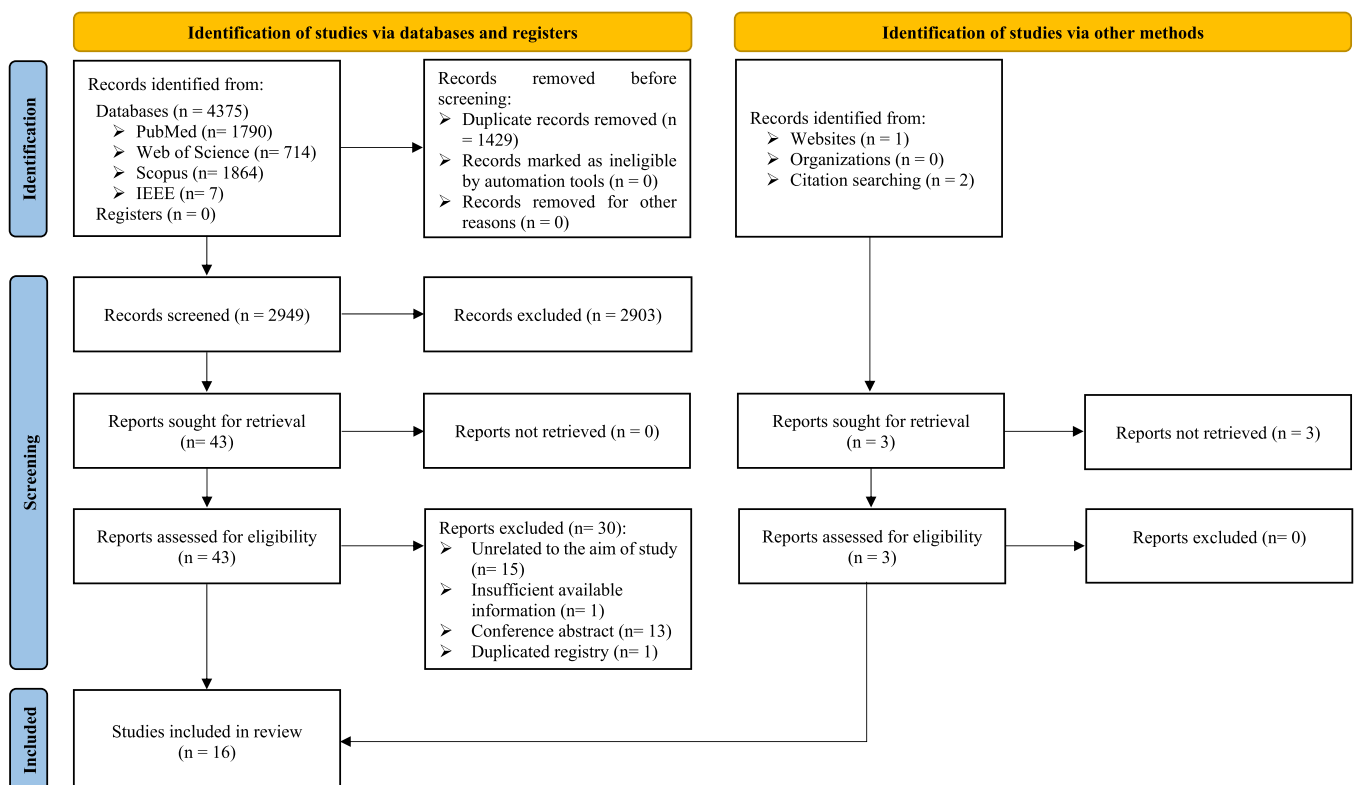
#### 3.2 | Details of the included studies

The details of the included studies and characteristics of the 16 registries are provided in Table 1. The oldest physical therapy registry was established in 1992, while the newest one was established in 2017. The USA has been a pioneer in implementing a physical therapy registry.<sup>34-40</sup> Ten registries were funded by the government,<sup>26,40-48</sup> five registries by private,<sup>34-36,38,39</sup> and one registry by both government and private (mixed).<sup>37</sup> Data sources of registries were collected in the clinics ( $n = 11$ ; 68.7%), hospitals and clinics ( $n = 2$ ; 12.5%), hospitals

( $n = 2$ ; 12.5%), and private practice ( $n = 1$ ; 6%), respectively. All of the physical therapy registries were implemented web-based. The data collection method in half of the registries was retrospective ( $n = 8$ ; 50%). The geographical coverage of 10 registries was nationally, three registries locally, and three registries internationally.

Table 2 shows administrative and clinical data along with outcome measurement tools regarding each registry. Data elements are divided into two categories: administrative and clinical data. Administrative data included information related to patients (first and last name, gender, date of birth, marital status, educational level, employment status, and others), healthcare providers (physician's name, physical therapist's name), and insurance (status, type, and name). Clinical data included information related to diagnosis, location of disorders, comorbidities, complications, radiology tests, medication, type of physical therapy intervention, outcome, and others. Valid and reliable outcome measurement tools were used among physical therapists for health-related outcome assessment such as patient-reported outcome measures (PROMs), Medical Outcome Survey Short-Form 36 items (SF-36), Shoulder Pain and Disability Index (SPADI), Tampa Scale of Kinesiophobia (TSK-11), Hospital Anxiety and Depression Scale (HADS), European Quality of Life Instrument (EQ-5D), Quebec Back Pain Disability Scale (QBPDS), and others.

Figure 3 shows 16 physical therapy registries established worldwide. Seven registries were from the United States of America (USA), three from Scandinavia countries including Sweden ( $n = 2$ ) and Denmark ( $n = 1$ ), two from the Netherlands, one from Egypt, one from



**FIGURE 2** PRISMA 2020 flow diagram indicating results of identification and screening process for included and excluded papers.



TABLE 1 Characteristics of the 16 studies.

Author (s), (Ref)	Study design	Registry name	Year of establish	Country	Registry aim(s)	Name of registry creator	Funding	Time period	Data source	Data exchange platform	Data collecting type	Registry geographical coverage
Jette et al. <sup>34</sup>	Retrospective cohort study	Focus on Therapeutic Outcomes (FOTO) network	1992	USA	The FOTO network was created to develop a standardized information management system that is outcome-oriented and can be used in outpatient physical therapy settings.	Five national rehabilitation companies	Private	1992–ongoing	Clinics	Web-based	Prospective	International
Cheng et al. <sup>35</sup>	Retrospective cohort study	Physical therapy clinic database	1996	USA	To collect musculoskeletal disorders data	New England Physical Therapy Network (NEPTN)	Private	1996–ongoing	Clinics	Web-based	Retrospective	National
Hordacre et al. <sup>41</sup>	Retrospective cohort study	Physiotherapy clinical database	1996	Australia	To collect patients with lower limb amputation rehabilitation data	Repatiation General Hospital (RGH)	Gov-ernment	1996–ongoing	Hospitals	Web-based	Retrospective	Local
Lentz et al. <sup>36</sup>	Cross-sectional	Impairment and outcome measures database	1998	USA	To collect physical therapy data	Department of Physical Therapy at the University of Florida & Shands Orthopedic and Sports Medicine Institute	Private	1998–ongoing	Clinics	Web-based	Prospective	National
Stålhnacke et al. <sup>42</sup>	Retrospective cohort study	Swedish quality registry for pain rehabilitation (SQRP)	1998	Sweden	The goal is to assess the effect of rehabilitation programs on patient-reported outcome measures related	Swedish Association of Rehabilitation Medicine (SFRM)	Gov-ernment	1998–ongoing	Clinics	Paper-based: 1998 – 2008 Web-based: 2009 - ongoing	Retrospective	National

TABLE 1 (Continued)

Author (s), (Ref.)	Study design	Registry name	Year of establish	Country	Registry aim(s)	Name of registry creator	Funding	Time period	Data source	Data exchange platform	Data collecting type	Registry geographical coverage
Swinkels et al. <sup>43</sup>	Retrospective cohort study	NIVEL Primary Care Database (NPCD)-physical therapy (formerly known as National Information Service for Allied Health Care (called LIPZ in Dutch)	2001	Netherlands	to function, activity, quality of life, and participation in working life and leisure. Additionally, the aim is to compare patient groups across different rehabilitation clinics.	Netherlands Institute for Health Services Research	Government	2001–ongoing	Private practice	Web-based	Retrospective	International
Deutscher et al. <sup>44</sup>	A prospective cohort study	Maccabi physical therapy database	2004	Occupied Palestine	The aim is to determine the correlation between treatment procedures and functional results for individuals receiving treatment for musculoskeletal	Maccabi Healthcare Services	Government	2004–ongoing	Clinics	Web-based	Prospective	International

(Continues)

TABLE 1 (Continued)

Author (s), (Ref.)	Study design	Registry name	Year of establish	Country	Registry aim(s)	Name of registry creator	Funding	Time period	Data source	Data exchange platform	Data collecting type	Registry geographical coverage
Zhang et al. <sup>37</sup>	Retrospective cohort study	PearlDiver patient record database (PearlDiver)	2007	USA	The aim is to gather insurance claims from private providers such as Humana and United Healthcare, as well as government claims from Medicare, in a format that is simplified and does not reveal any personal information	Health analytics company	Mixed (private insurance claims from Humana and United Healthcare, as well as government claims from Medicare)	2007–ongoing	Hospitals and clinics	Web-based	Retrospective	National
de Vos Andersen et al. <sup>45</sup>	A prospective cohort study	Physiotherapy Quality Development Database (In Denmark known by the name Fysioterapeutisk Kvalitetsudviklings database (FysDB))	2008	Denmark	To collect data about patients referred to physiotherapy clinics for the treatment of musculoskeletal disorders	Quality Committee in the Physiotherapy area Central Jutland Region	Government	2008–ongoing	Clinics	Web-based	Prospective	National
Hamrin Senorski et al. <sup>46</sup>	A prospective, cohort study	The Anterior cruciate ligament (ACL) rehabilitation outcome registry	2009	Sweden	The aim is to gather information and report the outcomes of rehabilitation for patients who	Not mentioned	Government	2009–ongoing	Clinics	Web-based	Prospective	National



TABLE 1 (Continued)

Author (s), (Ref.)	Study design	Registry name	Year of establish	Country	Registry aim(s)	Name of registry creator	Funding	Time period	Data source	Data exchange platform	Data collecting type	Registry geographical coverage
Praveen et al. <sup>47</sup>	Retrospective cohort study	Outpatient musculoskeletal physiotherapy clinic database	2010	Singapore	have suffered an ACL injury and undergone ACL reconstruction To collect musculoskeletal physiotherapy data	Changi General Hospital	Government	Not mentioned	Hospitals	Web-based	Retrospective	Local
Wertli et al. <sup>38</sup>	Retrospective cross-sectional	Occupational and Industrial Orthopedic Center registry	2012	USA	The goal is to gather data on patients with spine pain (SP) at baseline and during treatment from an outpatient physical therapy clinic	New York University Hospital for Joint Diseases	Private	2012-ongoing	Clinics	Web-based	Prospective	National
Meerhoff et al. <sup>48</sup>	A retrospective cohort study	Royal Dutch Society for Physical Therapy (KNGF) Registry	2013	Netherlands	To evaluate the potential of using PROMs to develop QIs in physical therapy treatment	Royal Dutch Society for Physical Therapy	Government	2013-ongoing	Clinics	Web-based	Prospective	National
Garcia et al. <sup>39</sup>	A retrospective cohort study	ATI Patient Outcomes Registry (ATI Physical Therapy's Patient Outcomes Registry)	2014	USA	To collect observational, epidemiologic, financial and clinical data that supports innovative approaches to physical therapy. In addition, to improve understanding of patient outcomes following rehabilitation to	Not mentioned	Private	2014-ongoing	Clinics	Web-based	Retrospective	National

(Continues)

TABLE 1 (Continued)

Author (s), (Ref.)	Study design	Registry name	Year of establish	Country	Registry aim(s)	Name of registry creator	Funding	Time period	Data source	Data exchange platform	Data collecting type	Registry geographical coverage
Mostafa et al. <sup>26</sup>	A cross-sectional study	Cerebral Palsy (CP) Physical Therapy Registry	2016	Egypt (Sohag City)	create actionable insights, set future vision, improve outcomes, and enable the realization of value more quickly To collect cerebral palsy data regarding the prevalence and characteristics of this common childhood disability	Cairo University	Government	2016–ongoing	Hospitals and clinics	Web-based	Retrospective	Local
APTA's Physical Therapy Outcomes Registry <sup>49</sup>	-	APTA's Physical Therapy Outcomes Registry (APTA's PTOR)	2017	USA	The registry aims to gather clinical information from therapists across the nation to analyze collective data on patient populations. This method can assist our profession in comprehending how to improve treatment outcomes and practice, enhance the quality of care, and enable data-driven clinical decision-making.	American Physical Therapy Association (APTA)	Government	2017–2022	Clinics	Web-based	Prospective	National

Abbreviations: QI, quality indicators.

TABLE 2 Data elements each of registries.

Registry name (Ref.)	Data elements		Outcome measurement tools
	Category	Subcategory	
Focus on Therapeutic Outcomes (FOTO) network <sup>34</sup>	Administrative data	Patient's information: Admission Date and Time, First Name, Last Name, Social Security Number (SSN), Gender, Date of Birth, Marital status, Ethnicity, Educational Level, Income Level, Region, Address, ZIP code, Phone number, Occupation, Employment status, Date of onset, Date of last visit, Number of physical therapy visits, Referred sources, Discharge Date, Duration (length) of physical therapy care, Date of next visit, Discharge destination. Healthcare provider's information: Physician's name, Physical therapist's name. Insurance's information: Insurance status (Yes, No), Insurance type, Name of insurance company.	PROMs, SF-36
	Clinical data	Height, Weight, Exercise (No, 1-2 times per week, + 3 times per week), Chief Complaint (C.C), Diagnosis, Body region, Comorbidity, Duration of problem, Surgical status (Yes, No), Surgical history, Mental disorders (depression), Diagnostic tests (X-rays, CT scan, MRI, EMG/NCV, Arthrogram and other), Medication, Type of treatments provided (Modality [Heat, Cold, Electrical stimulation, Lontophoresis/Phonophoresis, Massage, Myofascial techniques, Devices]), Exercise [Strengthening, Endurance, Flexibility, Multimodal], Mobilization, Manipulation).	
Physical therapy clinic database <sup>35</sup>	Administrative data	Patient's information: Admission Date and Time, First Name, Middle Name, Last Name, Social Security Number (SSN), Date of Birth, Gender, Marital status, Ethnicity, Educational Level, Income Level, Region, Address, ZIP code, Phone number, Email address, Occupation, Employment status, Date of onset, Date of last visit, Number of physical therapy visits, Discharge Date, Duration (length) of physical therapy care, Date of next visit, Discharge destination, Discharge work status. Healthcare provider's information: Physician's name, Physical therapist's name. Insurance's information: Insurance status (Yes, No), Insurance type, Name of insurance company.	SF-36
	Clinical data	Diagnosis, Body region, Comorbidity, Type of treatments provided.	
Physiotherapy clinical database <sup>41</sup>	Administrative data	Patient's information: Admission Date and Time, First Name, Middle Name, Last Name, Age, Gender, Marital status, Ethnicity, Educational Level, Income Level, Region, Address, ZIP code, Phone number, Email address, Occupation, Employment status, Employer's name, Employer's phone number, Employer's Address, Date of onset, Date of last visit, Number of physical therapy visits, Discharge Date, Duration (length) of physical therapy care, Date of next visit, Discharge destination, Discharge work status. Healthcare provider's information: Physician's name, Physical therapist's name. Insurance's information: Insurance status (Yes, No), Insurance type, Name of insurance company.	PROMs
	Clinical data	Diagnosis, Body region, Comorbidity, Type of treatments provided.	

(Continues)

TABLE 2 (Continued)

Registry name (Ref.)	Data elements		Outcome measurement tools
	Category	Subcategory	
Clinical database of impairment and outcome measures <sup>36</sup>	Clinical data	Diagnosis, Comorbidities, Complications, Indication for amputation (Dysvascular, Dysvascular with diabetes, Trauma, Tumor, Infection, Other), Amputation type (Transfemoral, Transfemoral, Knee disarticulation, Hip disarticulation, Bilateral transfemoral, Bilateral transfemoral, Bilateral transfemoral), Health related outcomes (wound healing, initial prosthetic casting, independent walking, and inpatient rehabilitation length of stay [RLOS], total rehabilitation programme duration [RPD]).	Disability was measured with the SPADI; pain-related fear was measured with the TSK-11.
		Administrative data	
	Clinical data	Medical history, Diagnosis, Duration of symptoms, Comorbidities, Mechanism of injury (traumatic or atraumatic), Type of treatments provided, Pain intensity, Pain-related fear, Range of motion (ROM) measures, follow-up data.	
Swedish quality registry for pain rehabilitation (SQRP) <sup>42</sup>	Administrative data	Patient's information: Admission Date and Time, First Name, Last Name, Date of Birth, Gender, Marital status, Educational Level, Income Level, Region, Address, Phone number, Occupation, Employment status, Employer's name, Employer's phone number, Employer's Address, Work absence in days; Date of onset, Date of last visit, Number of physical therapy visits, Discharge Date, Duration (length) of physical therapy care, Date of next visit. Healthcare provider's information: Physician's name, Physical therapist's name. Insurance's information: Insurance status (Yes, No), Insurance type, name of insurance company.	Pain intensity was measured with the visual analog scale (VAS); Depression and anxiety symptoms were measured with the Hospital Anxiety and Depression Scale (HADS); chronic pain problems were measured with the MSPQ; daily activities were measured with the DRI; pain interference with daily life was measured with the MPI; health status was measured with the SF-36; health-related quality of life was measured with the EQ-5D.
	Clinical data	Diagnosis, Pain distribution, Pain intensity, Number of pain sites, Psychological symptoms (depression, anxiety, and other), Type of treatment used, Radiology tests (X-rays, CT scan, MRI, and other), Measurements of activity/participation and health-related quality of life (MPI, HADS, SF-36, EQ-5D), Follow-up data (at the end of rehabilitation and one year later).	

TABLE 2 (Continued)

Registry name (Ref.)	Data elements		Outcome measurement tools
	Category	Subcategory	
NIVEL Primary Care Database (NPCD)-physical therapy (formerly known as National Information Service for Allied Health Care (called LiPZ in Dutch) <sup>43</sup>	Administrative data	<p>Patient's information: Admission Date and Time, First Name, Middle Name, Last Name, Date of Birth, Gender, Marital status, Educational Level, Income Level, Region, Address, Phone number, Occupation, Employment status, Date of onset, Date of last visit, Number of physical therapy visits, Discharge Date, Duration (length) of physical therapy care, Date of next visit, Discharge destination, Reason for discharge (treatment completed, goals achieved, treatment ended on patient's initiative, treatment ended physical therapist's initiative, reimbursement ended/changed, Unique visit, Patient moved/died, Other/unknown).</p> <p>Healthcare provider's information: Specialization of referring physician (GP or Medical specialist), Referring Physician(s) name, Physical therapist (PT) name, PT age, PT gender, Number of patient-related hours per week.</p> <p>Insurance's information: Insurance status (Yes, No), Insurance type, Name of insurance company.</p>	N/A
	Clinical data	<p>Diagnosis/Reason for referral, Location, Duration of complaint (&lt;1 m*, 1–3 m, &gt;3 m), Recurrent complaints (Yes, No, Unknown), Previous physical therapy for the same or other complaints in the last two years (Yes, No, Unknown); Interventions such as exercise therapy (functions—individual, Activities—individual, other), manual interventions (manual manipulation, massage, not specified), information/advice, physical modalities (electrotherapy, other), other interventions; Outcome of physical therapy (goals not achieved, goals 25% achieved, goals 50% achieved, goals 75% achieved, goals fully achieved, unknown).</p>	
Maccabi physical therapy database <sup>44</sup>	Administrative data	<p>Patient's information: Admission Date and Time, First Name, Last Name, Social Security Number (SSN), Date of Birth, Gender, Marital status, Ethnicity, Language, Educational Level, Income Level, Region, Address, Phone number, Occupation, Employment status, Date of onset, Date of last visit, Discharge Date, Length of stay, Date of next visit.</p> <p>Healthcare provider's information: Referring Physician(s) name, Physical therapist's name.</p> <p>Insurance's information: Insurance status, Insurance type, Name of insurance company.</p>	PROMs
	Clinical data	<p>Chief Complaint (C.C), Diagnosis based on ICD-9 coding, Comorbidities (Asthma, Cardiovascular disease, Diabetes, Tobacco use disorder), Chronic medication use (Antidepressant, Asthma, Cardiovascular, Migraine, Osteoporosis, and other), Physical activity (none, 1-2/week, 3 or more), Number of related surgeries (none, 1, 2, 3 or more), Type of care (orthopedic, neurologic), Type of Treatments used, Treatment duration, episode identification, Information on falls for elderly patients, Reason for discharge, Goal achievement, Attendance and exercise compliance, and Capacity to return to previous activities.</p>	

(Continues)

TABLE 2 (Continued)

Registry name (Ref.)	Data elements		Outcome measurement tools
	Category	Subcategory	
PearlDiver patient record database (PearlDiver) <sup>37</sup>	Administrative data	<p>Patient's information: Admission Date and Time, First Name, Last Name, Social Security Number (SSN), Date of Birth, Gender, Marital status, Ethnicity, Educational Level, Income Level, Region, Address, ZIP code, Phone number, Email address, Occupation, Employment status, Date of onset, Discharge Date.</p> <p>Healthcare provider's information: Physician's name, Physical therapist's name, Primary Care Physician, Referring Physician(s)</p> <p>Insurance's information: Insurance status, Insurance type, Name of insurance company, Insurance number.</p> <p>Diagnoses, Procedures, Comorbidities, Complications, Lab results, Radiology tests, Pharmacy data (Dispensed medications).</p>	N/A
Physiotherapy Quality Development Database (In Denmark known by the name Fysioterapeutisk Kvalitetsudviklings database (FysDB)) <sup>45</sup>	Administrative data	<p>Patient's information: Admission Date and Time, First Name, Last Name, Date of Birth, Gender, Marital status, Educational Level, Income Level, Region, Address, Phone number, Occupation, Employment status, Date of onset, Date of last visit, Discharge Date, Length of stay, Date of next visit.</p> <p>Healthcare provider's information: Referring Physician(s) name, Physical therapist's name.</p> <p>Insurance's information: Insurance status, Insurance type, Name of insurance company, Insurance number.</p>	RMDQ, SEQ, ÖMPSQ, WHO-5 Well-Being Scale.
	Clinical data	<p>Height, Weight, Diagnosis, Duration of pain (<math>\leq &lt;3</math> m, <math>&gt;3</math> m), Health behaviors (Smoking, Body Mass Index calculated from self-reported, and days per week being physical active); Outcomes information such as Disability was measured by RMDQ; Sleep and mental health were measured by SEQ (such as SEQ-pain, SEQ-disability, and SEQ-sleep), ÖMPSQ, and WHO-5 Well-Being Scale;</p> <p>Psychological factors (three question on fear of physical activity in leisure and work activities, one question on ability to cope and deal with pain, two questions on sleep problems and influence of sleep problems in daytime activity, five question on well-being).</p>	
The anterior cruciate ligament (ACL) rehabilitation outcome registry <sup>46</sup>	Administrative data	<p>Patient's information: Admission Date and Time, First Name, Last Name, Date of Birth, Gender, Marital status, Educational Level, Income Level, Region, Address, Phone number, Occupation, Employment status, Months after surgery, Date of last visit, Discharge Date, Duration (length) of physical therapy care, Date of next visit.</p> <p>Healthcare provider's information: Physician's name, Physical therapist's name.</p> <p>Insurance's information: Insurance status, Insurance type, Name of insurance company.</p>	TAS, PAS, KOOS, K-SES
	Clinical data	<p>Height, Weight, Body Mass Index (BMI), Four validated PROMs: TAS, PAS, KOOS and K-SES; Tests of the patients' muscle function (Isotonic tests for muscular strength such as knee extension, knee flexion; Single-leg tests for hop performance such as the vertical jump, the hop for distance and the side hop).</p>	



TABLE 2 (Continued)

Registry name (Ref.)	Data elements		Outcome measurement tools
	Category	Subcategory	
Outpatient musculoskeletal physiotherapy clinic database <sup>47</sup>	Administrative data	<p>Patient's information: Admission Date and Time, First Name, Last Name, Age, Gender, Marital status, Ethnicity, Educational Level, Income Level, Region, Address, Phone number, Occupation, Employment status, Referral source, Date of onset symptoms to first physiotherapy treatment, Date of last visit, Discharge Date, Duration (length) of physical therapy care, Date of next visit.</p> <p>Healthcare provider's information: Physician's name, Physical therapist's name.</p> <p>Insurance's information: Insurance status, Insurance type, Name of insurance company.</p>	VNP, PSFS.
	Clinical data	<p>Pregnancy (yes, no), Diagnosis, Symptom location, Nature of pain (acute/subacute/chronic/recurrent), History of disorders (previous mechanism of injury, management, and other), Complaints of pain in other body areas, Occupation injury (yes, no), Mechanism of injury (no trauma, normal daily activities [bending over to wear pants, moving from sitting to standing, etc.], major trauma [motor vehicle accidents, falls, etc.], systemic disorders [Guillian Barre Syndrome, osteoporotic fracture], and other), Radiology tests (X-Rays, CT scan, MRI, and other); Posture/Work ergonomic (slouched, normal, hyperlordotic), Physiotherapy intervention (manual therapy, exercise therapy, education, reassurance, and ergonomic advice), Number of sessions attended, Classification of disorders for example neck pain (NP) (NP with mobility deficits, NP with headache, NP with movement co-ordination impairments, NP with radiating pain), Time lost from work due to disorder, VNP rating scale on baseline and discharge for pain score, PSFS on baseline and discharge for functional score.</p>	
Occupational and Industrial Orthopedic Center registry <sup>38</sup>	Administrative data	<p>Patient's information: Admission Date and Time, First Name, Middle Name, Last Name, Social Security Number (SSN), Age, Gender, Marital status, Ethnicity, Educational Level, Region, Address, Phone number, Occupation, Employment status, Employer's name, Employer's phone number, Employer's Address, Date of onset, Date of last visit, Discharge Date and Time, Duration (length) of physical therapy care, Date of next visit.</p> <p>Healthcare provider's information: Physician's name, Physical therapist's name.</p> <p>Insurance's information: Insurance status, Insurance type, Name of insurance company.</p>	<p>Disability was measured by RMDQ and ODI.</p> <p>Exercise was measured IPAQ.</p> <p>Pain catastrophizing was measured by PCS.</p> <p>Depression was measured by CES-D.</p> <p>Fear avoidance was measured by FABQ.</p> <p>Fear of work was measured by FAQ.</p>
	Clinical data	<p>Height, Weight, Body Mass Index (BMI), Main complaint and other musculoskeletal pain complaints, Comorbidity, History of pain, Exposure to chronic illness in the family, Lifestyle (alcohol consumption, exercise, smoking), Medication, Test and examination (blood, FMRI, radiographs), Type of intervention, Pain related information (intensity [range 0-10], duration and location), Psychological factors (catastrophizing, depression, fear avoidance); Work related information (work related injury [yes, no], reasons for not working, fear of work; Follow-up general satisfaction on with medical care and treatment outcome satisfaction).</p>	

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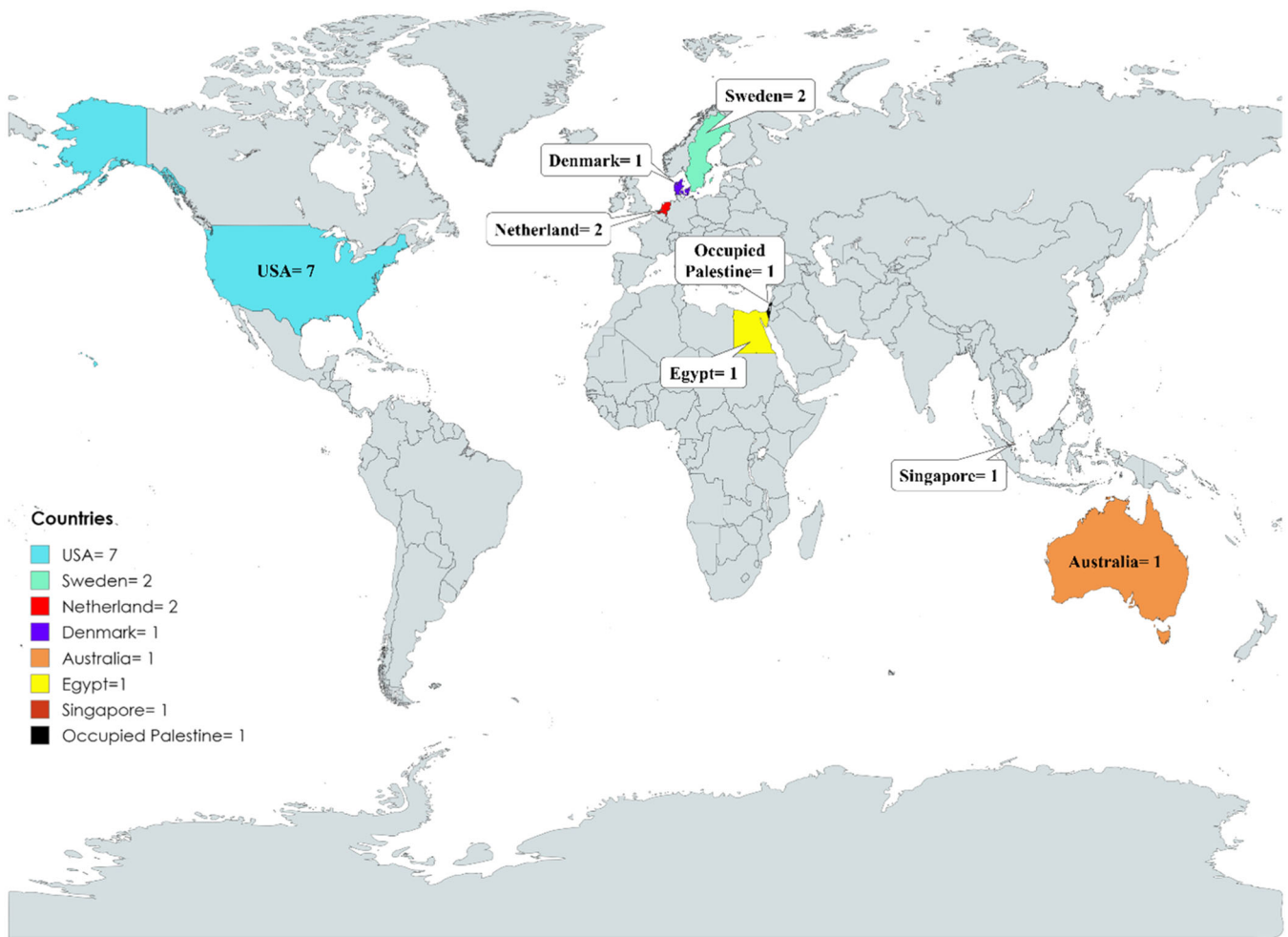
TABLE 2 (Continued)

Registry name (Ref.)	Data elements		Outcome measurement tools
	Category	Subcategory	
Royal Dutch Society for Physical Therapy (KNGF) Registry <sup>48</sup>	Administrative data	Patient characteristics (Patient ID, Patient year of birth, Patient gender, Patient postal code); Structure (Physical therapist ID, Practice ID, Number at Chamber of Commerce, Physical therapy license, Postal code of physical therapist practice, Address of physical therapist practice, Electronic Health Record system, Version number of the Electronic Health Record system).	Physical functioning domain was measured by QBPDS, PSFS. Pain intensity was measured by NPRS.
	Clinical data	Processes (Referring clinician/specialist registered, Date of consultation, Performance code, indicating the type of intervention, Date of final evaluation, Reason for consultation, Location/pathology code, Duration of health conditions, Course of experienced health conditions, Physical therapy diagnosis registered, Current health issue a relapse, Comorbidities registered, Expected recovery, Main treatment goal, Treatment episode duration, Achievement of treatment result, Reason end of treatment); Health outcomes based on PROMs. (Physical functioning domain (QBPDS and PSFS), Perceived pain intensity domain (NPRS)).	
ATI Patient Outcomes Registry (ATI Physical Therapy's Patient Outcomes Registry) <sup>39</sup>	Administrative data	Patient's information: Admission Date and Time, First Name, Last Name, Social Security Number (SSN), Date of Birth, Gender, Marital status, Ethnicity, Educational Level, Income Level, Region, Address, Phone number, Email address, Occupation, Employment status, Employer's name, Employer's phone number, Employer's Address, Date of onset, Date of last visit, Discharge Date and Time, Duration (length) of physical therapy care, Date of next visit. Healthcare provider's information: Physician's name, Physical therapist's name. Insurance's information: Insurance status, Insurance type, Name of insurance company.	VR-12 and PROMs.
	Clinical data	Height, Weight, Body Mass Index (BMI), Diagnosis, Location of disorders, Duration of symptoms (acute, subacute, chronic), Comorbidities (arthritis, asthma, deep vein thrombosis, cancer, chest pain, diabetes, double vision, fever, nausea, fracture, heart condition, high blood pressure, infection, kidney disease, osteoporosis, psychological disorders, smoking, stroke, unexplained weight of loss, and other), Type of treatment, Health-related QoL, and function outcome.	
Cerebral Palsy (CP) Physical Therapy Registry <sup>26</sup>	Administrative data	Patient's information: Admission Date and Time, First Name, Middle Name, Last Name, Date of Birth, Gender (Boy, Girl), Marital status, Educational Level, Region, Address, Phone number, Occupation, Employment status, Date of onset, Date of last visit, Discharge Date and Time, Duration (length) of physical therapy care, Date of next visit. Guarantor's information: Guarantor's name, Address, Phone number. Healthcare provider's information: Physician's name, Physical therapist's name. Insurance's information: Insurance status, Insurance type, Name of insurance company.	

TABLE 2 (Continued)

Registry name (Ref.)	Data elements		Outcome measurement tools
	Category	Subcategory	
APTA's Physical Therapy Outcomes Registry <sup>49</sup>	Clinical data	Height, Weight, Type of delivery (normal, CS), Complication (non, cognitive impairment, epilepsy, visual impairment [strabismus], hearing impairment, other complication); Types of cerebral palsy: 1—spastic (1-1—Spastic Unilateral CP [RT hemiplegia, LT hemiplegia], 1-2—spastic bilateral C.P [quadriplegia, diplegia]), 2—non-spastic (2-1—dyskinetic [dystonic, choreoathetoid C.P], 2-2—Ataxia), 3—Hypotonia; 4—Non classifiable; type of treatment; outcomes.	GMFCS, GMFM, MACS, VSS.
	Administrative data	Patient's information: Admission Date and Time, First Name, Middle Name, Last Name, Social Security Number (SSN), Age, Date of Birth, Gender, Marital status, Ethnicity, Educational Level, Income Level, Region, Address, ZIP code, Phone number, Email address, Occupation, Employment status, Date of onset, Date of last visit, Number of physical therapy visits, Discharge Date, Duration (length) of physical therapy care, Date of next visit, Discharge destination. Healthcare provider's information: Physician's name, Physical therapist's name. Insurance's information: Insurance status (Yes, No), Insurance type, Name of insurance company.	QoL was measured by PROMIS Global 10. Pain was measured by PIRS. Physical Function outcomes were measured by AM-PAC, BBS, ABC Scale, 6MWT, 10MWT. Body regions disability were measured by NDI, DASH, LBPDQ, ODI, HOOS, JR, KOOS, JR, KOS, LEFS.
	Clinical data	Diagnosis, QoL Outcomes, Pain Outcomes, Physical Function Outcomes, Body-Region Specific Outcomes (Neck, Upper Extremity, Back, Lower Extremity).	

Abbreviations: ABC Scale, Activities-Specific Balance Confidence Scale; AM-PAC, Activity Measure for Post-Acute Care; BBS, Berg Balance Scale; CES-D, Center for Epidemiologic Studies Depression Scale; CT, computed tomography; DASH, Disabilities of the Arm, Shoulder, and Hand Questionnaire; DRI, Disability Rating Index; EQ-5D, European Quality of Life Instrument; FABQ, Fear Avoidance Beliefs Questionnaire; FAQ, Fear Avoidance Questionnaire; GMFCS, Gross Motor Function Classification System; GMFM, Gross Motor Functional Measure; HADS, Hospital Anxiety and Depression Scale; HOOS, JR, Hip Disability and Osteoarthritis Outcome Score, Joint Replacement; IPAQ, International Physical Activity Questionnaire; KOS, Knee Outcome Survey; KOOS, Knee Injury and Osteoarthritis Outcome Score; KOOS, JR, Knee Injury and Osteoarthritis Outcome Score, Joint Replacement; K-SES, Knee Self-Efficacy Scale; LBPDQ, Modified Low Back Pain Disability Questionnaire; LEFS, Lower Extremity Functional Scale; \*m, month; MACS, Manual Ability Classification System; MPI, The Multidimensional Pain Inventory; MRI, magnetic resonance imaging; MSPQ, Modified Somatic Perception Questionnaire; N/A, not available; NCV, nerve conduction velocity; NDI, Neck Disability Index; NPRS, Numeric Pain Rating Scale; ODI, Oswestry Disability Index; ÖMPSQ, Örebro Musculoskeletal Pain Screening Questionnaire; PAS, Physical Activity Scale; PCS, Pain Catastrophizing Scale; PIRS, Pain Intensity Rating Scale; PROMs, Patient Reported Outcome Measures; PSFS, Patient Specific Functional Scale; QBPDS, Quebec Pain Disability Scale; QoL, Quality of Life; RMDQ, Roland-Morris Disability Questionnaire; SF-36, Medical Outcome Survey Short-Form 36 items; SPADI, Shoulder Pain and Disability Index; TAS, Tegner Activity Scale; TSK-11, Tampa Scale of Kinesiophobia; VAS, Visual Analog Scale; VNP, Verbal Numerical Pain; VR-12, Veterans RAND 12 Item Health Survey; VSS, Viking Speech Scale; 6MWT, 6-Minute Walk Test; 10MWT, 10-Meter Walk Test.



**FIGURE 3** Distribution of physical therapy registries worldwide.

Occupied Palestine, one from Singapore, and one from Australia. Most physical therapy registries were established in the USA.

We conducted a co-occurrence keywords analysis for the included studies. Figure 4 displays the network and density visualizations of the keywords analysis of the studies included. A keyword is represented by each node, and the relationship between the two nodes is depicted by the line. The frequency of the keyword in a domain is represented by the size of the circles, meaning that the larger the circle, the more repetitions of the keywords.

### 3.3 | Quality assessment

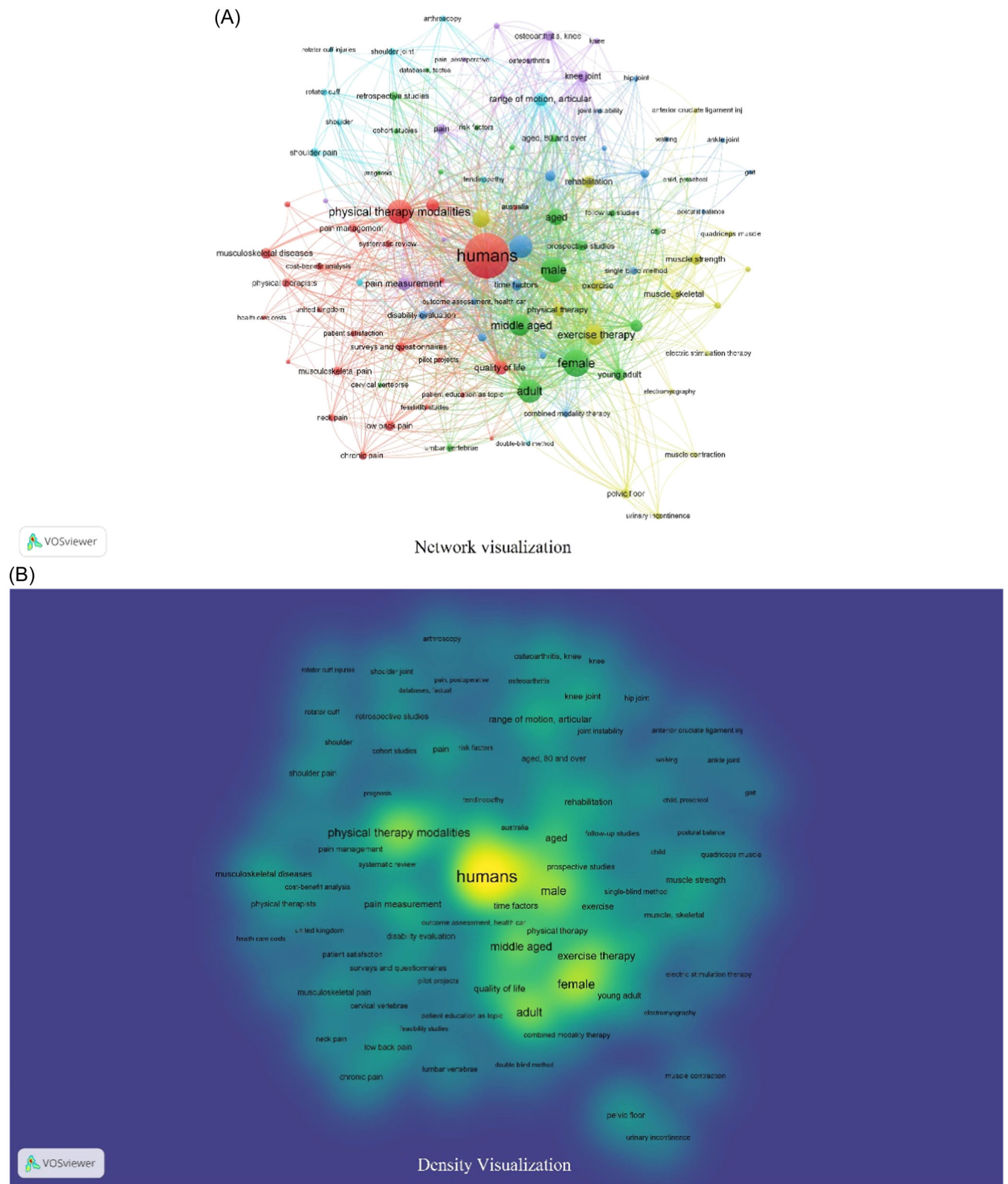
One study was excluded from the quality assessment because it was retrieved through a Google search and review of the APTA's Physical Therapy Outcomes Registry website.<sup>49</sup> Therefore, we used the EPHPP quality assessment tool to assess the quality of the remaining 15 studies. According to the EPHPP global rating, 1 study (7%) was rated strong, 11 studies (73%) were rated moderate, and 3 studies (20%) were rated weak. Overall, the quality assessment for the included studies was rated as moderate (Figure 5).

## 4 | DISCUSSION

The primary aim of our systematic review was to identify physical therapy registries that are present worldwide. We found 16 registries that collected data regarding physical therapy. The third objective of our study was to examine the data elements available in each registry. The results of this study showed that several registries in the field of physical therapy rehabilitation services have been established around the world, and are currently collecting high-quality data and evaluating the outcomes of therapeutic interventions. The purpose of these registries was to collect administrative and clinical data related to physical therapy rehabilitation services, provided to patients and their health-related outcomes, such as functional and quality of life outcomes.

### 4.1 | Findings

According to our findings, the USA has the largest number of implemented physical therapy registries.<sup>34–40</sup> The oldest registry was Focus on Therapeutic Outcomes (FOTO), and it was established in

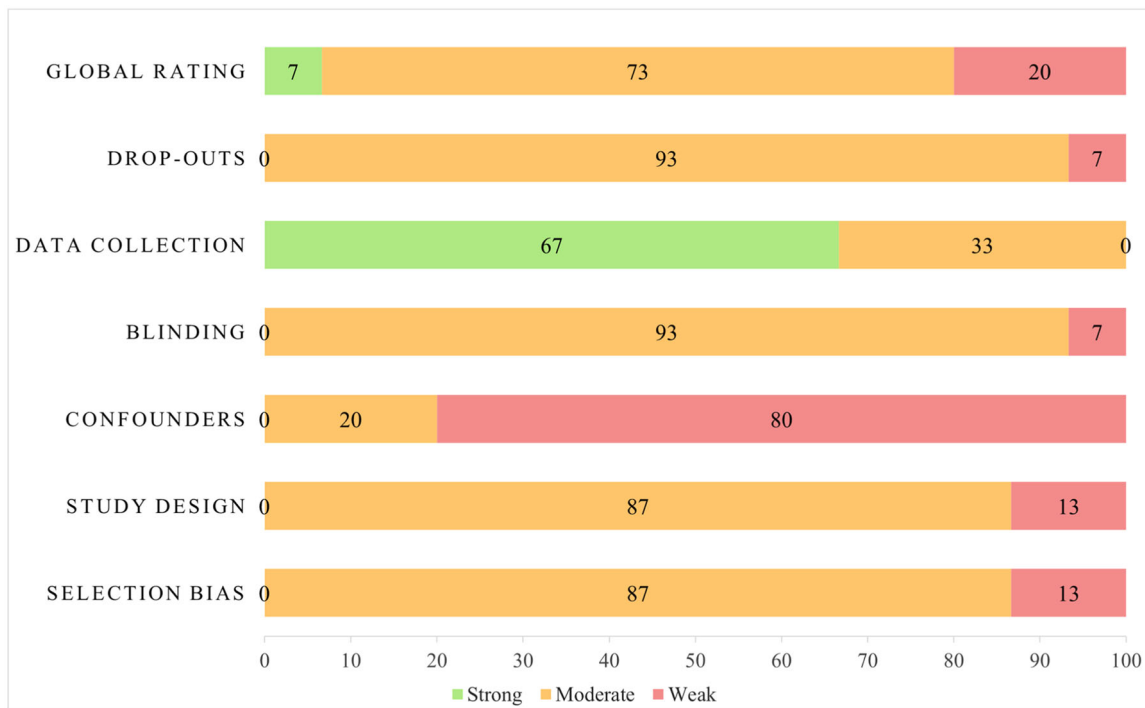


**FIGURE 4** Co-occurrence keywords analysis of included studies: (A) network visualization and (B) density visualization.

1992.<sup>34</sup> The FOTO registry is a commercial outcome registry used by therapists across the USA. Five outpatient rehabilitation companies privately funded it.<sup>50</sup> The FOTO network was developed to generate a uniform information management system that focuses on outcomes,

and it is intended to be used in outpatient physical therapy environments.<sup>51</sup> The FOTO provides reliable and valid results that gather accurate data about services, providing immediate information that empowers therapists, patients, policy-makers, and payers. This





**FIGURE 5** Quality assessment of the 15 included studies.

information helps in making informed decisions about the most effective physical therapy, including choices, delivery, and payment.<sup>52</sup>

The results of this review show that the most of registries are funded by the government. Government and private institutions such as societies can have different intentions and purposes for implementing a registry.<sup>53</sup> The government can use these registries to evaluate physical therapy interventions and eliminate high-risk and costly interventions, which will ultimately lead to improved efficiency, effectiveness, decision-making, and quality of physical therapy services. The findings of this study align with earlier studies.<sup>53,54</sup>

The findings of this study showed that only three registries collect data at the international level. One of the problems that most health information systems such as registries have is interoperability.<sup>55</sup> The capability of two or more systems or components to share information and utilize the shared information is referred to as interoperability.<sup>56</sup> Syntactic interoperability and semantic interoperability between health information systems are very important and essential for exchanging and understanding the shared healthcare data, respectively.<sup>56</sup> Syntactic interoperability refers to the ability of different systems to communicate and exchange data using a common data format or structure, such as XML, JSON, or CSV. It ensures that the data sent from one system can be read and understood by another system, at least in terms of its structure. Semantic interoperability, on the other hand, goes a step further. It ensures that the meaning of the exchanged information is understood consistently across different systems. This involves not just the structure of the data, but also its content and context. Semantic interoperability relies on the use of common terminologies and coding systems, such as SNOMED CT, ICD-10, LOINC, or UMLS.<sup>57,58</sup>

The lack of interoperability between healthcare systems results in healthcare information that is redundant, unstructured, disintegrated, and difficult to access. The quality of care given to patients may be negatively impacted, medical errors may occur more frequently, and financial resources may be wasted as a result of this.<sup>55</sup> The use of ontologies and standards (such as SNOMED CT, RadLex, ICD, RxNorm, LOINC, and DICOM) is important for promoting interoperability and leads to facilitating the linking of registries.<sup>59,60</sup> Using international coding and nomenclature, along with common minimum datasets, data dictionaries, and good practice guidelines, improves the ability of registries to work together and makes them more useful.<sup>61</sup> Therefore, probably due to problems related to syntactic interoperability and semantic interoperability, most of these registries are used at the national and local levels. The results of the present study confirm previous findings.<sup>17,62</sup> Patient registries, through the collection and analysis of important clinical data and outcomes at the national or international level, facilitate monitoring of quality of care, provide timely evidence-based feedback to healthcare providers, benchmarking of performance, describing patterns of treatment, identifying patients who are not receiving treatment by guidelines, and identifying high-risk patients so they can be more closely monitored. Healthcare providers, policymakers, and decision-makers can then rely on this available data and evidence to make informed decisions and take actions aimed at enhancing the quality of care. Ultimately, these efforts contribute to improved patient outcomes, reduced patient mortality, and decreased healthcare costs.

The results show that the data collecting type in most registries was retrospective. The type of data collecting and registry design is very important for the data collection and interpretation of the data recorded



in the registries whose purposes are to evaluate the characteristics and outcomes of the patients.<sup>63</sup> The most common design of registries is retrospective, where both the patients' identification and outcomes are recorded retrospectively.<sup>63</sup> Studies conducted on retrospective registries can be quick, and cheap, requiring fewer resources and less study time than prospective registries studies. However, they are more susceptible to bias in both data collection and analysis, and the impact of unidentified confounders. Retrospective registries encounter challenges of inaccurate measurement of exposures, confounders, outcomes, and overweighting of results because of the large study population.<sup>16</sup> Our study's findings are in line with previous research.<sup>64,65</sup>

According to our results, all of the registries collected administrative and clinical data. In addition, some of them used valid outcome measure tools for evaluating health-related outcomes. Each patient registry collects administrative and clinical data retrospectively or prospectively, depending on its purposes.<sup>16</sup> Healthcare administrative data are generated during every patient encounter with the healthcare system, whether it is a hospital admission or a visit to a physician's office.<sup>66</sup> Administrative data are collected for various purposes such as reimbursement, planning, and decision-making.<sup>67</sup> Administrative data can be utilized by hospital managers, policy-makers, and researchers to conduct studies on the population and assess the incidence, prevalence, and temporal trends of particular diseases and health conditions, along with their associated mortality.<sup>67</sup> Administrative data can be used to assess various outcomes such as death rates, hospital readmission rates, and the duration of hospital stays. These outcomes can be easily determined from administrative datasets and provide information on patients' health conditions.<sup>67</sup> Furthermore, these data have the potential to be utilized for assessing the quality of healthcare services and systems.<sup>67</sup> Clinical data in the registries are data that focus on a specific diagnosis, health conditions, and interventions for clinical, policy, or scientific purposes.<sup>68</sup> Healthcare registries that contain both administrative and clinical data are ideal for studying conditions treated by allied health professionals in fields such as physical therapy, occupational therapy, and speech-language pathology. These registries are particularly useful because they can collect evaluation and treatment data that may not be easily represented using medical codes.<sup>69</sup> Paying attention to the dimensions of data quality in patient registries is very important. The value of patient registries depends on having high-quality data that is collected and stored within the registry.<sup>16</sup> To accurately evaluate the effectiveness of health interventions and measure health-related outcomes, high-quality data are required.<sup>70</sup> Patient registry data quality can be guaranteed by having a data dictionary with clear definitions.<sup>16</sup> The data dictionary describes the data elements to be collected by the registry. This includes specifying the name of the element, data type (numerical, ordinal, categorical), range of acceptable values, precision (number of decimal points), and others. This is important because it ensures that the data collected is accurate and reliable.<sup>71</sup> Attention to ethical and legal issues in the registries is of utmost importance, as it ensures the safeguarding of privacy, confidentiality, and data protection.<sup>72</sup> Our results are consistent with prior studies.<sup>30,54,59</sup>

## 4.2 | Limitations of the systematic review

There are a few important limitations of our study. First, when we retrieved studies using the keywords "registry" and "physical therapy" from databases, a large number of studies were retrieved, which exceeded the researchers' capacity for review. Consequently, we refined our search strategy by adding the keywords "musculoskeletal" and "orthopedics" to limit the studies retrieved. To mitigate this limitation, we searched the first 10 pages of the Google Scholar database and Google search engine using the search terms "physical therapy registry" or "physiotherapy registry" to ensure comprehensive coverage of all physical therapy registry systems. Second, it was the lack of access to the details of the minimum data sets of some registries. Despite emailing the relevant registry support team to overcome this limitation, we did not receive a response. Third, some crucial details about the registry, such as the name of the software used, the number of registered patients, and the advantages and disadvantages of the registry, were not provided. Fourth, the quality of data collected in these registries was not reported.

## 4.3 | Implications and suggestions for future studies

The findings of our systematic review have important practical implications for the design and development of minimum data sets and physical therapy registries worldwide. Given the increasing trend of aging populations, the shift in disease patterns from communicable to non-communicable diseases, and the global prevalence of sedentary lifestyles, there is an urgent need for more countries, especially in the developing countries, to establish physical therapy registries. Moreover, these systems should be established and implemented at an international level and be interoperable with health information systems, such as electronic health records. To gather high-quality data and facilitate interoperability, it is crucial to focus on establishing the appropriate infrastructure and utilizing data dictionaries, standards (such as ICD-10), and ontologies (such as SNOMED-CT). Giving due consideration to data quality in registries is of critical importance, and research is recommended to assess the quality of data registered in these information systems.

## 5 | CONCLUSION

The findings of this systematic review indicate that 16 web-based registries in the field of physical therapy rehabilitation services have been established worldwide. These registries actively collect high-quality data and evaluate the outcomes of therapeutic interventions. The most important data elements collected by these registries include sociodemographic data (e.g., patient name, gender, age), healthcare provider data (e.g., name of the physical therapist, name and specialization of the referring physician), clinical and assessment data (e.g., chief complaint, diagnosis, comorbidities, pain location,

range of motion, type of physical therapy intervention), and outcome measurement tools (e.g., Oswestry Disability Index) to evaluate treatment results. Most of these registries are funded by government sources, with data primarily collected from clinics, and their geographical coverage is predominantly national. Healthcare providers, researchers, and policymakers can utilize data from physical therapy registries to evaluate the effectiveness of physical therapy interventions, measure health-related outcomes, compare treatment results across countries, develop clinical guidelines, and make informed decisions. Ultimately, this will lead to an improved health-related quality of life for individuals.

#### AUTHOR CONTRIBUTIONS

**Alireza Banaye Yazdipour:** Conceptualization; methodology; formal analysis; validation; visualization; project administration; writing—original draft; writing—review and editing. **Seyed Mohammad Ayyoubzadeh:** Writing—original draft; writing—review and editing; project administration; formal analysis; validation; investigation. **Salman Nazary-Moghadam:** Writing—original draft; writing—review and editing; conceptualization; investigation; validation; project administration. **Goli Arji:** Writing—original draft; writing—review and editing; investigation; validation; project administration. **Fatemeh Sadat Mirmohammad Meigooni:** Writing—review and editing; investigation; validation. **Khalil Kimiafar:** Writing—original draft; writing—review and editing; investigation; validation; visualization; project administration. **Leila Shahmoradi:** Writing—original draft; writing—review and editing; conceptualization; methodology; investigation; visualization; project administration.

#### ACKNOWLEDGMENTS

This study was part of the first author's Ph.D. dissertation titled "Design and Development of Musculoskeletal Physical Therapy Registry" in the Department of Health Information Management and Medical Informatics at the Tehran University of Medical Sciences (Ethics approval number: IR.TUMS.SPH.REC.1401.261). The authors express their gratitude to all those who offered guidance on this research.

#### CONFLICT OF INTEREST STATEMENT

The authors declare no conflict of interest.

#### DATA AVAILABILITY STATEMENT


All data generated or analyzed during this study are included in this published article and original data about the included studies are available publicly in PubMed, Web of Science, Scopus and IEEE databases.

#### TRANSPARENCY STATEMENT

The lead authors Khalil Kimiafar and Leila Shahmoradi affirm that this manuscript is an honest, accurate, and transparent account of the study being reported; that no important aspects of the study have been omitted; and that any discrepancies from the study as planned (and, if relevant, registered) have been explained.

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## SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

**How to cite this article:** Banaye Yazdipour A, Ayyoubzadeh SM, Nazary-Moghadam S, et al. Physical therapy registries worldwide: a systematic review. *Health Sci Rep*. 2024;7:e2312. doi:10.1002/hsr2.2312