








A comparative study of minimum data set of speech therapy: A systematic literature review

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Article Info

Article type:
Review

Article History:

Received: 2023-09-18

Accepted: 2023-10-28

Published: 2023-12-01

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Keywords:

Speech Therapy
Minimum Data Set
Registration System
Speech Disorders
MDS

ABSTRACT

Introduction: A minimum data set improves the potential of data standardization and overcoming the problem of low-quality speech therapy data by providing coherent, complete, and uniform data elements. Therefore, this study was conducted to compare speech therapy minimum data set among different countries.

Material and Methods: A systematic review was conducted without time limits in PubMed, Scopus, Web of Science, Embase, SID, Magiran, Elmnet databases, and in the Google search engine to retrieve articles, speech therapy forms, and speech therapy registry sites. Keywords related to speech therapy minimum data set including minimum data set, registry, and speech therapy, were used. First, studies were reviewed based on titles and abstracts. Then, the selected studies from the previous stage were examined independently by two researchers. A similar standard checklist was used to extract and compare the findings.

Results: A total of 1710 related records were extracted for review, and finally, six main articles and 11 forms were included in this review. The six original articles included two related to speech therapy minimum data set in the United States, two related to Iran, and one related to Australia and Germany. A comparative review of the most important data elements obtained from the articles and input forms in this review, including identity and admission information, referral information, history, assessment of verbal skills, assessment of non-verbal skills, assessment of organs of production, assessment of cognitive skills, assessment of other aspects of speech, and linguistic and cultural considerations, were information elements related to diagnoses, recommendations, and treatment plans.

Conclusion: It could be concluded that an agreed classification system is needed to facilitate communication between speech therapists. This potentially enables further testing of diagnostic and therapeutic hypotheses with more coherent and simultaneous data collection. The challenge ahead is to create a comprehensive and universally agreed-upon classification system that meets the needs of professionals and researchers.

Cite this paper as:

Kimiafar K, Sarbaz M, Sobhani-Rad D, Mousavi AS, Raei Mehneh M, Dahmardeh Kemmak F, Mousavi Baigi SF, Esmaeili M. A comparative study of minimum data set of speech therapy: A systematic literature review. *Front Health Inform.* 2023; 12: 171. DOI: [10.30699/fhi.v12i0.511](https://doi.org/10.30699/fhi.v12i0.511)

INTRODUCTION

Today, information is growing increasingly, and our knowledge about the surrounding environment is improving every moment. This condition requires

complete communication to create and transfer information. Speech and language are the optimal and easiest ways to communicate in human society. Humans can communicate their feelings and information using speech and language to influence

each other and be accepted [1]. If communication through speech and language is disrupted for any reason, human communication is disrupted. Therefore, man will not be able to meet his natural needs. Speech disorders are essential among people of any age group. In addition to creating obstacles and problems related to daily activities, these disorders can cause discomfort and many emotional problems over a long period [2]. It has been estimated that communication disorders occur in 5–10% of the population and can have a notable impact on the quality of life of individuals and their families. Speech-language pathologists provide services to this clinical population in the form of evaluation and treatment of a wide range of speech, language, voice, mental, and swallowing-related disorders. In adults, communication disorders such as aphasia, dysarthria, apraxia of speech, and cognitive-linguistic disorders usually occur as a result of stroke, traumatic brain injury, Parkinson's disease, and multiple sclerosis. Similar disorders in speech, language, voice, mental health, and swallowing occur in children. In children, the most common cause of communication disorder is developmental delay, which occurs in 19% of the child population [3].

According to the world health organization (WHO), 2.41 billion people worldwide needed rehabilitation services by 2019, which means that one in three people in the world needed such services during a period of illness or injury [3]. Hence, the demand for rehabilitation services has increased worldwide. While such a need has not been fulfilled significantly [4, 5], In addition, due to the long-term complications of disabilities and the high costs of their treatment, extensive planning, follow-up of patient care processes, and review of available evidence are very important to identify the best care and disease control programs. As a result, quality health care depends on the complete and wide information in the patient's medical record. Such information is necessary and important in order to support diagnosis and treatment, measure the quality of care, improve the progress of public health, improve the efficiency of health care, and facilitate reimbursement [6]. These needs can only be met using health information systems [7] that support decision-making in health policies, management, and clinical care by collecting, standardizing, coding, and managing information about health status indicators and health determinants [8]. However, as one of the major obstacles to strengthening rehabilitation services worldwide, national health information systems often do not provide sufficient information on rehabilitation.

In this regard, the WHO calls for measures until 2030 to strengthen rehabilitation services in the form of an integrated rehabilitation information system. This includes all sub-branches of rehabilitation, including speech therapy, physiotherapy, audiometry and

other such services worldwide [4].

The development and implementation of the minimum data set (MDS) is the first and most important step in creating health information systems or registry programs that are used to collect accurate, standardized, and comparable data at regional, national, and international levels, as well as to collect data in a specific range [9, 10]. In other words, an MDS is a set of essential data elements that must be used to collect and report data in the registry [11, 12]. MDS can improve the accuracy and completeness of data, care plans, and quality of care and increase the quality of life of people in society [13]. The development of MDS helps to standardize data and use data for decision-making and policy-making purposes. In addition, it provides the ability to compare data at national and international levels [14–17]. Therefore, in order to improve the quality of information in the health information system, the existence of a logical, expandable, and flexible structure of data elements is necessary. Also, the existence of an MDS is recognized as one of the main standards for electronic health records and essential data integrity [18].

Several recent studies have addressed the design of different MDSs or speech therapy information systems, including remote speech therapy based on different MDSs [19–31]. However, evidence-based speech therapy and the basic need for an integrated system in the initial step require the unification of basic infrastructure, including MDS. The research of the researchers indicates that, until today, a systematic review of speech therapy MDS and matching of their data elements has not been done. Considering the importance of uniform documentation and using evidence-based rehabilitation and speech therapy services, the present study was conducted to compare speech therapy MDS among different countries.

MATERIAL AND METHODS

Search strategy

On June 27, 2022, a systematic literature review was conducted without time limit in PubMed, Scopus, Web of Science, Embase, SID, Magiran, Elmnet, and Google search engines to retrieve articles, speech therapy forms, and speech therapy registry sites.

Articles related to the fields of MDS, registry, and speech therapy were examined to compile the search strategy and determine the keywords.

Also, MeSH and Emtree keywords and phrases were used under the supervision of experts in speech therapy, health information management, and medical informatics to search databases. The keywords and search strategy included two sets of keywords related to the field of MDS and speech

therapy, which were combined with the help of the Boolean AND operator, as described below. MeSH keywords are marked with "*" and Emtree keywords are marked with "#". The results of the search strategy are shown in Appendix 1.

1. ("Speech Therapy*" OR "TherapiesSpeech*" OR "TherapySpeech*" OR "Rehabilitation of Speech and Language Disorders*" OR "logopedic education#" OR "logopedic training#" OR "speech education#")
2. ("Minimum Data Set" OR "Minimal Data Set" OR "Core Data Set" OR "Dataset*" OR "Common Data Elements*" OR "Datasets as Topic*" OR "Registries*" OR "Registry*" OR "form*")

Eligibility criteria

The inclusion criteria for the studies were as follows: All studies and forms in English and Persian without a time limit on June 27, 2022, the full text of the studies related to the purpose of providing speech therapy for MDS and speech disorders was compiled and implemented. But, the exclusion criteria included studies, letters to the editor, conference summaries, and studies that did not aim to design, develop, implement, or present speech therapy MDS.

Data extraction and synthesis

First, the studies extracted from the databases were examined based on titles and abstracts. Then, the full text of the selected studies from the previous step was examined independently by two reviewers. In case of disagreement between the two reviewers, the third reviewer resolved the dispute. A similar standard checklist was used to extract and compare the findings. Data items in this checklist included MDS name, country, year of establishment, sponsoring organization, scope, and data elements. After collecting the data elements from the articles and input forms for the study, the comparative data elements from all the studies were presented.

RESULTS

Study selection

A total of 1610 relevant records were extracted from the databases for review. In addition, the retrieved records on the first 10 pages (100 items) of the Google search engine were examined. In the internal databases, including SID, Magiran, and Elmnet, based on the considered keywords, a search was made, and unfortunately, based on the researcher's reviews, no articles in this regard were retrieved. After reviewing the extracted studies and removing duplicate studies (342 records), 1368 records remained, which were screened based on their titles and abstracts. Then, 31 records were selected for their full-text review, and 14 studies unrelated to the purpose of the review

were removed. Finally, six main articles and 11 forms were included in this review. Fig 1 shows the steps for searching and selecting studies.

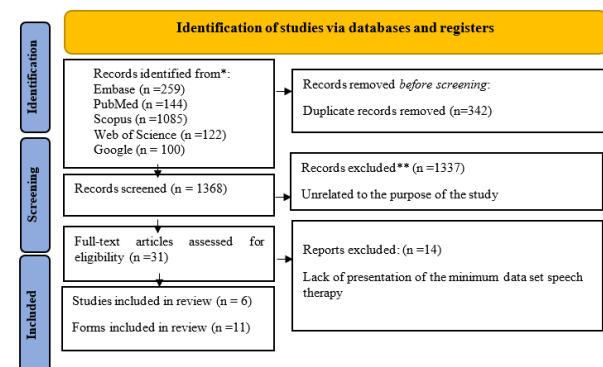


Fig 1: Flowchart of the study selection

Results of data extraction from studies related to MDS for speech therapy

In this systematic review, six articles related to speech therapy MDS [2, 15, 32-35] and 11 forms that were selected based on inclusion and exclusion criteria were examined [36-46]. According to Table 1, speech therapy MDSs in the United States [32, 35], Australia [33], Germany [34] and Iran [2, 15] are as shown in Table 1.

A group of physicians and supervisors in the Los Angeles area began a series of meetings in 1964 to create a standard case file, hoping to facilitate the efficient transfer of information among physicians. Finally, a draft was prepared in which five guidelines as followings:

- 1) The file should be easy to complete.
- 2) It should be arranged so that a fact can be discovered quickly.
- 3) Its terms and categories should be unambiguous.
- 4) It should use common terms used by school doctors.
- 5) It should have a format compatible with data recovery.

Currently, 300 doctors in 60 regions are using it. Some parts of it are still weak and need further study and explanation. In addition to the usual identification based on name, age, sex, address, school, and doctor's report, the file includes information about school and family background, general health, and hearing. It includes evaluation results of spontaneous speech, communicative responsiveness, physical behaviors associated with verbal communication, and the state of the speech mechanism. Communication disorders are summarized according to the expression disorder, single or multiple, along with the degree of severity. There is a form for recording detailed test results on

the back cover of the file for easy reference. The coherent file was designed to display the results of a complete phonetic list of sounds as singles as well as 28 combinations, including those contained in the Templin-Darley 50-item screening test. The classification of speech disorders was based solely on

the expressive disorder, thus preventing inferences based on concurrent conditions that may or may not be related to communication deviations [32].

Table 1: Results of data extraction from articles related to speech therapy MDS

Ref.	MDS name	Country	Established Year	Scope	Founder	Data elements
[35]	American Speech-Language-Hearing Association	America	1994	Pathology of speech, language and hearing	American Speech-Language-Hearing Association	Identification information, medical history, assessment of the patient's current condition, treatment plan, current patient condition, consultation records
[2]	MDS speech therapy	Iran	2015	Speech disorders and speech therapy	Tabriz University of Medical Sciences	Administrative data: collection of demographic data, financial data, data center & service provider, data related to admission & discharge Clinical data collection: data on health history, main complaint of the patient, time of injury or dysfunction, cause damage or disruption, age of onset of the disorder, history of speech, current status of the individual in relation, proposed remedial action, short-term treatment goals, long-term treatment goals, result, the diagnostic report, reports of short-term and long-term goals, reports on consultation, reports referred
[15]	MDS disability	Iran	2019	disability (speech therapy)	Iran University of Medical Sciences	Administrative data: demographic, socioeconomic, patient encounter, provider id, facility identifier, data registrar, financial data, supportive services Clinical data: patient chief complaint, personal medical history, family history, review of systems (ROS), environmental factors, diagnosis and disability determination, procedures, discharge condition, follow up, death
[32]	Standard form of speech file	United States	1964	School speech and listening programs	School of Northern California	Spontaneous speech and language, speech mechanism, communicative responsiveness: responsiveness, general health history, observed physical behaviors, identification data, family information, expressive speech or language disorder, hearing disorder (if applicable), articulation record, hearing status, threshold tests, amplification
[33]	Classification of phonological interventions for children	Australia	2018	Speaking while teaching	Australian Research Council	Goal: Focus, Characteristics of goal/target, Linguistic context of stimulus Teaching moment: Antecedent event (clinician), Modality of model or instruction, Response (child), Response level, Response requirement Consequent event (clinician) Evaluative feedback, Reflective feedback, Responsive feedback, Context, Intervention agent, Venue, Session format, Resources Activities: Type, Social/emotional, Valence Procedural issues: Intensity, Training, Evaluation
[34]	Berlin Stroke Registry	Germany	2022	Aphasia, dysarthria and dysphagia after stroke	Berlin stroke registry	Demographic information Speech disturbances, dysphagia, German <i>modification of the international statistical classification of diseases and related health problems</i> , 10th revision (ICD-10-GM) codes Inpatient diagnosis (initial hospital stays) Inpatient condition Utilization rehabilitation services (first stay)

The American Speech-Language-Hearing Society also designed an MDS that included data elements such as patient identification information, medical history, assessment of the patient's current condition, treatment plan, current patient condition, discharge

summary, and consultation records, each of which had several subcategories. This document is intended as a guide for speech and language pathology programs in creating, reviewing, and maintaining accurate and appropriate clinical records. These

standards include the standards of the American Speech-Language-Hearing Association (ASHA) as well as the standards of external organizations that establish documentation requirements, including the Centers for Medicare and Medicaid Services (CMS), the Joint Commission on Accreditation of Healthcare Organizations (JCAHO), and the accreditation of rehabilitation facilities, which is considered by regulations such as the Health Insurance Portability and Accountability Act (HIPAA) for speech and language pathologists who are entities covered by this law [35].

In Iran, in 2013, MDS was evaluated using a checklist in nine speech therapy clinics in Tabriz city. This MDS for speech therapy was divided into clinical and administrative data. Then data elements such as name and surname, date of birth, gender, address, phone number, hospitalization date and number of treatments, patient complaint, time of injury or disorder, cause, and age of illness are the most important elements of administrative data, and health history is the most important element. Clinical data were selected [2].

In order to develop the MDS system of disability information management in Iran, the Iran University of Medical Sciences collected data from the data bank of people with disabilities of the country's welfare organization at "payment.behzisti.net" and the information elements of the Ministry of Health and Medical Education (MOHME). A disability MDS including administrative and clinical categories (including speech therapy data) was prepared with 130 and 345 data elements, respectively. While 238 data elements were mandatory (administrative: 60, clinical: 178) and the rest were optional [15].

The Australian Research Council also conducted a classification of phonological interventions for children with the aim of creating a classification of elements, including phonological interventions for children with speech-sound disorders. Seventy-two intervention elements were identified using content analysis of intervention descriptions, and then a hierarchical framework including 4 areas, 15 sets, and 9 sub-sets was arranged to form the classification of phonological intervention. Among the interventions, the average element concentration (number of required or optional elements) was 45 elements, with a range of 27 to 59 elements. The average flexibility of interventions (the percentage of elements considered optional from all elements included in the intervention) was 44%, with a range of 29% to 62%. Differentiation of interventions the percentage of rare elements in an intervention and the removal of common elements from all the elements in the intervention (both optional and necessary) ranged from zero to 30% [33].

In Germany, with the aim of analyzing the adherence to guidelines in the treatment of disorders

(dysphagia, aphasia, dysarthria, after stroke) based on appropriate test parameters and determining the effective factors in the implementation of stroke, six test parameters based on a systematic study as well as guidelines for the treatment of speech disorders and disorders Swallowing (such as comprehensive diagnosis, early onset, and persistence) were defined. In total, five specific testable parameters for the provision of speech and language therapy were extracted from the guidelines, which included the treatment of speech disorders by speech therapists, specific diagnosis at the end or after the acute stage, and early initiation and continuation of treatment. Finally, the results showed a deficiency in the implementation of guideline recommendations in post-stroke care [34].

Results from comparing data elements from included articles and forms

According to Table 2, the most important data elements obtained from articles and input forms in this study include: identity and admission information, referral information, history, evaluation of verbal skills, evaluation of non-verbal skills, evaluation of production organs, evaluation of cognitive skills, and evaluation of others. Aspects of speech and linguistic and cultural considerations were informational elements related to diagnoses, recommendations, and treatment plans.

DISCUSSION

Speech therapy MDS in heterogeneous populations is a fundamental requirement to achieve evidence-based rehabilitation to guide the best rehabilitation services and outcomes for patients and provide health service value. The aim of this study was to compare speech therapy MDS among different countries. 6 articles, including speech therapy MDSs in the United States [32, 35], Australia [33], Germany [34], and Iran [2, 15] and 11 forms were included in the review [36-46]. This systematic literature review showed that in Iran, only one proposed MDS was considered for speech therapy centers affiliated with Tabriz university of medical sciences [2], and the other MDS addressed all disabilities, including speech and language disabilities [15]. In Germany, MDS was used to treat disorders of dysphagia, aphasia, and dysarthria, after stroke [34]. Research in Australia also considered only one classification of phonological interventions for the child population [33]. One of the researches in the United States also created a standard file for students with speech disorders [32].

Meanwhile, the American Speech-Language-Hearing Society had the most complete MDS compared to other countries and was considered a guide for speech and language pathology programs in creating, reviewing, and maintaining accurate and appropriate

clinical records. This MDS was also in general, and different populations that have various speech and language disabilities had not been given special attention. On the other hand, the other proposed MDSs covered limited groups of the target population, such as children in Australia [33], students with speech disorders in the United States

[32], and people who had a stroke followed by speech disorders in Germany [34]. In Iran, a limited population of people was considered [2], which shows that there is no coherent data set for all age groups with any conditions, and diseases, or disabilities that cause speech and language disorders.

Table 2: Results from comparing data elements from included articles and forms

Identity and admission information	Referral information	History	Evaluation of verbal skills	Assessment of non-verbal skills	Evaluation of production organs	Evaluation of cognitive skills	Evaluation of other aspects of speech	Linguistic and cultural considerations	Informational elements related to diagnoses	Recommendations and treatment plans
Name and surname	Information about the referring therapist or treatment center	History of speech and language development	Evaluation of comprehension skills (formal and informal)	Examining the auditory system includes:	Lips	Amount of attention and level of alertness	Type of breathing	First and second language	The main diagnosis	Treatment plan
Record number	Previous evaluation date	Presence or absence of hearing problems	Evaluation of expression skills (formal and informal)	* Name and degree of hearing problems	Language	Memory (number and sequence of memory units)	Breath volume	The language spoken at home, work or school	The severity of the problem	Treatment goals
Date of birth	Place of previous assessment	Medical history (history of other diseases)		* Using hearing aids such as hearing aids, cochlear implants, etc.	Band under the tongue	Ability to solve problems compared to peers	Coordination of speech and breathing		Other conditions, diagnoses and clinical findings	Number of sessions needed
Age	Former therapist	Educational level		* Position of the external ear	The teeth	Behavioral observations	Resonance		The tool used	Prognosis
National code	The reason for referral to the center	Psychological and emotional problems		* Position of the middle and inner ear	Lower jaw		Frequency		Tests	Possible date of completion of treatment
Sex	Use of other rehabilitation services and type of service	Treatments that are being done		* Otoscopy findings	Hard-working		Loudness and sound quality		Results, weaknesses and strengths	Referral to other specialists or medical centers
Nationality		Progress of ongoing treatments		Examination of the visual system includes:	Softcom		Fluency			Suggestions for patients or caregivers
Marital status		Medications (name of medication, dosage, etc.)		* Physical condition of the eye	Sucking					Speech therapy signature
Social life status		Sensitivity and allergy		* Use of glasses or different types of lenses	Gag reflex					Diagnostic codes
Address		Family history of speech and language and hearing diseases		* Name and degree of vision problems	To swallow					

Identity and admission information	Referral information	History	Evaluation of verbal skills	Assessment of non-verbal skills	Evaluation of production organs	Evaluation of cognitive skills	Evaluation of other aspects of speech	Linguistic and cultural considerations	Informational elements related to diagnoses	Recommendations and treatment plans
Phone number		Family information (name, age, occupation and education of family members)		Tactile perception	Blowing					
Therapist information				Ability to imitate and perform movements (such as gross and fine movements)	Puffing out the cheeks					
Date of admission to the center				Hand-eye coordination	Diado movements					
Date of speech and language assessment				Side superiority						
Discharge date										
Number of visits										
Insurance information										

In Iran, two studies were designed using a questionnaire containing minimum data for speech therapy and shared between speech therapy specialists using a 5-point Likert scale [2]. In another study, the MDS of the disability information management system was collected using the information bank of persons with disabilities of the country's welfare organization and the information elements available in MOHME [15]. In both studies, MDS was divided into clinical and administrative categories, each of which included several subcategories [2, 15].

The most important data elements obtained from articles and input forms in this study include: identity and admission information, referral information, history, evaluation of verbal skills, evaluation of non-verbal skills, evaluation of production organs, evaluation of cognitive skills, and evaluation of others. Aspects of speech and linguistic and cultural considerations were informational elements related to diagnoses, recommendations, and treatment plans.

In other studies, a number of theoretically different classification systems based on an etiological (medical) approach, a descriptive-linguistic approach, or a processing approach have been proposed. Children with speech-sound disorders

(SSD) make up more than 70% of doctors' cases and are a very heterogeneous group. One of the biggest problems facing the classification of such children is that there is no universal and agreed-upon system for SSD [47]. A speech disorders classification system (SDCS) was created to address the issue of how to classify children with SSDs of unknown origin. SDCS was developed over the past 30 years. SDCS has been supported in the United States and Australia since its inception. Support for the SDCS was partly due to its perceived high face validity. A significant problem with the SDCS was the uniqueness of each subgroup category, because clinical intuition suggested that some children might be unclassifiable under the SDCS. For example, a child who presented without a family history of speech and language problems would not be covered by the SDCS system. Therefore, it became a difficult clinical classification tool and required at least accessible analysis software to be clinically useful [48].

Dodd [49] proposed a classification model based on a descriptive linguistics approach that included phonological delay types. The main premise of Dodd's classification system was that subtypes such as articulation disorder, phonological delay, atypical phonological disorder, or inconsistent phonological disorder based on error pattern analysis can be

identified by surface pattern errors that reflect subgroup-specific processing deficits. He developed a differential diagnosis system from a theoretical basis using subtypes known as "phonological delay" and "deviant" development; however, the lack of information in this classification model about vocabulary age and expressive language skills, ignoring the role of vocabulary and linguistic differences, may be overlooked in the different performance of tasks. In addition, Dodd's classification system critically depended on a polysyllabic word mismatch task, which consisted of repeating a set of 25 words in three separate trials, the validity of which was not established. Therefore, this was not a suitable cover for speech-sound disorders in children [47].

The psychological framework of Stackhouse and Wells is that children with SSD have specific deficits in one or more points of the speech processing chain. This deficit differentiates them from typically developing children, and target deficits lead to improvements in speech output. Additionally, how children with the same diagnosis (etiology) can present with different breakpoints in the speech processing chain and how breaks can be mapped to reflect habituation at different levels of speech development is proposed [50]. This framework enables the categorization of children with SSDs of unknown origin into profiles using a psycholinguistic approach. However, the framework has theoretical shortcomings. First, failure hypotheses are limited to input and output mechanisms. Maybe the deficits stem from a more central level, such as learning phonological constraints. Second, deficits in the speech processing model are considered to be the cause of SSD. While it is possible that speech processing problems (consequences or symptoms) are accompanied by another fundamental defect [47].

Shriberg's SDCS, Dad's differential diagnosis system, and the psychological framework of Stackhouse and Wells show many similarities. All three classification systems recognize three common subtypes, including an articulation-based subtype, a planning subtype, and a phonological subtype characterized primarily by simplification processes. Furthermore, the SDCS and the Stackhouse and Wells framework identify a subgroup with auditory-based input deficits, while the Differential Diagnosis System and the Stackhouse and Wells framework identify children with incoherence but without oral-motor problems. The difference is how much each classification system considers diagnostic elements such as the underlying medical condition, family history, and types of audio errors. It emphasizes speech processing and the importance of memory and higher executive functions. For example, the SDCS and the differential diagnosis system both emphasize the importance of the nature of speech sound errors as indicators of subgrouping, whereas the Stackhouse and Wells

framework suggests that sound error patterns do not represent a specific failure and can arise from any point in the speech processing chain [47].

In a similar way, McPherson et al. conducted a study aimed to show the status of rehabilitation information systems in countries with different income levels. They also identified the main processes and measures for the development of such systems in underdeveloped and low-income countries. They found that there is no standard for rehabilitation in health information systems [51].

Many studies on registration and MDSs in Iran have been conducted in recent years, most of which also presented an indigenous model for the development of MDSs specifically for a disease, injury, or group of patients [52-54]. However, no study has focused on the development of its speech therapy registry. Actually, until today, there was no universal and agreed-upon classification system in the field of speech therapy. In this regard, Mousavi et al. concluded in previous studies that despite the creation of MDSs in rehabilitation sub-disciplines, including speech therapy, a complete MDS and, in the next step, an integrated registry for rehabilitation management, including rehabilitation sub-disciplines, have not been developed and implemented in Iran. Undoubtedly, the provision of integrated rehabilitation services requires strong infrastructure, including the minimum set and the ideal set of integrated, valid, and comprehensive data in each of the rehabilitation sub-disciplines. This infrastructure cannot be achieved except by putting together the pieces of the puzzle in an integrated manner, by bringing together similar valid infrastructures in other countries, conducting review studies to collect all available data, and using the opinions and suggestions of experts in each field to finally reach the lofty goal of evidence-based rehabilitation [19-21].

In general, this literature review shows that currently, the most comprehensive MDS of speech disorders belongs to the United States, which includes the standards of the American Speech-Language-Hearing Association as well as the standards of foreign organizations. In other countries, including Iran, there is no coherent MDS for speech therapy. It is clear that an agreed-upon classification system is needed to facilitate communication between specialists and to enable further testing of diagnostic and therapeutic hypotheses with more coherent and simultaneous data collection. The challenge ahead is to create a comprehensive and universally agreed-upon classification system that meets the needs of professionals and researchers. In this regard, according to recent developments in the digital industry, it is possible to go beyond the borders of a country with the help of new technologies such as

artificial intelligence, telemedicine, and holding coordinated meetings [55-58]. Researchers should potentially collaborate with the clinical community to determine a minimum data set that includes a primary outcome set and potential covariates. Examining the data obtained from previous studies indicates the need for a more coordinated and simultaneous collection of assessment data for people with speech disorders. But to achieve this goal, we need to go beyond the sets created so far and create a collection of several minimal datasets. Consensus between clinical and research speech therapists on what should be collected for people with speech disorders is critical to ensuring that the content of future MDS is collectible and appropriate. In this case, the obtained dataset will be a valuable resource for academic and clinical research communities and will lead to better results and more cost-effective services. Therefore, the future work of this study is the development and implementation of a coherent MDS and, in the next step, the establishment of a speech therapy registry in Iran.

This study was the first comprehensive systematic review in the field of speech therapy MDS. In this study, we tried to gather the most reliable scientific evidence with systematic methods and increase its usefulness. Also, in this study, we did not limit ourselves to only the articles extracted from the journals and examined the articles published in the gray literature to try to provide the most comprehensive evidence. However, the search keywords may not be sufficient and complete to obtain more studies, and some prominent and related studies may not be included in this research. Also, the included studies have very heterogeneous designs and have used different methods to measure the results of the interventions. Therefore, it was not possible to perform a meta-analysis or examine the effect of these studies in a group.

CONCLUSION

This comprehensive systematic review shows that

currently, the most comprehensive MDS of speech disorders belongs to the United States, which includes the standards of the American Speech-Language-Hearing Association as well as the standards of foreign organizations. In other countries, including Iran, Germany, and Australia, there was no coherent MDS for speech therapy. In general, an agreed-upon classification system is needed to facilitate communication between speech therapy professionals and to enable further testing of diagnostic and therapeutic hypotheses with more coherent and simultaneous data collection. The challenge ahead is to create a comprehensive and universally agreed-upon classification system that meets the needs of professionals and researchers.

ACKNOWLEDGMENT

We hereby express our gratitude to the Student Research Committee of Mashhad University of Medical Sciences who helped us in conducting this research.

AUTHOR'S CONTRIBUTION

All authors contributed to the literature review, design, data collection and analysis, drafting the manuscript, read and approved the final manuscript.

CONFLICTS OF INTEREST

The authors declare no conflicts of interest regarding the publication of this study.

FINANCIAL DISCLOSURE

No financial interests related to the material of this manuscript have been declared.

ETHICS APPROVAL

This study was approved after review and presentation in the Ethics Committee of Mashhad University of Medical Sciences (Code: IR.MUMS.REC.1400.296).

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