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Specialized stroke rehabilitation services in seven countries

Preliminary results from nine rehabilitation centers

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Background There is a lack of defined levels of rehabilitation, indicating possibly random content and access to specialized services.

Aims and/or hypothesis The aim of the study was to perform a multinational descriptive study of specialized rehabilitation in persons with stroke, to elucidate what the different centers define as prerequisites for specialized rehabilitation, and to analyze whether these descriptions map to currently applied standards or constructs of specialized rehabilitation. A secondary aim was to look for similarities and differences between therapies and services for persons with stroke in the sub-acute stage in the different institutions.

Methods Descriptive data of the collaborating centers regarding structure and processes of services were recorded and compared with the British Society of Rehabilitation Medicine and Specialized Services National Definitions sets.

Results Comparisons of the definitions showed that all centers admitted severely disabled persons with stroke, in need of complex rehabilitation, and provided high levels of physical services, with specialized equipment and facilities. However, funding, size, university affiliation, quality accreditation, staffing levels, specialist training, cognitive and vocational services, coordination of the professional teams, admission procedures, time and type of therapies, estimated length of stay, and follow-up procedures differed between the centers.

Conclusion This multinational study of specialized stroke rehabilitation centers shows that a universal definition of specialized rehabilitation is possible, even in quite different countries and settings, in terms of general principles. There were however differences in structures and procedures, which may

influence patients' outcomes, indicating a need for refinement of the definitions to be globally applicable.

Key words: specialized rehabilitation, stroke, multidisciplinary team

Introduction

It is estimated that 15 million people worldwide suffer a stroke each year (1,2). Stroke is the leading cause of serious long-term disability (3). Approximately one-third of stroke survivors will have permanent disability after their stroke (1,4). Consequently, many individuals with stroke are in need of specialized services and specialized rehabilitation.

Specialized rehabilitation has been defined by the British Society of Rehabilitation Medicine (BSRM) as 'services that support patients with complex disability, whose rehabilitation needs are beyond the scope of their local rehabilitation services' (5–7). Relatively few rehabilitation centers for persons with stroke can be defined as specialized in accordance with the BSMR's definition, and those that may be in line with the definitions may differ regarding content both within a country and between different countries (8). This lack of defined levels of rehabilitation, indicating random content and access to specialized services, signals a need for more information about content and the effectiveness of services provided, to obtain a basic understanding of how and what special rehabilitation should be, and how specialized rehabilitation might be developed to benefit patients.

A descriptive study of specialized rehabilitation should preferably be undertaken in a cross-cultural setting to allow comparisons between countries (9,10). Sunnaas Rehabilitation Hospital in Norway has initiated a multinational comparative descriptive study on the content of specialized stroke rehabilitation with partners from nine rehabilitation centers in seven countries: Norway, China, the United States, Russia, Palestine, Israel, and Sweden.

Thus, this is a multinational descriptive study of specialized rehabilitation for persons with stroke. The aims are to elucidate what the different centers define as prerequisites for specialized rehabilitation and to analyze whether these descriptions map to currently applied standards or theoretical constructs of specialized rehabilitation. Furthermore, the services for persons with stroke in the sub-acute stage are presented from the different institutions, to look for similarities and differences in practice.

The study was registered in Clinical trials Gov: NCT01732679.

Ethics

Approval of the local ethical committees in each country was obtained in 2012, including from the Regional Ethics Committee of Health South-East in Norway (2012/768). Information on the

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aim of the study was given to the participants' both verbally and in writing, and written informed consent was obtained.

Materials and methods

Design

The design was a prospective, descriptive study of specialized rehabilitation for persons with stroke, in nine rehabilitation centers, in seven countries. The characteristics of the participating centers were described, such as structure and process of services, therapies provided, and the principles for admission and discharge.

Data collection

Structured questionnaire

A structured questionnaire was developed which included questions of general descriptions of the specialized rehabilitation unit.

This ensured descriptions of the participating centers, and mapping onto the analytical tools the BSRM definition of specialized rehabilitation (5) and Specialized Services National Definitions (SSND) sets for tertiary rehabilitation (6,7) could be readily compared (Appendix S1). The head of each center answered the questions. The contact persons in each clinic presented the description of each center at a workshop, where the described content was discussed, and consensus regarding the interpretation was reached (Fig. 1). The patients with stroke were assessed with the Modified Rankin Scale on admission, and a score of 3–5 was considered to be the target population for specialized rehabilitation (11,12).

Video film

The project coordinator and assistants (BL, SS, MH) also visited the participating centers ($n = 8$) to do on-site video documenta-

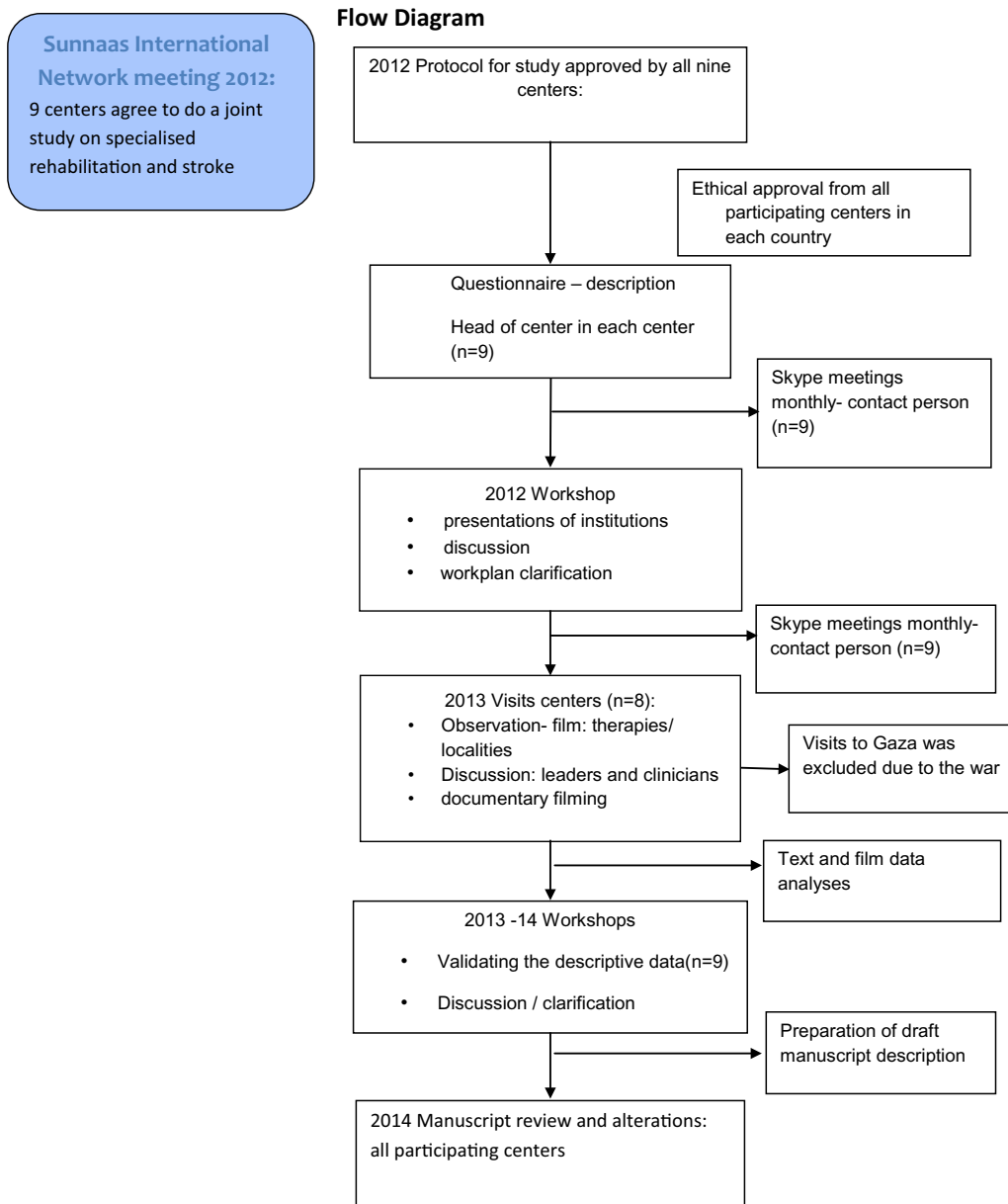


Fig. 1 Study progress of descriptive data collection of specialized rehabilitation.

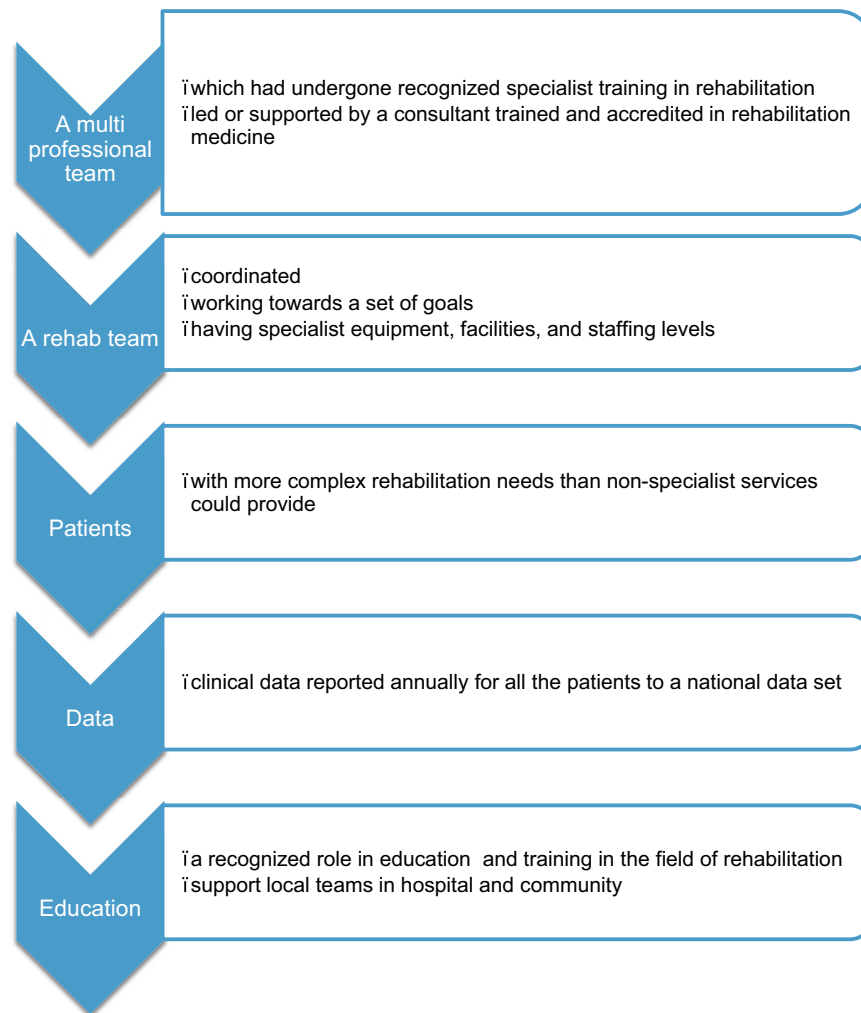


Fig. 2 The British Society of Rehabilitation Medicine (BSRM) key features of specialized rehabilitation, answers categorized as yes = 1 and no = 0.

tion of the rehabilitation locations, therapies, and procedures. However, one center could not be visited due to political circumstances and documentary pictures were sent by the clinic. The videos complement data from the questionnaires describing the content of rehabilitation in the respective centers. The participants have approved the videos.

Analysis

The participating centers' descriptions were mapped to the BSRM's standards of specialized rehabilitation (Fig. 2) (5), and SSND sets to analyze to what extent they coincided (Fig. 3) (6,7) (Appendices S2 and S3).

Qualitative analysis

The structured questionnaire, the interviews, and the material from the workshops were analyzed qualitatively through comparative text analyses (13). Two of the co-authors (B. L., S. S.) performed the analyses in five stages: reading, interpreting, searching for similarities and differences, synthesizing into categories, and reaching consensus (13). In addition, three collaborators (B. L., S. S., and M. H.) analyzed the video material. A score, yes = 1, no = 0, and partly = 0.5, for each presented characteristics

was set to quantify the theoretical framework BSRM and SSND. A total agreement would give 10 and 6 points, respectively.

Statistical analysis

Quantitative data are presented with descriptive statistics, mean, and standard deviation for comparisons of performance on admission (14).

Results

Structure

None of the participating centers obtained the maximum score for specialized rehabilitation as defined by the modified BSRM (Table 1a) (5). The highest score was obtained by Sahlgrenska (Sweden), followed by Rusk (United States), Sunnaas (Norway), Sheba (Israel), and CRRC (China). El Wafa (Palestine), Policlinica no. 2 (Russia), BASR (Palestine), and Sichuan Bayi (China) obtained the lowest score among all participating countries.

Common for all centers were the selection of patients with complex disability for admission. The clinics had a minimum of three categories of rehabilitation staff and all used special equipment in rehabilitation (5).

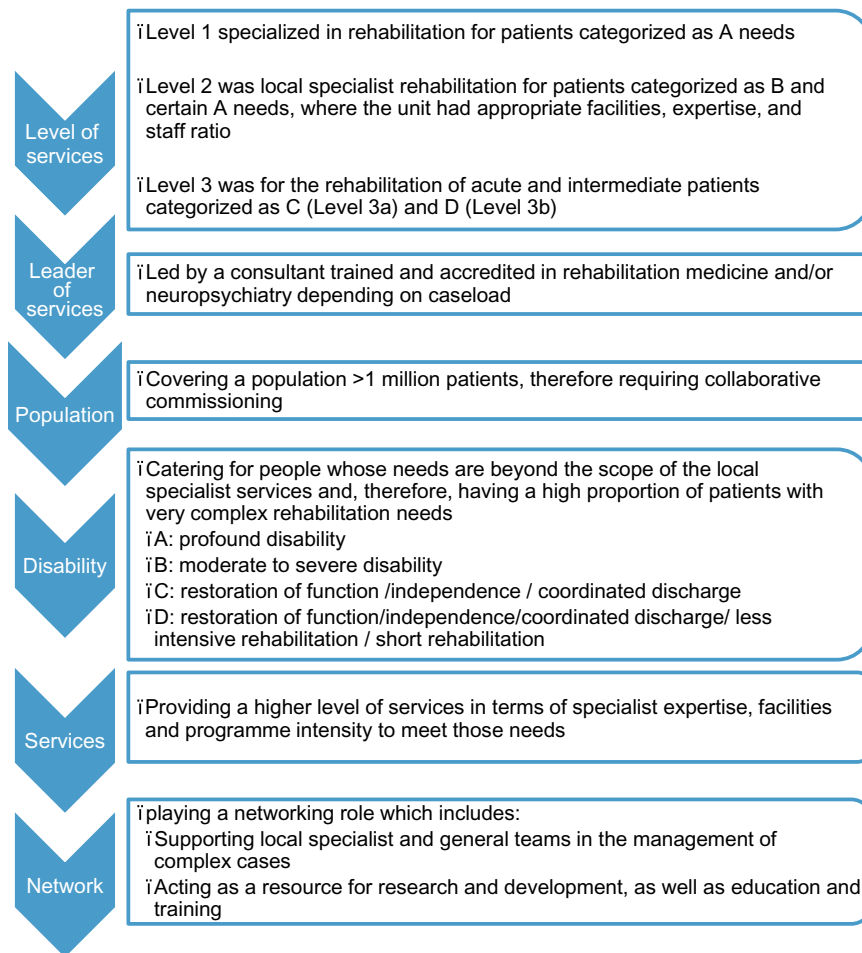


Fig. 3 Definition of a 'tertiary specialized' rehabilitation after Specialized Services National Definitions (SSND) set, answers categorized as yes = 1, no = 0.

Two centers, CRRC (China) and Sheba Medical hospital (Israel), were in line with all criteria in the modified SSND (6), which aims to define tertiary specialized rehabilitation service levels (Table 1b).

The participating centers varied in size, staffing levels, and number of beds devoted to stroke rehabilitation (Table 2 and 3).

Admission criteria in all centers were persons with stroke in need of complex rehabilitation services. A majority of the centers received sub-acute patients; they were located away from the emergency hospital and had national ($n=2$), regional ($n=8$), and local ($n=7$) intake of patients (Table 2). Three out of the nine centers also admitted medically unstable patients (Table 4). Patients admitted to the different centers had all moderate to severe disability, with an mRS score 3–4.

Standardized follow-up procedures after discharge differed; some had standardized control visits after discharge ($n=2$), some practiced 'according to needs', and four centers had no follow-up procedures (Table 4).

All centers provided rehabilitation with specialized equipment and in specialized facilities with a minimum of three categories of staff (Table 5). The majority of the centers ($n=7$) provided higher levels of rehabilitation, as defined by SSND, to patients regardless of age and used standardized outcome measures.

None of the centers used standardized specified goals for rehabilitation. Only three countries had developed national guidelines based on evidence-based medicine/practice. Another three countries referred to national consensus guidelines, and three countries did not refer to any standards of rehabilitation (Table 5).

Funding of rehabilitation varied. The majority had public funding ($n=6$), while others had private funding ($n=3$). In addition, some centers charged additional fees for specific services. This practice was optional in two centers, mandatory in one center, and depending on the patients' financial situation in another (Table 2).

Five of the nine centers collaborated with educational institutions (Table 2). Four of the nine centers were accredited rehabilitation facilities by the Commission on Accreditation of Rehabilitation Facilities (CARF) (15); the same centers also scored highest on the BSRM evaluation (Tables 1a and 2). The description of therapy, the use of different approaches, and the length of time in therapy also varied widely between the centers.

Process of services

All centers had a multidisciplinary team, with a medical doctors (MD), nurses (RN), physiotherapist (PT), occupational therapist (OT), and psychologists (Table 3). However, the staff per rehabili-

Table 1 (a) Rehabilitation in the participating clinics and British Society of Rehabilitation Medicine (BSRM) and (b) rehabilitation, analyzed according to the Specialized Services National Definitions set (SSND) and 'Tertiary Specialized Rehabilitation Service' (10), in the participating clinics

	Sunnaas	CRRRC	Rusk Inst	Policlinica 2	Sheba	BASR	El Wafa	Högsbo	Sichuan Bai
(a) Rehabilitation in the participating clinics and BSRM									
Multi-professional team who have undergone recognized specialist training in rehabilitation	Partly	Partly	Partly	No	No	No	No	Partly	No
Led or supported by a consultant trained and accredited in rehabilitation medicine	Yes	Yes	Yes	Yes	Yes	No	No	Yes	No
A coordinated inter-disciplinary team	Partly	Yes	Yes	No	Yes	No	No	Yes	No
Working toward a set of goals	Yes	Partly	Yes	No	Yes	No	No	Yes	No
Take patients with more complex rehabilitation needs than nonspecialist services	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Have specialist equipment and facilities	Yes	Partly	Yes	Partly	Yes	Partly	Partly	Yes	Partly
Staffing levels to meet those needs	Partly	No	Yes	No	Partly	No	Partly	Yes	No
Clinical data defined by the national dataset for specialist rehabilitation services are collected and reported annually for all patients	No	No	No	No	No	No	No	Yes	No
Support local teams in hospital and community	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Partly
Have a recognized role in education, training in the field of rehabilitation	Yes	Yes	Yes	No	Yes	No	No	Yes	No
Total points = 10	7.5/10	6.5/10	8.5/10	2.5/10	7.5/10	2.5/10	3/10	9.5/10	2/10
(b) Rehabilitation, analyzed according to the SSND set and Tertiary Specialized Rehabilitation Service in the participating clinics									
Service lead by a consultant trained and accredited in rehabilitation medicine and /or neuropsychiatry depending on caseload	No	Yes	No	Yes	Yes	No	No	No	Yes
Covers a population >1million patients, therefore requires collaborative commissioning	Yes	Yes	Yes	No	Yes	Yes	Yes	No	Yes
Caters for people whose needs are beyond the scope of the local specialist services, and therefore has a high proportion of patients with very complex rehabilitation needs	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes
Provides higher level of services in terms of specialist expertise, facilities, and program intensity to meet those needs	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Also plays a networking role which includes: Supporting local specialist and general teams in the management of complex cases	Yes	Yes	Yes	No	Yes	Yes	No	Yes	No
Acts as a resource for research and development, as well as education and training	Yes	Yes	Yes	No	Yes	No	No	Yes	No
Total score = 6	5/6	6/6	5/6	2/6	6/6	4/6	3/6	4/6	4/6

A score for each characteristics was given: yes = 1, no = 0 and partly = 0.5. Partly was rendered if some parts of the criteria was fulfilled.

tation bed varied (Table 2). Speech therapists and social workers were not always part of these teams (Table 3).

Participating centers were well equipped. The exercise equipment appeared old fashioned in some and very modern in others. However, the equipment was functional and served its purpose.

Standard therapy in all centers was the combination of PT and OT. The patients spend most therapy time on these activities. However, specific time spent in therapy varied between centers from 20 to 180 min per day. Complementary services reported as 'other' (horse-riding, gardening, music therapy, etc.) were mainly related to PT and OT activities.

In the majority of the centers, speech therapy, psychological help, prosthetics, and assistance from a social worker were optional therapies, only used when needed. Therapy time varied between 30 and 60 min.

Variations in frequency, intensity, time, and type varied widely between the centers. Frequency of PT and OT was daily in seven of the nine centers. Intensity of the therapies was not standardized in any of the centers. Total time in all the therapies varied from two- to five-hours per day.

Discussion

Specialized rehabilitation – structure

Compared with the definitions for specialized rehabilitation (5–7), none of the participating centers obtained the maximum score possible, although four out of the nine were close (Table 1a,b). The result indicates that a universal definition of specialized rehabilitation is possible even in countries that are quite different in terms of admission criteria, multidisciplinary

Table 2 Descriptives of the participating institutions

	Sunnaas	CRRC	Rusk rehab	Pol. clin 2	Sheba	BASR	El Wafa	Högsbo	Sichuan Bayi
Rehabilitation Financing	Subacute Public Regional	Acute and subacute* Public National, regional, and local	Subacute Private Regional and local	Subacute Public Regional and local	Acute and subacute Public National, regional, and local	Subacute Private Regional and local	Subacute Private Local	Subacute Public Regional and local	Subacute Public Regional and local
University affiliation	Yes	Yes	Yes	No	Yes	No	No	Yes	No
CARF accreditation	Yes	No	Yes	No	Yes	No	No	Yes	No
Rehab financed:	Government: Nonwegian patients' rights act	Health, commercial insurance or private: governmental 180 days rehab	Medicare (federal): time limited	Medical insurance	Health maintenance organization (HMO)/ State Health insurance	BASR, ministry of health, internal and external private donations	Non-Governmental Organization	Government: Swedish patients' right act	Health, commercial insurance or private: governmental 90 days rehab
Patients' own share:	No	Some therapies	No	No	No	No	No	Yes	Some therapies
Beds total	159	1100	66	NA [†]	108	73	57	17	500
Number of beds Neurorehab/stroke	130/40	250 Stroke	39	NA [†]	36/12	28	57	17/12	50 Stroke

Participating institutions: Sunnaas Rehabilitation Hospital (Sunnaas) in Norway, China Rehabilitation Research Center (CRRC) in PR China, Rusk Institute of Rehabilitation Medicine (Rusk Rehab) in United States, Polidinic no 2 Petrozavodsk (Pol clin 2) in Russia, Sheba Medical Center (Sheba) in Israel, Bethlehem Arab Society Rehabilitation (BASR) in Palestine, El Wafa in Palestine, Högsbo Rehabilitation Hospital (Högsbo) in Sweden, and Sichuan Bayi, China. Data were collected through administrators/leaders of the respective clinics.

*Acute and sub-acute = medically unstable.

[†]Outpatient clinic.

CARF, Commission on Accreditation of Rehabilitation Facilities.

Table 3 Descriptive therapy personnel in the participating clinics

	Sunnaas	CRRC	Rusk	Pol. clin. 2	Sheba	BASR	El Wafa	Høgsbo	Sichuan Bayi
Head of department	Professional *	MD [†]	Professional [‡]	MD [†]	MD [†]	MD [†]	MD [†]	Professional [†]	MD [†]
MD	2	39	9	60	5	8	7	8	1
Nurse	13	52	42	60	40	26	40	15-5	13
Assistant nurses	9	–	5	–	–	46	–	13-5	–
Physical therapist/assistant	5	37	12	8	6	8	20	6-5/3-0	6
Occupational therapist/assistant	5	43	10	1	6	4	9	8-6/2-0	6
Speech therapist	3	13	7-5	1	2	3	–	–	2
Psychologist	2	6	3	1	1	1	1	4-25	1
Social workers	1	2	3	–	3	2	4	4-40	5
Staff per rehab bed (min 1-95)	1-8	0-74	2-4	0-15 [§]	1-75	0-96	1-42	3-89	0-68

Data from questionnaires and interviews with leaders and contact persons.

*Physical therapist. [†]Neurologist/medical rehab/orthopedic. [‡]Occupational therapist. [§]Staff/per daily patients.

staff, and specialized equipment. However, the definition needs to be refined in order to be globally applicable in terms either tertiary or specialized, the provision of staffing establishment, and to refrain from sizes of population. The comparison to BSRM and SSND is by no means 'gold standard' but has a goal of defining some standards for specialized rehabilitation vs. ordinary rehabilitation. For example, the head of department is a professional leader in some centers rather than an MD specialized in rehabilitation medicine, which gives a lower score (Table 1b). The choice of a professional leader may indicate a more dynamic organization of specialized rehabilitation where psychosocial and medical issues are equally important, enhancing the aspects of the International Classification of Functioning, disability, and health (16). Therefore, the organization of services may seem more up-to-date than BSRM standards, and this might be an explanation for lower scores.

Many centers were not university affiliated, which may influence the level of knowledge and the specialization of rehabilitation personnel working in those centers (17–19). In most of the participating centers, the professionals had a diploma or bachelor level and no further specialization. This reduced the score for the item 'the recognized role in education, training in the field of rehabilitation'. Furthermore, a more evidence-based practice (EBP) might be expected in centers with a higher degree of specialized personnel (20).

Another reason for a decreased score was that many centers did not routinely use outcome measures to set goals in the clinic (Table 1a, b). Outcome measures were only used regularly in Sahlgrenska, Rusk, Sheba, and Sunnaas. This is probably worth discussing to improve rehabilitation services (21,22). It highlights the need to objectively evaluate progress in patient outcomes with standardized tests that are developed for global use and appropriate for different cultural settings (23).

Rehabilitation was funded in three ways: public/government, private insurance, or through charitable donations. The different financial organization may be one of several possible reasons for the observed differences in rehabilitation models. Centers that were reimbursed via health insurance, through taxes, private funding, or company schemes were more prone to follow 'expert' or combined 'expert and patient'-driven models for therapy. In organizations where patients paid for the services, the

choices, to a greater degree, were based on patients' preferences and by their perceived needs. These structural differences, embedded in the various health-care systems, and existing contextual differences in the organization of rehabilitation units have also been pointed out in other studies (8,24–26).

The differences in funding may have had a direct influence on LOS and on services rendered. The rehabilitation centers, independent of private or public funding, where all services were included in the fee, may seem in that respect socially more equal. Otherwise, economic and social differences may influence who has access to the more expensive services.

Services were, as was earlier pointed out, based on experts' evaluation of the patients' needs, rather than on the clients' own evaluation. It is not known whether these procedures have a negative influence on user involvement and self-efficacy. Only one center provided annual reports to a national data set, Web Rehab (27). This may reflect the paucity of guidelines and stakeholders' demands that exists on an international and national level for specialized rehabilitation (28).

Participating centers were all well equipped, reflecting the complex rehabilitation needs that were to be met. There were differences in rehabilitation remedies, like traditional Chinese medicine vs. Western medicine, reflecting cultural differences (29). However, it might also be a reflection of different views on evidence-based medicine or purely economic realities (30).

The centers CRRC, Rusk, Policlinica no 2, Sheba, BASR, El Wafa, and Bayi Sichuan represented more expert-driven centers, where the professionals did the evaluations and decided the therapies in joint meetings consisting only of professionals. The patients' interests and their ability to influence the treatment were incorporated in their communication with the professionals. The organization of services was parallel; each department organized independently of one another with weekly meetings between professionals to adjust therapies according to progress and patients' needs.

On the other hand, Sunnaas and Sahlgrenska represented centers where therapies incorporated the patients and their families' goals and interests through dialogue with the team coordinator and the experts in addition to the experts' evaluation and advice. In these centers, therapies were also organized in parallel settings, but in close collaboration with the nursing staff, who

Table 4 Admission criteria and follow-up procedure for the participating institutions, from questionnaires and interviews with leaders and contact persons

Admission criteria	Sunnaas	CRRC	Rusk Inst	Pol. clin. 2	Sheba	BASR	El Wafa	Högsbo	Sichuan Bayi
Patients status	Complex impairment* Medically stable Able to participate in active rehab	Complex impairment Medically stable and unstable Able to participate in active rehab	Need for inpatient rehabilitation† Medically stable and unstable Ability to participate minimum three-hours of therapy per day See above	Need for complex rehabilitation Medically stable Not specified	Complex impairment, in need of inpatient rehabilitation Medically stable and unstable Hope of functional improvement See above	In need of rehabilitation Medically stable and unstable Not specified Not specified	Complex impairment Medically stable Not specified	Complex impairment Medically stable Able to participate in active rehab	Complex impairment Medically stable Able to participate in active rehab
Standardized procedure follow-up post stroke	Potential to return to an active lifestyle Yes, 12 months post-rehab	Potential to return to an active lifestyle Yes	See above No	Need for independent transportation to the clinic No	Yes, according to needs	Yes, according to needs	Potential to return to an active lifestyle Yes, 3 and 12 months post-stroke	Potential to return to an active lifestyle No	

*Complex impairment = motor and/or cognitive disability. †Complex/inpatient rehabilitation refers to services available: physical, cognitive, and social.

were actively taking part in the rehabilitation processes, transferring therapies into activities on the wards. This enhanced variation and duration of exercise and led to higher self-efficacy and preparation for discharge (31).

To what extent national guidelines, or consensus, were implemented in regular rehabilitation was not clear, neither to what extent consensus guidelines differed from national guidelines. However, ambitions to deliver high-quality services were high in all the participating centers (Table 4). A weak point was that follow-up procedures after the in-patient period were scarce and only regular in two centers.

Process of services

The results indicate that the participating centers practiced somewhat different models of cooperation within the rehabilitation teams and that length of time, intensity, and type of therapy varied.

There are no standards for the composition of the multidisciplinary team in rehabilitation, although attempts have been made to describe a minimum staffing level for an acute stroke unit (8,28). The majority in this study seemed to practice a multidisciplinary model (30–33). This is in contrast to what is recommended, which is an interdisciplinary model to enhance therapies and rehabilitation in a 24-h perspective (34–36). Some centers practiced this 24-h approach, with nurses specialized in rehabilitation continuing the rehabilitation activities on the ward, and where OTs and PTs practiced activities on the wards with the nursing staff. However, in most centers, this was not an option. Relatives or paid assistants increased the therapy input in those centers. This variation in practice might partly be explained by the fact that therapy rooms were in a separate location from the wards.

The intensity of the therapies was not standardized in any of the centers. Repetitions, perceived ‘difficulty’/‘loading’, and variation did not seem to be issues that were discussed. Rather to the contrary, ‘individualized training’ was commonly referred to when intensity was discussed. It was obvious that intensity was considered a subjective entity relating to the individual patient, context, circumstances, and the therapists’ experience, disclosing a heterogeneous practice. This is probably a general issue in rehabilitation where intensity has often been a challenge, and studies that have focused on this particular subject are generally small and few (20,37,38). The difference in time spent in therapy has already been noted in other studies, where it was questioned whether this was more related to management decisions than to the number of staff available (24,25).

The questionnaires, meetings, workshops, and visits disclosed how specialized rehabilitation in the various countries was organized. For example, patients at the outpatient clinic in Petrozavodsk were offered an individualized ‘programme of rehabilitation’, prescribed by the medical doctor, consisting of a ‘cocktail’ of therapy services, including passive and active treatment. The professionals worked efficiently in parallel settings true to the program prescribed. This was in contrast to the more individual approach in CRRC and Bayi, China, where patients could, to a certain extent, choose their therapists, in addition to the pre-

Table 5 Description of patients and services in the respective clinics in accordance with British Society of Rehabilitation Medicine (BSRM)

	Sunnaas	CRRC	Rusk Inst	Pol. clin. 2	Sheba	BASR	El Wafa	Högsbo	Sichuan Bayi
Patients rehab needs	A, B	A, B, C	A,B, C, D	D	A, B, C	B, C	C, D	A, B,	A, B, C
Level of services	1	1	1	3b	1	1	3b	1	1
Specified goals with rehabilitation*	No	No	No	No	No	No	No	No	No
Programmes/therapies [†]	1–4	1–4	1–4	1–3	1–4	1–2, 4	1–2,4	1–3	1–4
Outcome measures	Yes FIM	Yes BI, mRS, NIHSS, MMSE	Yes FIM	No	Yes FIM	Yes FIM	No	Yes FIM, mRS++	Yes BI, NIHSS, MMSE
National guidelines [‡]	Yes	No	Yes	No	No	No	No	Yes	No
Guidelines – consensus [§]	NA	Yes	NA	No	Yes	Yes	No	NA	No

Data from questionnaires and interviews with leaders and contact persons.

*Specified goals on admittance based on outcome measures with minimal clinical change. [†]Specialized rehab service program: 1: physical 2. cognitive, 3: vocational, 4: children/adolescent. [‡]National guidelines are graded advice for treatment and rehabilitation based on systematic reviews of existing evidence for treatment and rehabilitation by an expert panel consisting of multidisciplinary experts and representatives of patients. [§]Guidelines – consensus are experts consensus opinions on a stroke treatment and rehabilitation.

Abbreviations for the participating clinics are as given in Table 1.

scribed therapies, add therapies of their own choices and perceived needs, in collaboration with the MDs. This choice depended on what they could and could not afford. The experts delivered services efficiently, in a parallel organization with little communication between different professions.

Therapy rooms also seemed to signal what type of ‘therapy school’ the center practiced. The type of therapy varied; from working on tables and mats, or in functional rooms with activities like gardening, kitchen activities, or big areas for walking practice, group training, and outdoors. Therapies also varied in the use of passive and active therapy remedies. Different methods have been practiced in rehabilitation, often with little reference to EBP, depending more on the explicit and tacit knowledge and assumptions of the particular therapists (34–42). These different approaches reflect the diversity of rehabilitation as a whole.

Prerequisites for specialized rehabilitation and to what extent these prerequisites mapped to standards was the main aim of this paper. The standards BSRM and SSND were in fact the only tools found that have operationalized the difference and are to a certain extent overlapping. Three key issues defined in both documents could be mapped from the descriptions: Admittance of stroke patients with very complex rehabilitation needs, similar categories of rehabilitation staff, and adequate special equipment for rehabilitation were universal throughout centers. Therefore, despite large cultural, political, and juridical differences between countries, it seems advisable to define international standards for stroke rehabilitation in general and specialized rehabilitation in particular, for the sub-acute period after stroke. Centers with CARF accreditation following universal standards seem to provide stroke rehabilitation services in agreement with EBP. As CARF is an international organization, this emphasizes the need for further international cooperation to improve specialized rehabilitation services even more around the globe (13).

However, a further refinement of standards would include structures and procedures like time from debut to admission, and more detailed parameters for therapy content and dose in terms of frequency, intensity, time, and type on a general basis. The strength of this study is the description from a wide range of

rehabilitation institutions in a multicultural and multicenter study. A weakness of a multicenter/multicultural study is perhaps the language and communication challenges. Misinterpretations may arise in the process of mapping and comparing to standards. An effort was made to minimize these challenges by striving for a transparent and friendly process, and by including elements of validation in terms of meetings and discussions in progression with the study.

Conclusion

This multinational study of specialized stroke rehabilitation in nine centers from seven countries shows that a universal definition of specialized rehabilitation is possible, and may be desirable to enhance evidence-based rehabilitation practice for persons with stroke. All centers admitted persons with stroke and complex rehabilitation needs, similar categories of rehabilitation staff, and adequate special equipment for rehabilitation. There were, however, differences in structures and procedures, which may influence patients’ outcomes, indicating a need for refinement of the definition of specialized rehabilitation to be globally applicable.

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Supporting Information

Additional Supporting Information may be found in the online version of this article at the publisher's web-site:

Appendix S1. Questionnaire.

Appendix S2. BSRM standards for rehabilitation services, mapped on to the National Service Framework for long-term conditions.

Appendix S3. Specialist neuro-rehabilitation services: providing for patients with complex rehabilitation needs.

Appendix S4. Detailed description of text analyses.